U.S. Fire Administration
Working for a fire-safe America

Fire in the United States 2008-2017

20th Edition

November 2019

FEMA

Mission Statement

We support and strengthen fire and emergency medical services and stakeholders to prepare for, prevent, mitigate and respond to all hazards.

U.S. Fire Administration

Working for a fire-safe America

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Executive Summary

The National Fire Data Center (NFDC) of the U.S. Fire Administration (USFA) periodically publishes "Fire in the United States," a statistical overview of the fires in the United States, with the focus on the latest year in which data were available. This report provides the fire service and others with information that motivates corrective action, sets priorities, targets specific fire programs, serves as a model for state and local analyses of fire data, and provides a baseline for evaluating programs.

The primary source of data is from the USFA's National Fire Incident Reporting System (NFIRS). The National Fire Protection Association (NFPA) annual survey results, mortality data from the National Center for Health Statistics (NCHS), data from state fire marshals' offices or their equivalents, population data from the U.S. Census Bureau, and inflation adjustments from the Bureau of Labor Statistics' Consumer Price Index (CPI) are also used. Because of the time it takes for states to submit data to the USFA from the thousands of fire departments that participate in the NFIRS, then obtain corrections and edit the data, and analyze and display the results, the publication lags behind the date of data collection. Fortunately, the fire problem does not change very rapidly, so the data is usually quite representative of the situation in the year of publication as well.

This 20th edition covers the 10-year period from 2008 to 2017, with a primary focus on 2017.[1] The report addresses the overall national fire problem. Detailed analyses of the residential and nonresidential fire problem, firefighter casualties, and other subsets of the national fire problem are not included. These topic-specific analyses are addressed as separate, stand-alone publications.

National problem

Fire departments in the U.S. responded to over 1.3 million fire incidents in 2017.[2] Each year, thousands of Americans die, tens of thousands of people are injured and property losses reach billions of dollars as a result of the U.S. fire problem.

There are huge indirect costs of fire as well, including temporary lodging, lost business revenues, medical expenses and psychological damage. To put this into context, the annual losses from floods, hurricanes, tornadoes, earthquakes and other natural disasters combined in the U.S. average just a fraction of those from fires.[3] The public, the media and local governments are generally unaware of the magnitude and seriousness of the fire problem and how it affects individuals and their families, communities and the nation.

Annual deaths from fire in the U.S. were estimated at 12,000 in 1974, the year in which the USFA was established. At that time, a goal was set for reducing this number by half within a generation. This goal was met.[4] By 2012, estimates of civilian deaths were at their

[1]Only native NFIRS Version 5.0 data was used for NFIRS-based analyses. By Jan. 1, 2009, NFIRS 4.1 data was no longer accepted by the system.
[2]NFPA. (2018). *Fire loss in the United States during 2017.*
[3]National Weather Service (NWS). (2018). *Summary of national hazard statistics for 2017 in the United States.* Retrieved from http://www.nws.noaa.gov/om/hazstats/sum17.pdf.
[4] NFPA changed their estimation methodology in the mid-1970s. As a result, by 1977, the estimate of fire deaths had already dropped to approximately 7,400 and rose the next year to 7,700. Nevertheless, it is fair to say that the 50% reduction in fire deaths was achieved. National Commission on Fire Prevention and Control. (1973). *America burning: The report of the national commission on fire prevention and control.* Washington, DC: Author.

lowest level (2,855). Over recent years, trends in fire deaths have increased. By 2017, the estimate of fire deaths was 3,400 — 19% higher than it was in 2012, but comparable to the estimate in 2007 when the number of fire deaths was 3,430.[5,6]

Table 1 presents 10-year fire and fire-loss rate trends. Fires per million population reached a new low in 2013, continuing the downward trend. Although the trend in the fire death rate (deaths per million population) increased 2% from 2008 to 2017, it is still less than a third of what it was in the late 1970s.[7] While dollar loss per capita increased 12% over the 10 years, injuries per million population continued to decline.

Table 1. Fire and fire loss rate trends (2008-2017)

Loss measure	10-year trend (percent)
Fires per million population	-12.3
Deaths per million population	2.4
Injuries per million population	-21.2
Dollar loss/capita*	11.9

Sources: NFPA, CPI and U.S. Census Bureau.
* The 2008 to 2016 dollar-loss values were adjusted to 2017 dollars.

Regional and state profiles

The fire problem varies from region to region and state to state because of variations in climate, socioeconomic status, education, demographics and other factors. In 2017, four states (Alaska, Arkansas, South Dakota and West Virginia) had fire death rates that exceeded 20 deaths per million population. The District of Columbia and 22 states, mostly situated in the Southeast and Midwest, had death rates between 11.3 and 20 deaths per million population. Additionally, 21 states had fire death rates at or below the national fire death rate — 11.2 deaths per million population.[8] Ten states, mostly largely populated states, accounted for 49% of the national total fire deaths. Unless their fire problems are significantly reduced, the national total will be difficult to lower.

Residences and other properties

Over the years, there has been little change in the proportion of fires, deaths, injuries and dollar loss reported to the NFIRS by the type of property involved. In terms of numbers of reported fires, the largest category continued to be outside fires (43%) — in fields, vacant lots, trash, etc. Residential and nonresidential structure fires together constituted 38% of fires, with residential structure fires outnumbering nonresidential structure fires by over 3 to 1. What may be surprising was the large proportion of vehicle fires. In fact, approximately 1 out of every 7 fires to which fire departments responded involved a vehicle.

[5]USFA. (2009). *Fire in the United States (2003-2007)* (15th ed.). Retrieved from https://www.usfa.fema.gov/downloads/pdf/publications/fa_325.pdf.
[6]The NFPA estimated fire deaths to be 3,400 in 2017. For the same year, the National Center for Health Statistics (NCHS) mortality data reflected 3,645 fire deaths. For 2017, the NCHS mortality data suggest that fire deaths may be 7.2% higher than the NFPA estimate of fire deaths.
[7]The fire death rate used throughout this edition of *Fire in the United States,* however, reflects the number of fire deaths (3,645) from the 2017 NCHS mortality data. This death rate is 11.2 fire deaths per million population. In 1979, the fire death rate was 34.8 deaths per million population, as cited in USFA's *America Burning Revisited,* 1987, p. 15.
[8]This analysis includes only states where fire death rates were computed. Fire death rates were not computed for Delaware, Rhode Island and Wyoming due to very small numbers of fire deaths (fewer than 10 deaths).

By far, the largest percentage of reported deaths — 78% in 2017 — occurred on residential properties, with the majority of these on one- and two-family properties. Vehicles accounted for the second largest percentage of fire deaths at 15%. Great attention is given to large, multiple-death fires in public places, such as hotels, nightclubs and office buildings; however, fires that kill 10 or more people are few in number and constitute only a small portion of overall fire deaths. Furthermore, public properties are generally required by local codes to have built-in fire suppression systems. The area with the largest problem is most commonly overlooked — in people's homes. Prevention efforts continue to focus on home fire safety.

Only 3% of the 2017 fire deaths occurred in nonresidential commercial and public properties. Outside and other miscellaneous fires, including wildfires, were also a small factor (4% combined) in fire deaths.

The picture was generally similar for fire injuries, with 76% of all reported injuries occurring on residential properties. The remaining fire injuries were distributed across the other property types — nonresidential properties, 8%; vehicles, 7%; and outside and other fires, 9% combined.

The picture changes somewhat for dollar loss. While residential properties were the leading property type for dollar loss, nonresidential properties played a considerable role. These two general property types accounted for 81% of all reported dollar loss. The proportion of dollar loss from outside fires, however, may be understated because the destruction of trees, grass, etc., is often given zero value in fire incident reports if it is not commercial cropland or timber.

Causes of fires and fire losses

Residential

At 52%, cooking was the leading cause of residential building fires. Heating caused another 9%. These percentages (and those that follow) are adjusted, which proportionally spreads the unknown causes over the other 15 cause categories.

The leading causes of residential fatal fires were other unintentional or careless actions at 17%, cause under investigation at 14%, intentional actions at 13%, and smoking at 12%. These four causes accounted for more than half of the residential fatal fires. The cause category "other unintentional or careless actions" includes the misuse of materials or products, abandoned or discarded materials or products, heat source too close to combustibles, and other unintentional actions.

The leading cause of residential fires that resulted in injuries was cooking (32%). Cooking was, by far, the leading cause of fires resulting in dollar loss at 27%, followed by electrical malfunction and other unintentional or careless actions (12% each).

Nonresidential

For nonresidential building fires, cooking was the leading cause of fires (30%), followed by other unintentional or careless actions (11%). The leading causes of fires resulting in dollar loss in nonresidential buildings were other unintentional or careless actions (14%), cooking (12%), and electrical malfunctions (12%).

Vehicle

Unintentional actions were the leading cause of fires and fires resulting in dollar loss in vehicles (38% and 37%, respectively). Failure of equipment or heat source, at 20%, was the second leading cause of vehicle fires. In 24% of vehicle fires, the causes were undetermined after the investigations.

Outside

Unintentional actions were the leading cause of fires and fires resulting in dollar loss in outside fires (42% and 40%, respectively). In 27% of outside fires and 25% of outside fires resulting in dollar loss, causes were undetermined after the investigations.

Other

Just as with vehicle and outside fires, unintentional actions were the leading cause of other fires and fires resulting in dollar loss (45% and 48%, respectively). Failure of equipment or heat source was the second leading cause of other fires (19%) and other fires resulting in dollar loss (24%).

Race, age and gender characteristics of victims

Fire casualties affect all groups and races, rich and poor, Northern and Southern, urban and rural. But the problem is greater for some groups than for others. Males, African Americans and American Indians/Alaskan Natives had higher fire death rates 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.

Males were 1.6 times more likely to die in fires than females. The percentage of female fire deaths in the 65 and older age group accounted for 42% of all female fire deaths. Male fire deaths, by contrast, were highest for those adults ages 55 to 64, accounting for 21% of male fire deaths.

People with limited physical and cognitive abilities, especially older adults (ages 65 and older), are at a higher risk of death from fire than other groups. Older adults accounted for 40% of all fire deaths and 15% of estimated fire injuries in 2017.

The majority of fire-related injuries occurred in adults ages 20 to 64. This age group accounted for 69% of the fire injuries in 2017. Males ages 20 to 24 and 30 to 59 had a higher proportion of injuries than females, while older adult females had more injuries than older adult males.

As baby boomers enter retirement age, the demographic profile of the U.S. is expected to change dramatically. Over the coming decades, the older population will increase, and a corresponding increase in fire deaths and injuries among older adults is likely.

In the past, children ages 4 and younger were also considered to be at a high risk of death from fire; however, data indicate that the trend is changing. In 2017, the relative risk of children ages 4 and younger dying in a fire was 40% less than that of the general population.

Conclusions

Over the years, the USFA has contributed to remarkable progress in reducing the adverse effects of fire on the U.S. It is likely that several factors continue to contribute to this progress:

- Smoke alarms, which have become nearly universal. The USFA continues to partner with other government agencies and fire service entities to improve and develop new smoke alarm technologies.
- Sprinklers, which quickly combat incipient fires, especially in nonresidential and multifamily buildings. There are major movements in the U.S. fire service to require or facilitate use of sprinklers in all new homes, which could improve the use of residential sprinklers in the future.
- Fire codes, which have been strengthened.
- Construction techniques and materials, which have been developed specifically for fire prevention.
- Public education at the community, county, state and federal levels.
- Improved firefighter equipment and training.

Despite the progress in the reduction of fires in the U.S., there is still a need to continue the work of lessening the fire problem. Although there is an overall reduction in the numbers of fires and civilian fire injuries, the U.S. is seeing a rise in the trend of the overall numbers of civilian fire deaths; however, the numbers of deaths are generally lower than or comparable to what they were 10 years earlier. Although certain demographic groups remain at high risk, potentially driven by socioeconomic conditions, children ages 4 and younger are no longer a statistically high-risk group.

Specific areas that continue to be of concern:

- The elderly remain at high risk of death from fire.
- The focus for fire injury prevention should be on adults ages 25 to 64 and those ages 80 to 84.
- Males, African Americans and American Indians/Alaskan Natives remain at a higher risk of death from fire than the general population.
- Outside/Wildland fires.

In addition to the areas of concern listed above, data challenges still exist. Many records submitted to the NFIRS by participating fire departments provide either incomplete or no information in some of the fields. Additionally, in preparing this report, it is assumed that participating fire departments have reported 100% of their fire incidents; however, this is not always the case. The completeness of all the information in the NFIRS modules and the improvement of data quality will contribute to the refinement and confidence level of future analyses.

With continued enhancements to the NFIRS, data collection and data quality efforts continue to improve. If we understand the relative importance of the factors that lessen the fire problem, resources can be better targeted to have the most impact.

Prevention and other resources

The USFA develops and delivers fire prevention and safety education programs in partnership with other federal agencies, the fire and emergency response community, the media, and safety interest groups. The USFA also works with public and private groups to promote and improve fire prevention and life safety through research, testing and evaluation.

- The USFA's outreach materials and educational programs are available at https://www.usfa.fema.gov/prevention.
- Smoke alarm information on 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. The USFA's position statement on smoke alarms is available at https://www.usfa.fema.gov/about/smoke_alarms_position.html.
- Residential sprinkler information on costs and benefits, performance, training bulletins, and public education and outreach materials is available at https://www.usfa.fema.gov/prevention/technology/home_fire_sprinklers.html. The USFA's position statement on residential sprinklers is also available at https://www.usfa.fema.gov/about/sprinklers_position.html.
- The USFA sponsors research and conducts studies to support emergency responder health and safety and help fire departments prepare for and respond to fire, natural disasters, nonfire emergencies, and other threats and vulnerabilities. Information on fire department operations, management and safety is available at https://www.usfa.fema.gov/operations.

Provide feedback on this report.

Fire in the United States 2008-2017 20th Edition

Introduction

In 1973, the president's Commission on Fire Prevention and Control published "America Burning." This document was the first in-depth discussion of this country's fire problem. The report prompted a national awareness about the depth of the fire problem and the need for prevention efforts. By 1987, when a second commission was assembled, much progress had been made toward addressing the nation's fire problem. Among other objectives, "America Burning Revisited" redefined the strategies needed to further reduce loss of life and property to fire.

This report is a statistical portrait of fire in the U.S. It is intended for use by a wide audience, including the fire service, the media, researchers, industry, government agencies and the general public. The report focuses on the national fire problem with emphasis on the magnitude and trends of the fire problem, the causes of fires, where they occur, and whom fire impacts.

This document is the 20th major edition of "Fire in the United States" published by the USFA. It covers the 10-year period from 2008 to 2017, with a primary focus on 2017.

Organization of report

This report presents an overview of the national fire problem in terms of estimates of the total numbers of fires, deaths, injuries and dollar loss (the four principal measures used to describe the fire problem), as well as 10-year trends. It also provides an overview and 10-year trends of building fires and losses (i.e., residential and nonresidential). Trends in vehicle and other mobile properties as well as outside and other properties are also analyzed. Additionally, the report covers causes of fires and fires resulting in losses, as well as fire casualties in terms of death and injury rates and relative risk.

Finally, the last section of the report includes detailed descriptions of the data sources and data analysis methodologies used in this edition. Two appendices follow this section to include acronyms and a list of previous editions of the "Fire in the United States" reports.

The National Fire Problem

Fire departments in the U.S. responded to over 1.3 million fire incidents in 2017.[9] Each year, thousands of Americans die, tens of thousands of people are injured, and property losses reach billions of dollars as a result of the U.S. fire problem. There are huge indirect costs of fire as well, including temporary lodging, lost business revenues, medical expenses and psychological damage. To put this in context, the annual losses from floods, hurricanes, tornadoes, earthquakes and other natural disasters combined in the U.S. average just a fraction of those from fires.[10]

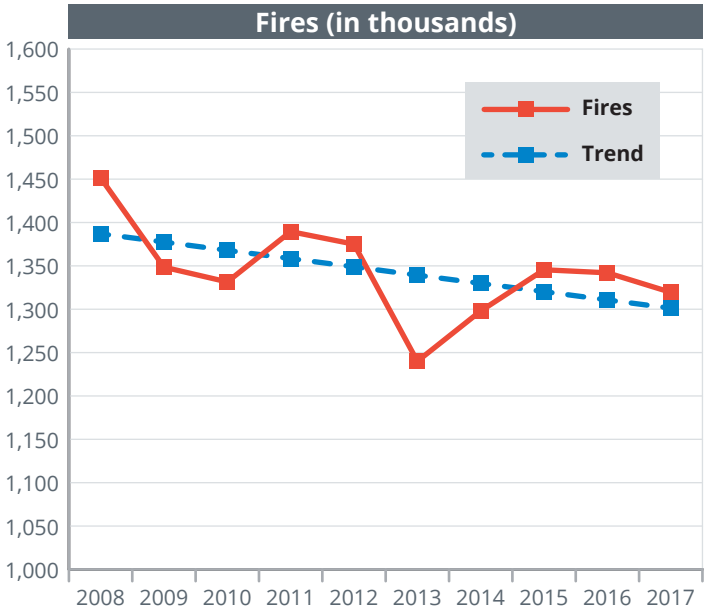
Fires and losses (10-year trends, 2008 to 2017)

Over the 10 years from 2008 to 2017, the U.S. had an annual average estimate of 1,344,100 fires resulting in 3,190 civilian deaths, 16,225 civilian injuries, and $14.7 billion in direct property loss each year.[11] In terms of estimates of fires, fire deaths and fire injuries, the estimates are lower than they were 10 years ago. When the USFA was established in 1974, annual fire deaths were estimated at 12,000. The goal was to reduce deaths by 50% within 25 years; that goal was met.[12] By 2012, estimates of civilian fire deaths were at their lowest level (2,855). Over recent years, however, trends in fire deaths have increased. By 2017, the estimate of fire deaths was 3,400 — 19% higher than it was in 2012, but still comparable to the estimate in 2007 when the number of fire deaths was 3,430.[13]

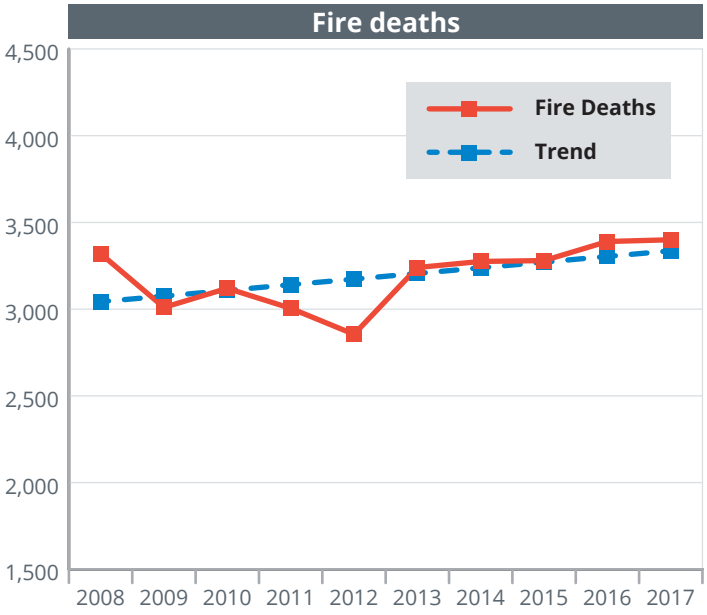
Figure 1 shows the 10-year trends for all fires and losses from 2008 to 2017. Fires declined by 6% over the 10 years. Trends in fire-related injuries also declined by 16%. Trends in fire-related deaths and dollar loss (when adjusted for inflation), however, increased by 10% and 21%, respectively. The large increase in the dollar loss trend is partially attributed to the increase in the 2017 dollar loss estimate which reflects the Northern California wildfires with an estimated property loss of $10 billion.[14] By excluding this outlier, the 10-year trend in dollar loss declined by 14%.

[9]NFPA. (2018). *Fire loss in the United States during 2017.*
[10]NWS. (2018). *Summary of national hazard statistics for 2017 in the United States.* Retrieved from http://www.nws.noaa.gov/om/hazstats/sum17.pdf.
[11]Annual average estimates are based on NFPA estimates of fires, deaths, injuries and dollar loss. Fires are rounded to the nearest 100, deaths to the nearest five, injuries to the nearest 25, and dollar loss to the nearest billion dollars. The 2008 to 2016 dollar-loss estimates were adjusted to 2017 dollars.
[12]The NFPA changed their estimation methodology in the mid-1970s. As a result, by 1977, the estimate of fire deaths had already dropped to approximately 7,400 and rose the next year to 7,700. Nevertheless, it is fair to say that the 50 percent reduction in fire deaths was achieved. National Commission on Fire Prevention and Control. (1973). *America burning: The report of the national commission on fire prevention and control.* Washington, DC: Author.
[13]USFA. (2009). *Fire in the United States (2003-2007)* (15th ed.). Retrieved from https://www.usfa.fema.gov/downloads/pdf/publications/fa_325.pdf.
[14]For 2017, the $23 billion in direct property loss estimate includes a $10 billion loss in the Northern California wildfires. NFPA. (2018). Fire loss in the United States during 2017.

Figure 1. Fires and fire losses (2008-2017)

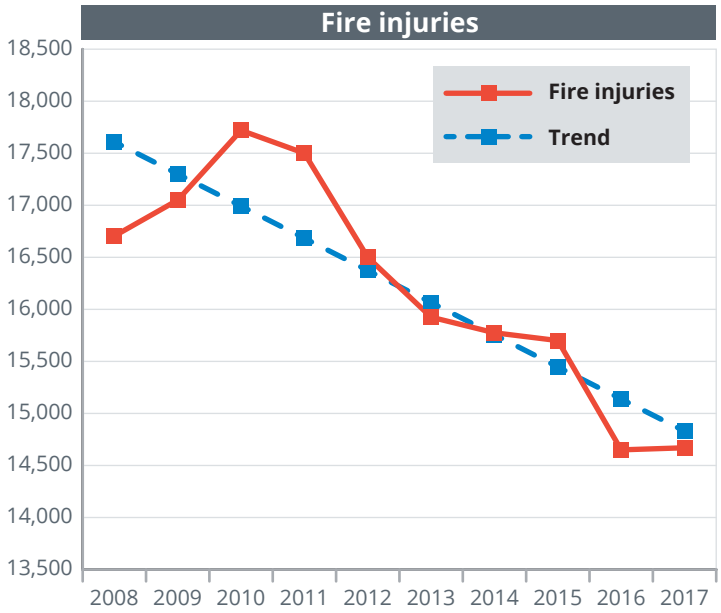


Fires (thousands)	
Year	Value
2008	1,451.5
2009	1,348.5
2010	1,331.5
2011	1,389.5
2012	1,375.0
2013	1,240.0
2014	1,298.0
2015	1,345.5
2016	1,342.0
2017	1,319.5
10-year trend (%)	**-6.2%**

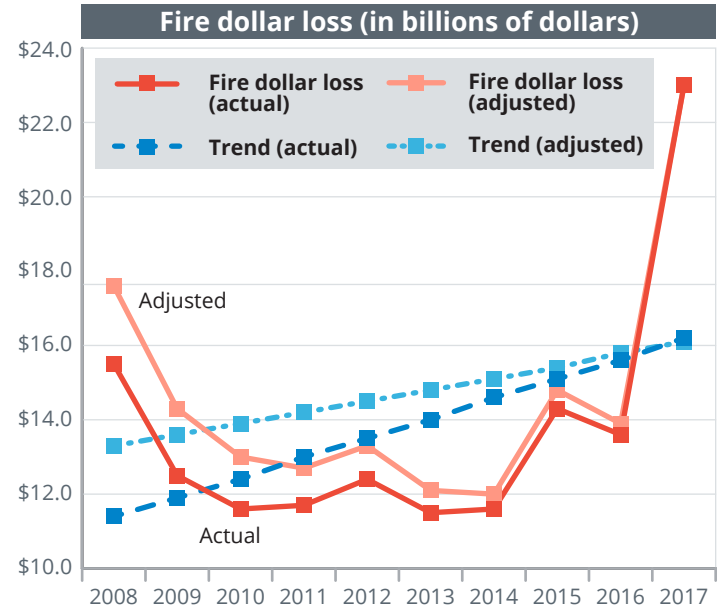


Deaths	
Year	Value
2008	3,320
2009	3,010
2010	3,120
2011	3,005
2012	2,855
2013	3,240
2014	3,275
2015	3,280
2016	3,390
2017	3,400
10-year trend (%)	**9.6%**

Figure 1. Fires and fire losses (2008-2017) — continued



Injuries	
Year	Value
2008	16,705
2009	17,050
2010	17,720
2011	17,500
2012	16,500
2013	15,925
2014	15,775
2015	15,700
2016	14,650
2017	14,670
10-year trend (%)	**-15.8%**



Dollar loss (billions of dollars)		
Year	Actual	Adjusted to 2017 dollars
2008	$15.5	$17.6
2009	$12.5	$14.3
2010	$11.6	$13.0
2011	$11.7	$12.7
2012	$12.4	$13.3
2013	$11.5	$12.1
2014	$11.6	$12.0
2015	$14.3	$14.8
2016	$13.6	$13.9
2017	$23.0	$23.0
10-year trend (%)	**42.0%**	**20.9%**

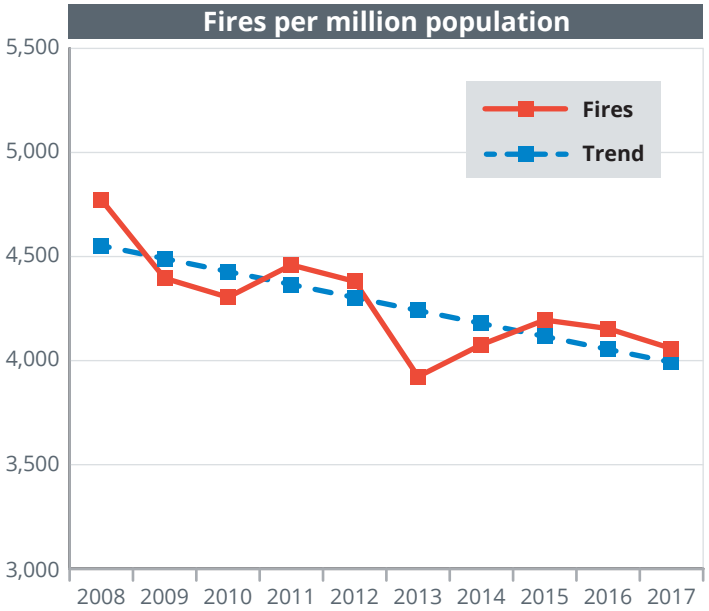
Sources: NFPA and CPI.

Note: The large increase in the dollar loss trend is partially attributed to the increase in the 2017 dollar loss estimate which reflects the Northern California wildfires with an estimated property loss of $10 billion.

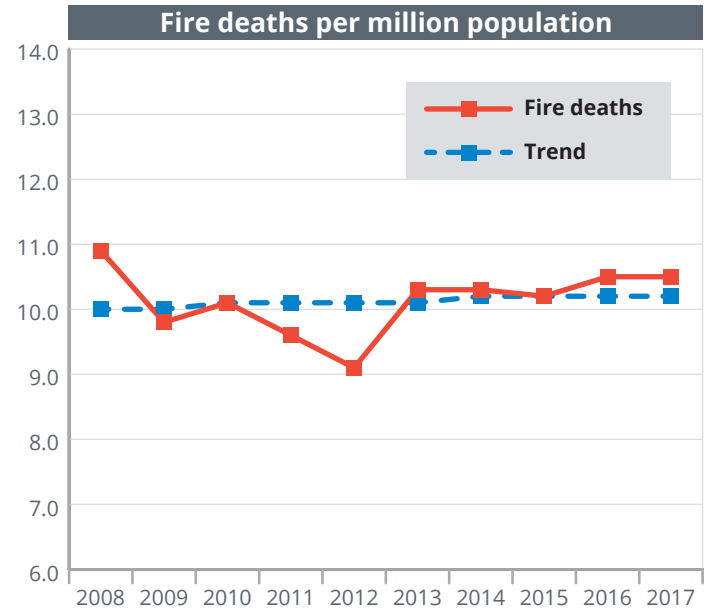
Fire loss rates (2008-2017)

Figure 2 shows the 10-year trends in the rates per million population for all fires and associated losses from 2008 to 2017. Fires per million population reached a low in 2013, but increased in 2014 and 2015, then declined again through 2017. Still, in 2017, the fire death rate was less than a third of what it was in the late 1970s.[15] Fires and injuries per million population continued to decline by 12% and 21%, respectively, while deaths per million population and dollar loss per capita (when adjusted for inflation) increased 2% and 12%, respectively, over the 10 years. When excluding the loss from the 2017 Northern California wildfires, the trend in the dollar loss per capita declined by 20% (adjusted for inflation).[16]

Figure 2. Fire loss rates (2008-2017)



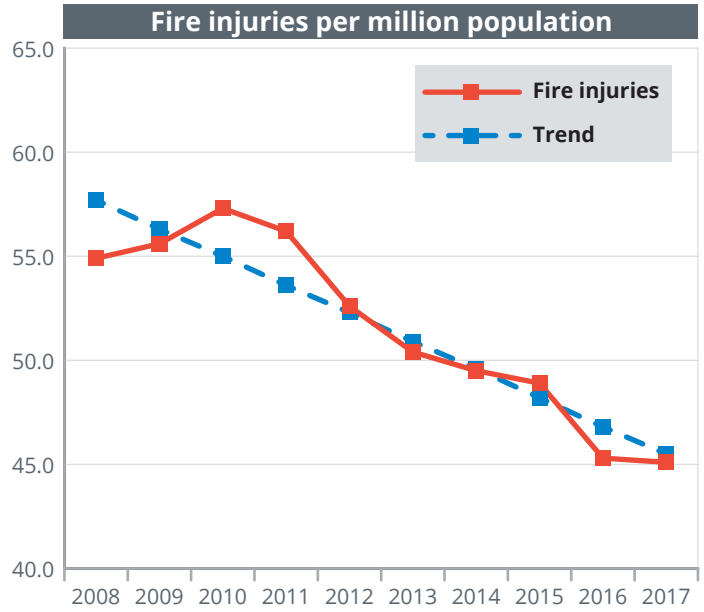
Fires per million population	
Year	Value
2008	4,773.2
2009	4,395.8
2010	4,304.5
2011	4,459.5
2012	4,380.7
2013	3,923.3
2014	4,076.8
2015	4,195.0
2016	4,153.9
2017	4,058.2
10-year trend (%)	**-12.3%**



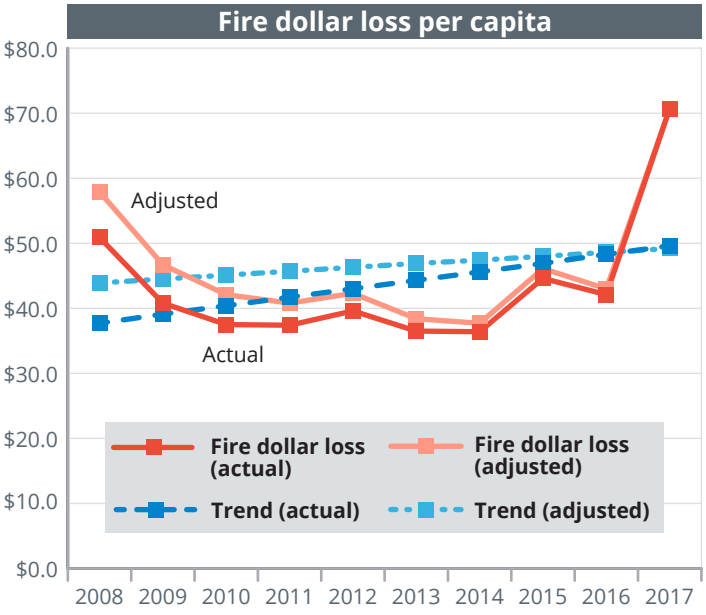
Deaths per million population	
Year	Value
2008	10.9
2009	9.8
2010	10.1
2011	9.6
2012	9.1
2013	10.3
2014	10.3
2015	10.2
2016	10.5
2017	10.5
10-year trend (%)	**2.4%**

[15]In 1979, the fire death rate was 34.8 deaths per million population as cited in USFA's *America Burning Revisited,* 1987, p. 15.
[16]For 2017, the $23 billion in direct property loss estimate includes a $10 billion loss in the Northern California wildfires. NFPA. (2018). *Fire loss in the United States during 2017.*

Figure 2. Fire loss rates (2008-2017) — continued



Injuries	
Year	Value
2008	54.9
2009	55.6
2010	57.3
2011	56.2
2012	52.6
2013	50.4
2014	49.5
2015	48.9
2016	45.3
2017	45.1
10-year trend (%)	**-21.2%**



Dollar loss per capita		
Year	Actual	Adjusted to 2017 dollars
2008	$50.9	$57.9
2009	$40.8	$46.7
2010	$37.5	$42.1
2011	$37.4	$40.8
2012	$39.6	$42.3
2013	$36.5	$38.4
2014	$36.4	$37.7
2015	$44.6	$46.1
2016	$42.1	$43.0
2017	$70.7	$70.7
10-year trend (%)	**31.3%**	**11.9%**

Sources: NFPA, CPI and U.S. Census Bureau.
Note: The large increase in the dollar loss per capita trend is partially attributed to the increase in the 2017 dollar loss estimate which reflects the Northern California wildfires.

Types of properties where fires occur

This section describes the proportions of the fire problem by general property type: residential structures, nonresidential structures, vehicles, outside properties, and other or unknown properties.

Fires and fire losses by general property type (2017)

Figure 3 describes the proportions of the fire problem in 2017 by general property type. Over the years, there has been little change in the proportion of fires, deaths, injuries and dollar loss reported to NFIRS by the type of property involved. In terms of numbers of reported fires, the largest category continued to be outside fires (43%) — in fields, vacant lots, trash, etc. Residential and nonresidential structure fires together constituted 38% of fires, with residential structure fires outnumbering nonresidential structure fires by over 3-to-1. What may be surprising was the large percentage of vehicle fires. In fact, approximately 1 out of every 7 fires which fire departments responded to involved a vehicle.

The largest percentage of reported deaths by far — 78% in 2017 — occurred on residential properties, with the majority of these on one- and two-family properties. Vehicles accounted for the second largest percentage of fire deaths at 15%. Only 3% of the 2017 fire deaths occurred in nonresidential commercial and public properties. Outside and other miscellaneous fires, including wildfires, were also a small factor in fire deaths (4% combined).

Great attention is given to large, multiple-death fires in public places, such as hotels, nightclubs and office buildings; however, fires that kill 10 or more people are few in number and constitute only a small portion of overall fire deaths. Furthermore, public properties are generally required by local codes to have built-in fire suppression systems. The area with the largest problem is most commonly overlooked — in people's homes. As a result, prevention efforts continue to focus on home fire safety.

The picture was generally similar for fire injuries, with 76% of all reported injuries occurring on residential properties. The remaining fire injuries were distributed across the other property types — nonresidential properties, 8%; vehicles, 7%; and outside and other fires, 9% combined.

The picture changes somewhat for dollar loss. While residential properties were the leading property type for dollar loss, nonresidential properties played a considerable role. These two general property types accounted for 81% of all reported dollar loss. The proportion of dollar loss from outside fires, however, may be understated because the destruction of trees, grass, etc., is often given zero value in fire incident reports if it is not commercial cropland or timber.

Figure 3. Fires and fire losses by general property type (2017)

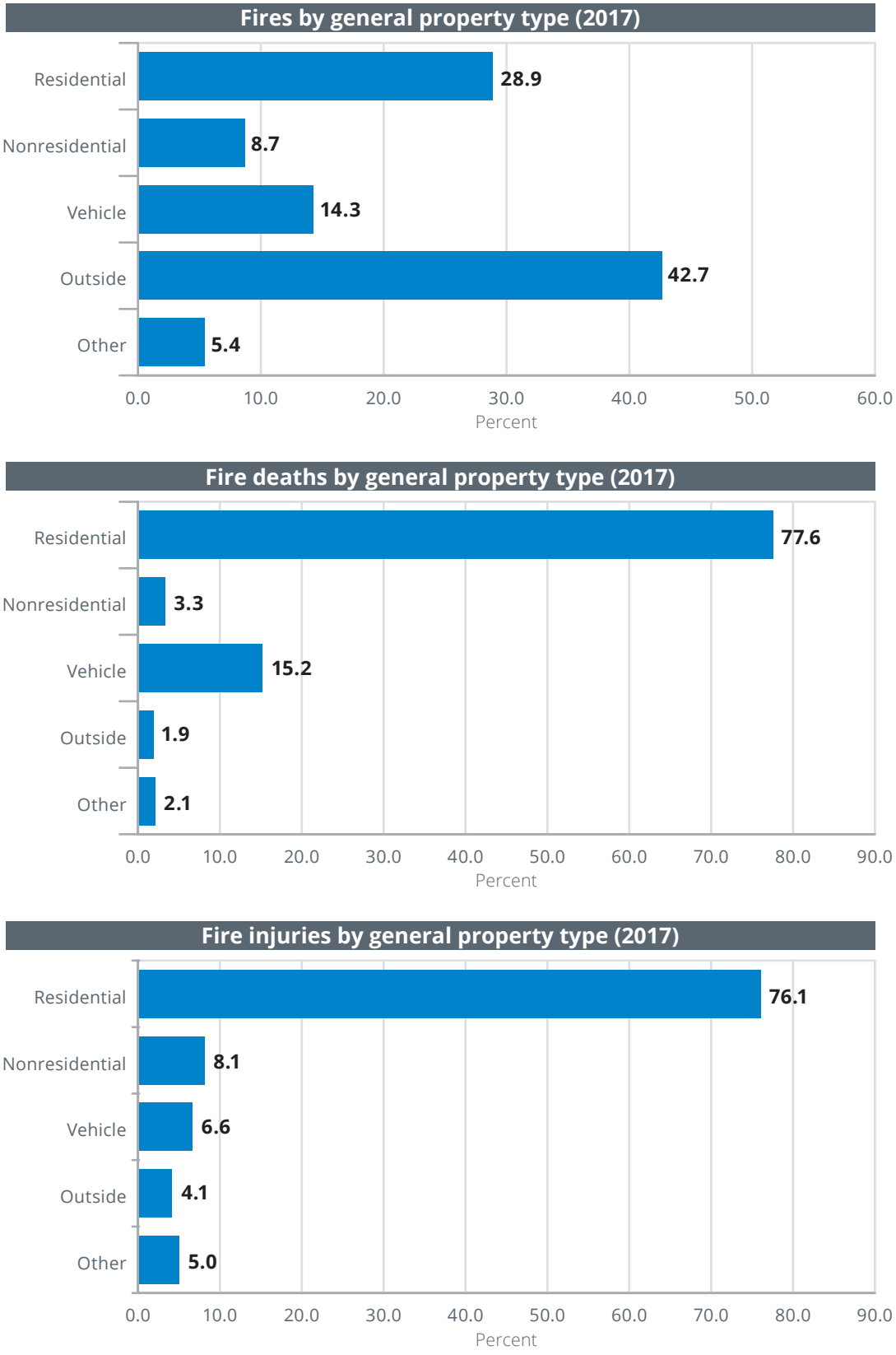
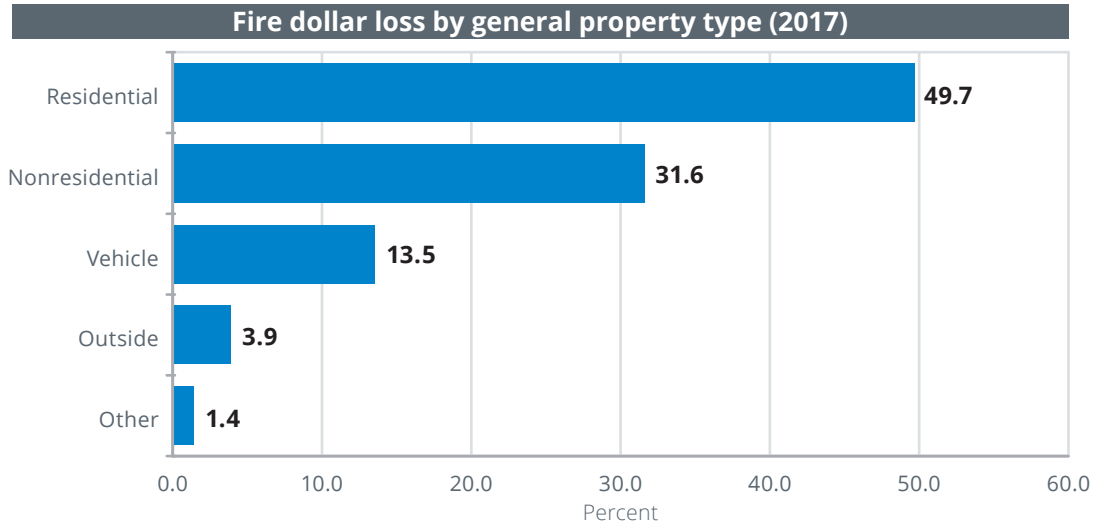


Figure 3. Fires and fire losses by general property type (2017) — continued



Source: NFIRS.
Note: Totals may not add up to 100% due to rounding.

Fire casualties and dollar loss per fire by general property type (2017)

Figure 4 shows reported fire deaths and injuries per 1,000 fires and dollar loss per fire in 2017 by general property type: residential structures, nonresidential structures, vehicles, outside properties, and other or unknown properties. These indicators represent the severity of fires, but they are somewhat ambiguous because they can increase if there are more casualties or damage per fire (the numerators) or if fewer minor fires are reported (the denominators).

Residential fires had the highest numbers of deaths and injuries per 1,000 fires — another important reason for prevention programs to focus on home fire safety. Nonresidential structure fires had the highest dollar loss per fire.

Figure 4. Fire casualties and dollar loss per fire by general property type (2017)

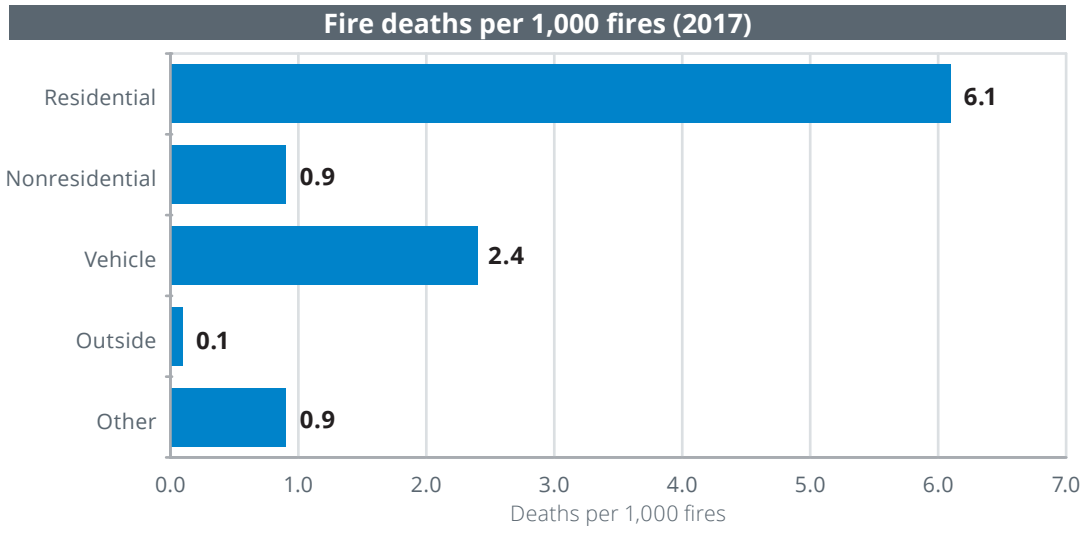
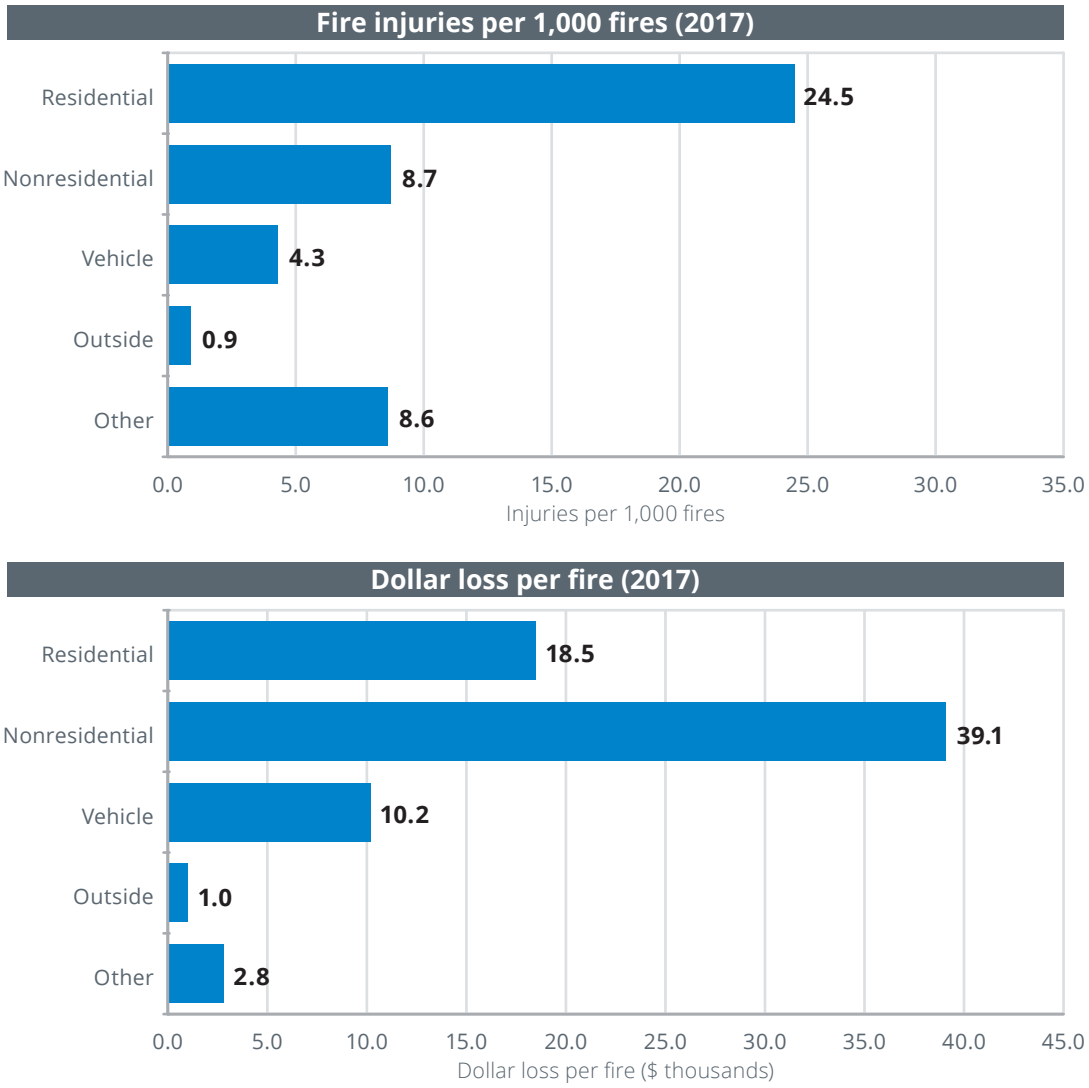


Figure 4. Fire casualties and dollar loss per fire by general property type (2017) — continued



Source: NFIRS.

Buildings and other properties

This section provides an overview of the fire problem in buildings, vehicles, and other mobile properties over the 10-year period from 2008 to 2017.

Buildings

The analysis of building fires is presented in two major sections: residential (including one- and two-family dwellings, multifamily dwellings, and other residential buildings) and nonresidential (including industrial and commercial properties, institutions, educational establishments, mobile properties, and storage properties).

Residential building fires and losses

The term "residential buildings" includes what are commonly referred to as "homes," whether they are one- and two-family dwellings or multifamily buildings. It also includes manufactured housing, hotels and motels, residential hotels, dormitories, assisted living facilities, and halfway houses (residences for formerly institutionalized individuals (mentally impaired patients, drug addicts or convicts) that are designed to facilitate their readjustment to private life). The term "residential buildings" does not include institutions, such as prisons, nursing homes, juvenile care facilities, or hospitals, though many people may reside in them for short or long periods of time.

The residential building portion of the fire problem continues to account for the vast majority of civilian casualties. National estimates show that, on average from 2008 to 2017, 97% of residential structure fires, 98% of associated deaths, 98% of injuries, and 97% of dollar losses occurred in residential buildings. Because the majority of structure fires and losses occurred in buildings, the remainder of the residential analyses will focus on building fires and their associated losses.

All residential buildings

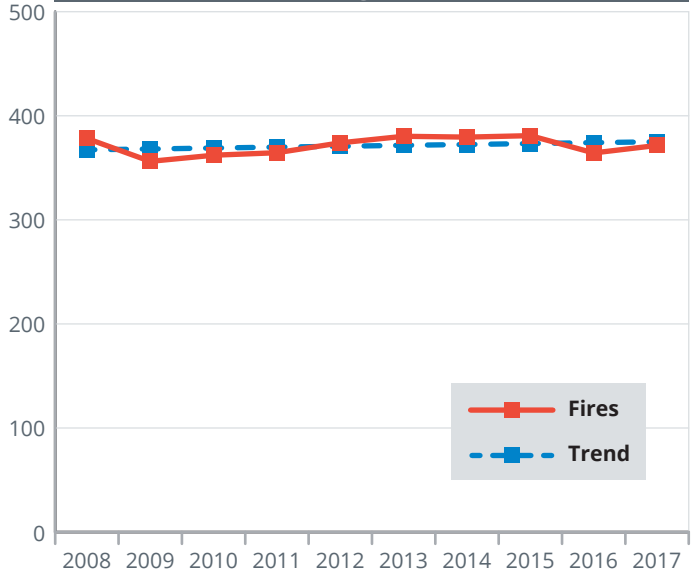
Overall, residential buildings include one- and two-family, multifamily, and other residential buildings.[17] Annually, from 2008 to 2017, there were an estimated 371,200 residential building fires. Because these fires resulted in an annual average of 2,610 civilian deaths, 12,375 injuries, and $7.7 billion in property loss (adjusted to 2017 dollars) over the 10 years, the fire problem in U.S. residences is of significant concern.[18]

Figure 5 shows the 10-year trends for the overall residential building fires and losses. From 2008 to 2017, trends in residential building fires and losses showed a 2% increase in fires, an 8% increase in deaths, a 19% decrease in injuries, and a 13% decrease in dollar loss.

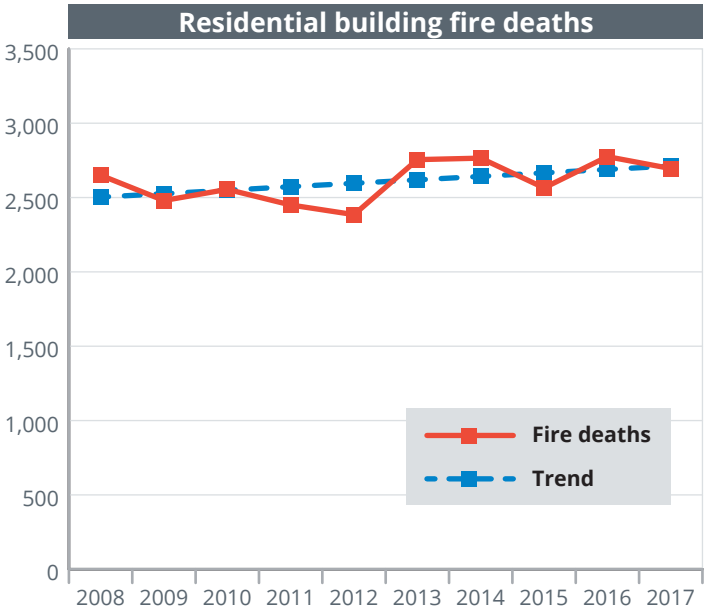
[17]The USFA's three topical reports that explore facets of the residential building fire problem, *Residential Building Fires (2013-2015), One- and Two-Family Residential Building Fires (2013-2015),* and *Multifamily Residential Building Fires (2013-2015),* are available at https://www.usfa.fema.gov/data/statistics/reports.

[18]The USFA's *Residential Building Fires Estimate Summary Series (2008 to 2017)* is available at https://www.usfa.fema.gov/downloads/pdf/statistics/res_bldg_fire_estimates.pdf. To download an Excel file of residential building fire and fire loss estimates by property use and cause, visit https://www.usfa.fema.gov/data/statistics/order_download_data.html (located under the section "Download select data sets"). Note: The 2016 fire dollar-loss estimate for residential buildings used in this document was revised based on an updated release of 2016 NFPA dollar-loss estimates (NFPA Errata No.: FLX10-September 2017_01) and does not match the estimate published in the *2008-2017 Fire Estimate Summary* series for 2016.

Figure 5. Trends in residential building fires and fire losses (2008-2017)

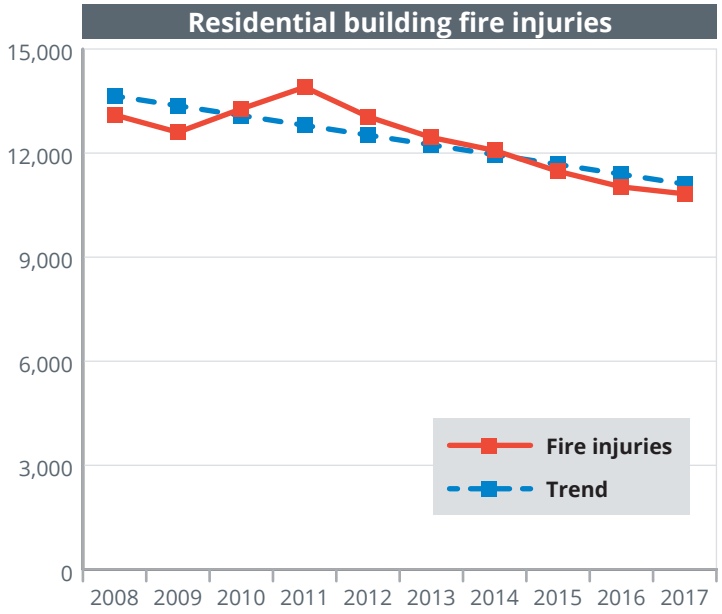


Fires (thousands)	
Year	Value
2008	378.2
2009	356.2
2010	362.1
2011	364.5
2012	374.0
2013	380.3
2014	379.5
2015	380.9
2016	364.3
2017	371.5
10-year trend (%)	**2.1%**

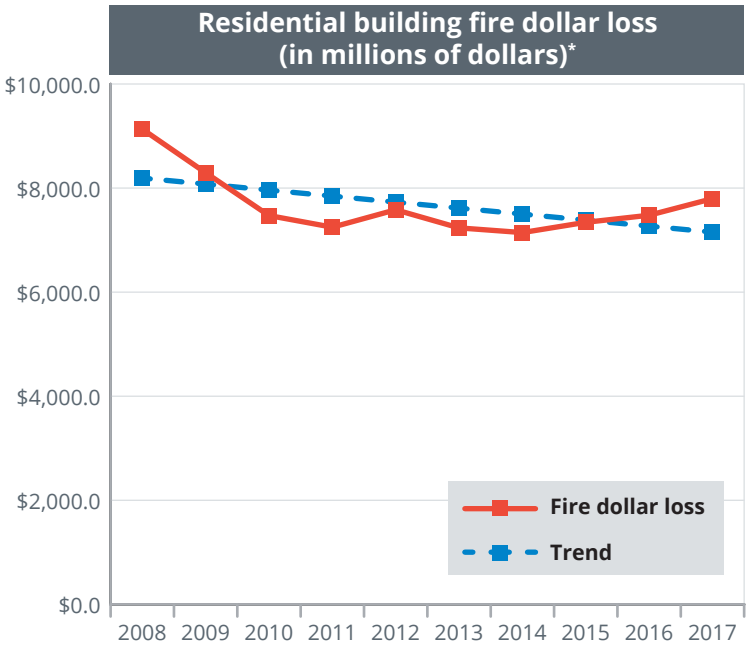


Deaths	
Year	Value
2008	2,650
2009	2,480
2010	2,555
2011	2,450
2012	2,385
2013	2,755
2014	2,765
2015	2,565
2016	2,775
2017	2,695
10-year trend (%)	**8.4%**

Figure 5. Trends in residential building fires and fire losses (2008-2017) — continued



Injuries	
Year	Value
2008	13,100
2009	12,600
2010	13,275
2011	13,900
2012	13,050
2013	12,450
2014	12,075
2015	11,475
2016	11,025
2017	10,825
10-year trend (%)	**-18.6%**



Dollar loss (millions of dollars) *Adjusted to 2017 dollars	
Year	Value
2008	$9,133
2009	$8,295
2010	$7,472
2011	$7,248
2012	$7,583
2013	$7,235
2014	$7,145
2015	$7,342
2016	$7,478
2017	$7,797
10-year trend (%)	**-12.7%**

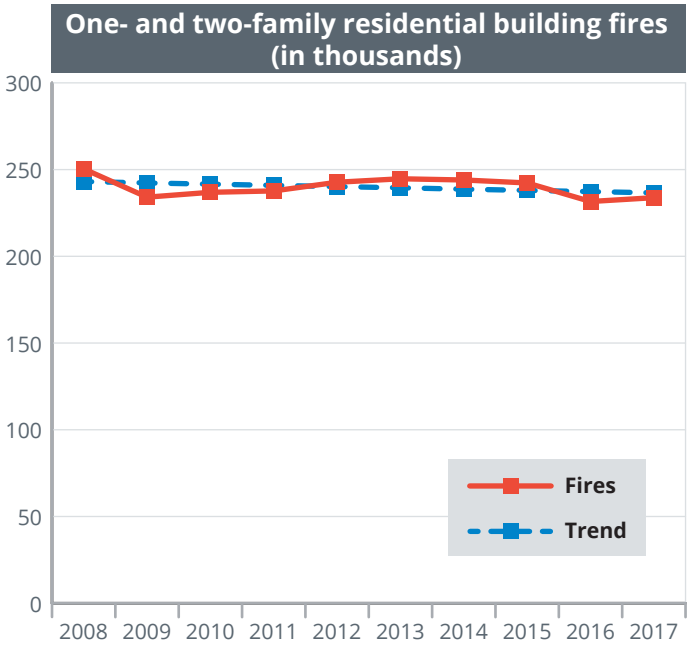
Sources: NFIRS, NFPA and CPI.

One- and two-family residential buildings

One- and two-family dwellings are where 75% of the people in the U.S. reside.[19] The residential building fire profile is, therefore, dominated by this category. One- and two-family residential buildings include detached dwellings, manufactured homes, mobile homes not in transit and duplexes.

From 2008 to 2017, one- and two-family residential building fires accounted for 65% of all residential building fires and dominated the overall residential building fire profile. Trends in one- and two-family dwellings showed a 3% decrease in fires, an 11% increase in deaths, a 22% decrease in injuries, and an 18% decrease in dollar loss from 2008 to 2017 (Figure 6).[20]

Figure 6. Trends in one- and two-family residential building fires and fire losses (2008-2017)

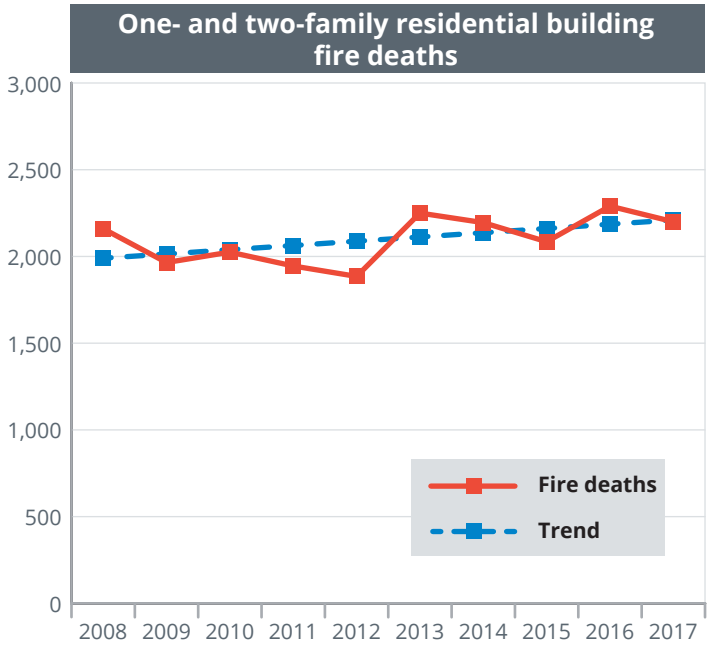


Fires (thousands)	
Year	Value
2008	250.4
2009	234.1
2010	236.9
2011	237.7
2012	242.7
2013	244.7
2014	244.0
2015	242.3
2016	231.6
2017	233.8
10-year trend (%)	**-2.7%**

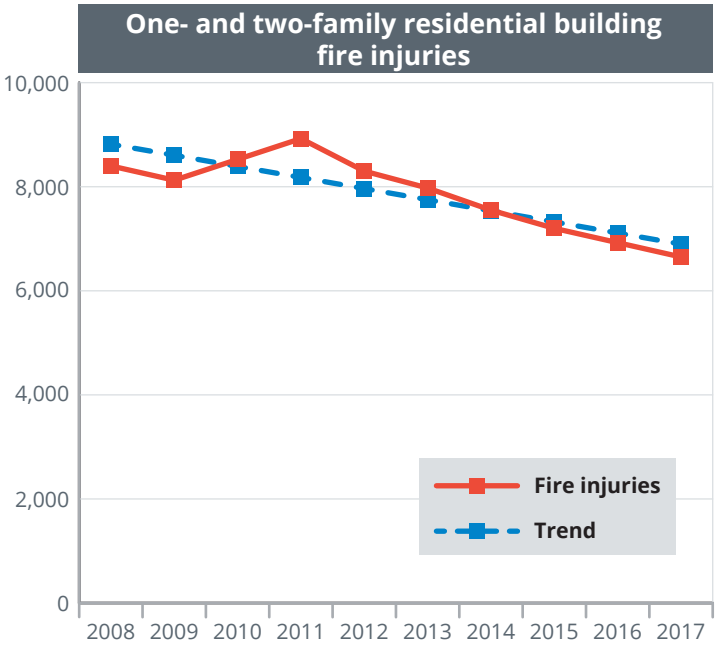
[19]The U.S. Census Bureau shows that, in 2017, 76.1% of occupied housing units were one-unit attached and detached structures or mobile homes (92.5 million), U.S. Department of Housing and Urban Development and U.S. Census Bureau, 2017 American Housing Survey — Table Creator, select "2017 (Year) General Housing (Table); Units by Structure Type (Variable 1)," https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html#?s_areas=a00000&s_year=n2017&s_tableName=Table1&s_byGroup1=a3&s_byGroup2=a1&s_filterGroup1=t1&s_filterGroup2=g1&s_show=S (accessed Sept. 5, 2019). Household size was estimated at 2.65 people per household (https://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=ACS_17_1YR_DP02& prodType=table, Selected Social Characteristics in the U.S., 2017 American Community Survey 1-Year Estimates). Thus, 92.5 million housing units x 2.65 people per household = 245.1 million people. With the 2017 U.S. population given as 325.1 million, (https://www.census.gov/data/tables/time-series/demo/popest/2010s-national-total.html#par_textimage_2011805803, 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)), approximately 75.4% of the population lived in what the NFIRS defines as one- and two-family housing.

[20]The 2016 fire dollar-loss estimate for one- and two-family residential buildings used in this document was revised based on an updated release of 2016 NFPA dollar-loss estimates (NFPA Errata No.: FLX10-September 2017_01) and does not match the estimate published in the *2008-2017 Fire Estimate Summary* series for 2016.

Figure 6. Trends in one- and two-family residential building fires and fire losses (2008-2017) — continued

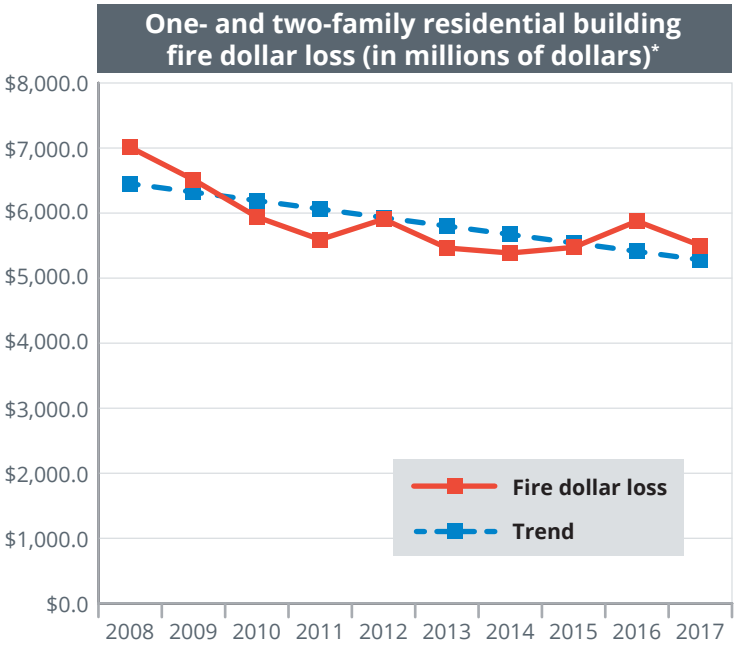


Deaths	
Year	Value
2008	2,160
2009	1,965
2010	2,025
2011	1,945
2012	1,885
2013	2,250
2014	2,195
2015	2,085
2016	2,290
2017	2,200
10-year trend (%)	**11.1%**



Injuries	
Year	Value
2008	8,400
2009	8,125
2010	8,525
2011	8,925
2012	8,300
2013	7,975
2014	7,550
2015	7,200
2016	6,925
2017	6,650
10-year trend (%)	**-21.8%**

Figure 6. Trends in one- and two-family residential building fires and fire losses (2008-2017) — continued



Dollar loss (millions of dollars) *Adjusted to 2017 dollars	
Year	**Value**
2008	$7,011
2009	$6,513
2010	$5,941
2011	$5,593
2012	$5,907
2013	$5,464
2014	$5,386
2015	$5,473
2016	$5,876
2017	$5,501
10-year trend (%)	**-18.1%**

Sources: NFIRS, NFPA and CPI.

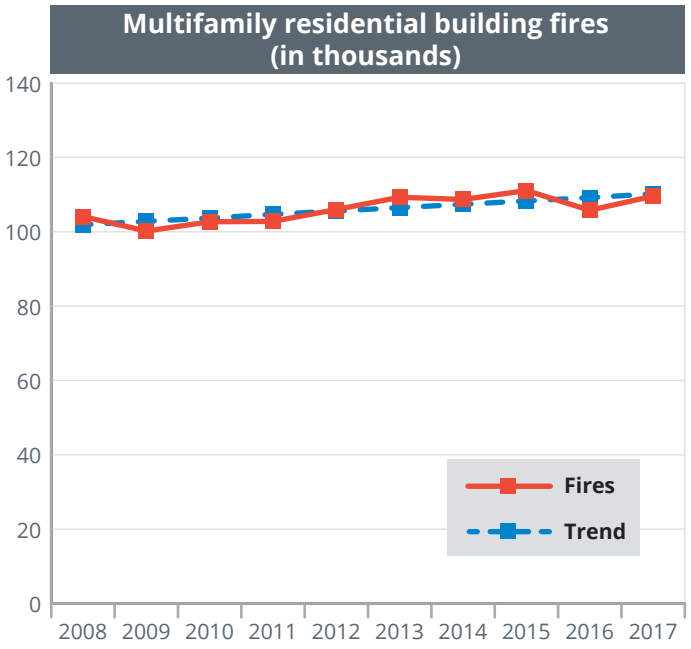
Multifamily residential buildings

Multifamily residential buildings include structures such as apartments, town houses, row houses, condominiums and other tenement properties. Many multifamily dwellings are rental properties, which often fall under more stringent fire prevention statutes and tend to be regulated by stricter building codes. From 2008 to 2017, multifamily residential building fires accounted for 29% of all residential building fires responded to by fire departments across the nation.

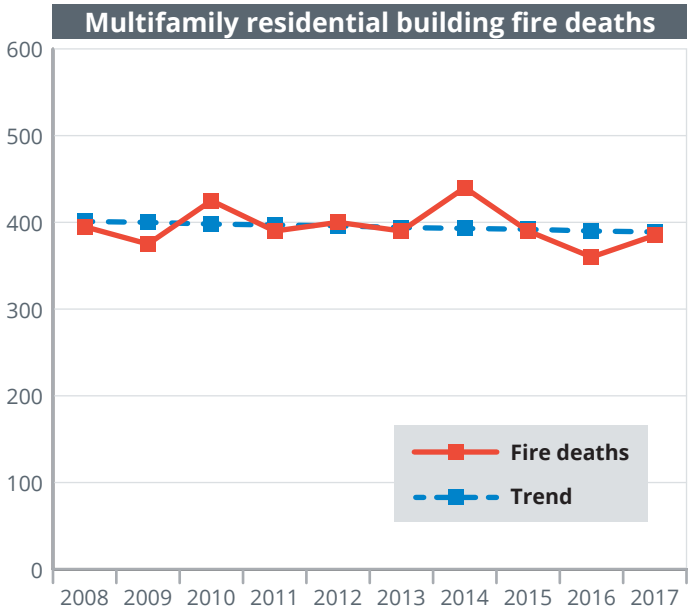
From 2008 to 2017, trends in multifamily dwellings showed an 8% increase in fires, a 3% decrease in deaths, a 13% decrease in injuries, and an 18% increase in dollar loss (Figure 7).[21] In 2017, there were four multifamily residential building fires reported to NFIRS with total dollar losses exceeding $20 million each that contributed to the increase in dollar loss.

[21]The 2016 fire dollar-loss estimate for multifamily residential buildings used in this document was revised based on an updated release of 2016 NFPA dollar-loss estimates (NFPA Errata No.: FLX10-September 2017_01) and does not match the estimate published in the *2008-2017 Fire Estimate Summary* series for 2016.

Figure 7. Trends in multifamily residential building fires and fire losses (2008-2017)



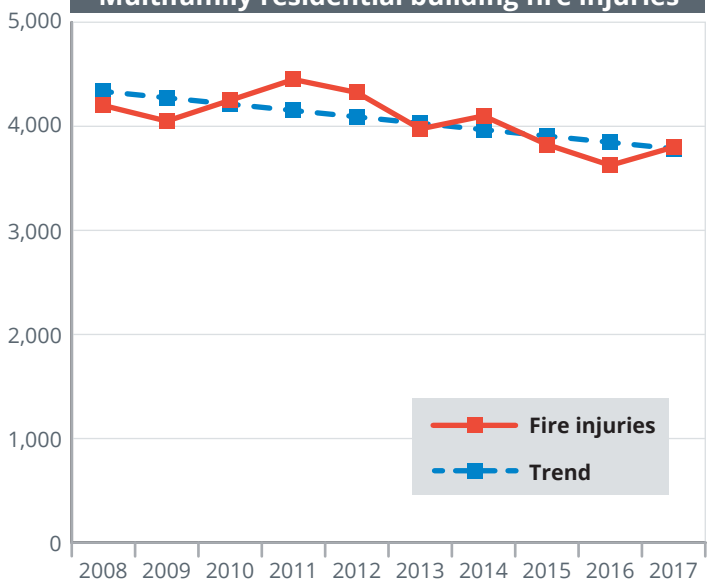
Fires (thousands)	
Year	Value
2008	104.1
2009	100.2
2010	102.7
2011	102.8
2012	106.0
2013	109.3
2014	108.7
2015	111.1
2016	105.8
2017	109.6
10-year trend (%)	**8.1%**



Deaths	
Year	Value
2008	395
2009	375
2010	425
2011	390
2012	400
2013	390
2014	440
2015	390
2016	360
2017	385
10-year trend (%)	**-3.1%**

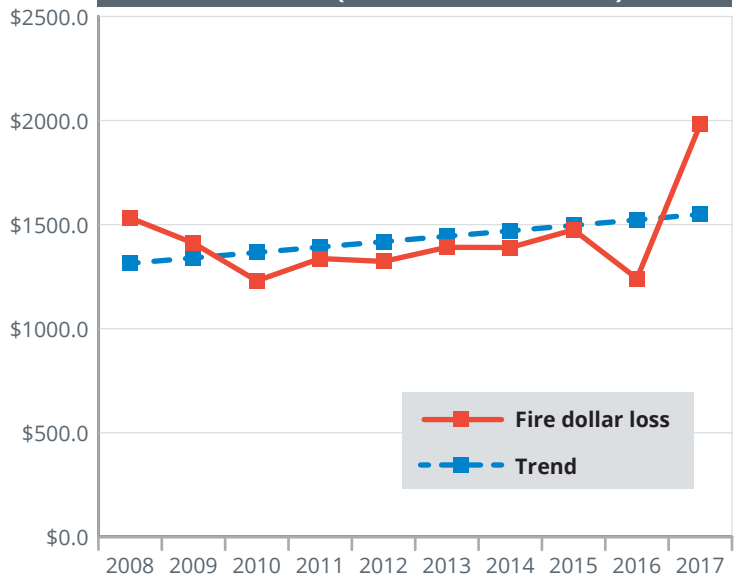
Figure 7. Trends in multifamily residential building fires and fire losses (2008-2017) — continued

Multifamily residential building fire injuries



Injuries	
Year	Value
2008	4,200
2009	4,050
2010	4,250
2011	4,450
2012	4,325
2013	3,975
2014	4,100
2015	3,825
2016	3,625
2017	3,800
10-year trend (%)	**-12.7%**

Multifamily residential building fire dollar loss (in millions of dollars)*



Dollar loss (millions of dollars) *Adjusted to 2017 dollars	
Year	Value
2008	$1,532
2009	$1,411
2010	$1,230
2011	$1,337
2012	$1,323
2013	$1,391
2014	$1,390
2015	$1,475
2016	$1,241
2017	$1,982
10-year trend (%)	**17.9%**

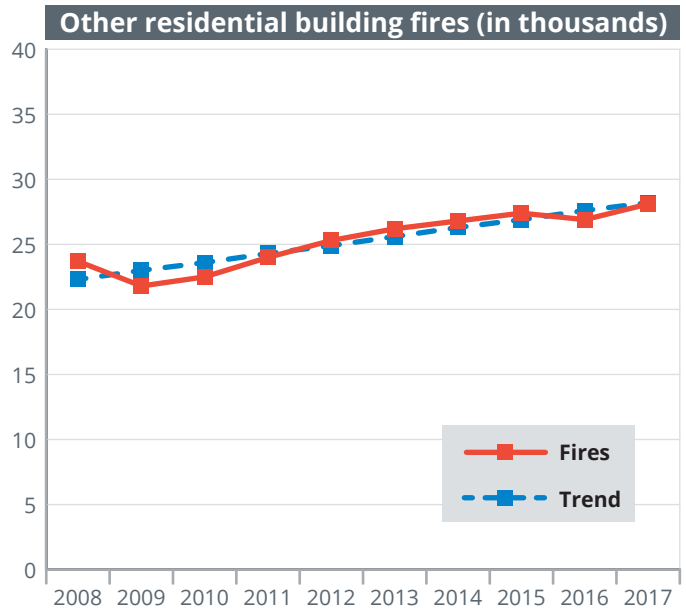
Sources: NFIRS, NFPA and CPI.

Note: In 2017, there were four multifamily residential building fire incidents reported to NFIRS with total dollar losses exceeding $20 million each that contributed to the increase in dollar loss.

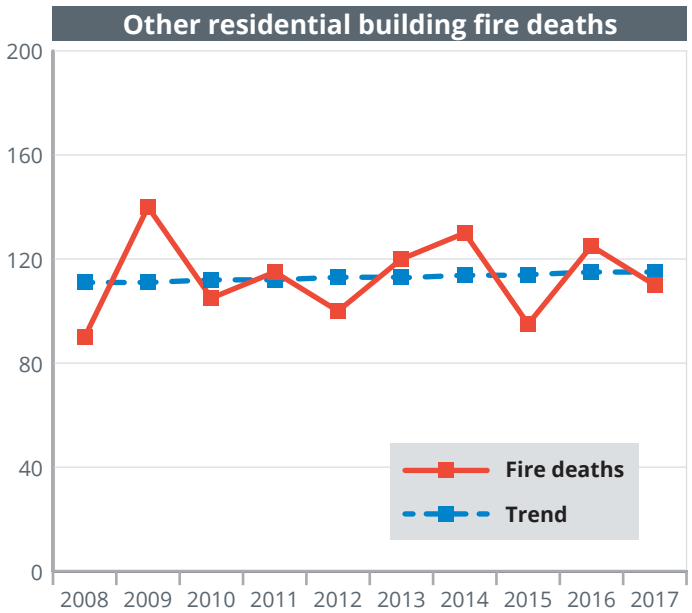
Other residential buildings

Other residential buildings include rooming houses, dormitories, residential hotels, halfway houses, hotels and motels, and miscellaneous and unclassified buildings reported as residences. This category does not include nursing homes, prisons or other institutions; these categories are addressed as part of nonresidential buildings. Trends in other residential buildings showed a 27% increase in fires, a 4% increase in deaths, a 17% decrease in injuries, and a 24% decrease in dollar loss from 2008 to 2017 (Figure 8).[22]

Figure 8. Trends in other residential building fires and fire losses (2008-2017)



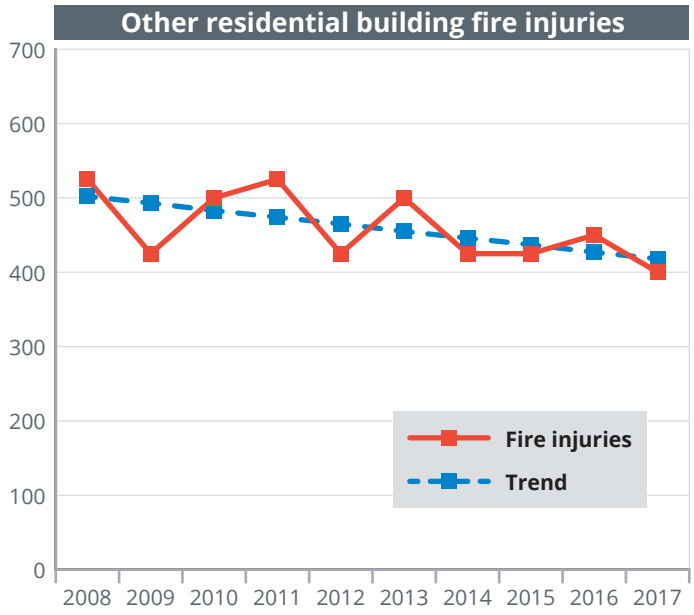
Fires (thousands)	
Year	Value
2008	23.7
2009	21.8
2010	22.5
2011	24.0
2012	25.3
2013	26.2
2014	26.8
2015	27.4
2016	26.9
2017	28.1
10-year trend (%)	**26.7%**



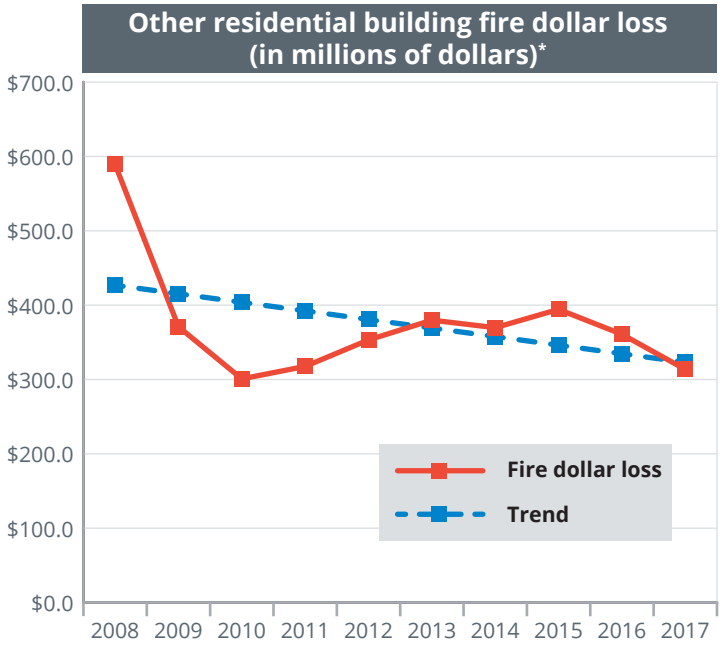
Deaths	
Year	Value
2008	90
2009	140
2010	105
2011	115
2012	100
2013	120
2014	130
2015	95
2016	125
2017	110
10-year trend (%)	**4.4%**

[22]The 2016 fire dollar-loss estimate for other residential buildings used in this document was revised based on an updated release of 2016 NFPA dollar-loss estimates (NFPA Errata No.: FLX10-September 2017_01) and does not match the estimate published in the *2008-2017 Fire Estimate Summary* series for 2016.

Figure 8. Trends in other residential building fires and fire losses (2008-2017) — continued



Injuries	
Year	Value
2008	525
2009	425
2010	500
2011	525
2012	425
2013	500
2014	425
2015	425
2016	450
2017	400
10-year trend (%)	**-16.8%**



Dollar loss (millions of dollars) *Adjusted to 2017 dollars	
Year	Value
2008	$589.2
2009	$370.9
2010	$300.8
2011	$317.6
2012	$353.2
2013	$379.8
2014	$369.7
2015	$394.3
2016	$360.8
2017	$313.5
10-year trend (%)	**-24.3%**

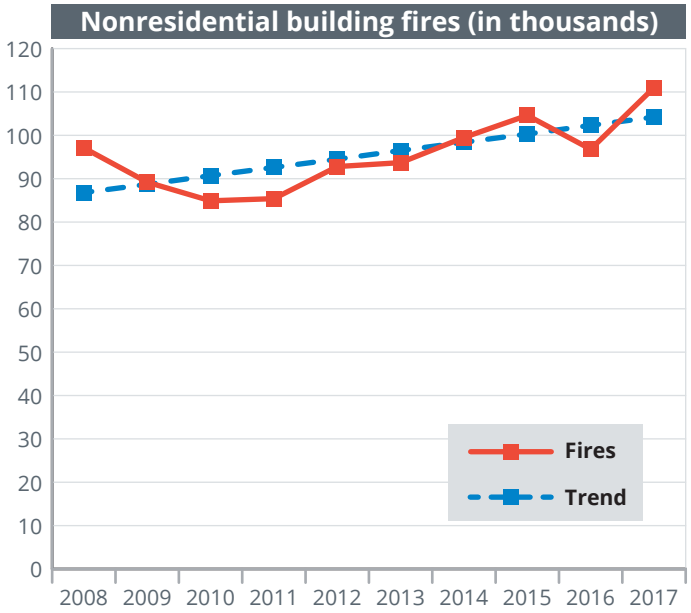
Sources: NFIRS, NFPA and CPI.

Nonresidential buildings

The nonresidential building category includes industrial and commercial properties, institutions (such as hospitals, nursing homes and prisons), educational establishments (from preschool through university), mobile properties and storage properties. National estimates show that, on average from 2008 to 2017, about 90% of nonresidential structure fires, 90% of deaths, 92% of injuries, and 92% of dollar losses occurred in nonresidential buildings.

National estimates of nonresidential building fires and losses, from 2008 to 2017, annually accounted for only 7% of all fires, 3% of deaths, and 8% of injuries. These properties, however, accounted for a disproportionately large annual dollar loss — 20%.[23] Trends in nonresidential buildings showed a 20% increase in fires, a 16% increase in deaths, a 0.3% decrease in injuries, and a 21% decrease in dollar loss from 2008 to 2017 (Figure 9). In 2016, in Oakland, California, a fire at a former warehouse that had been converted to mixed-use properties with an assembly area contributed to the peak in fire deaths. As a result of this incident, 35 fire deaths were reported to the NFIRS. Excluding these 35 deaths from the 10-year trend analysis results in an overall 1% decrease in nonresidential building fire deaths.

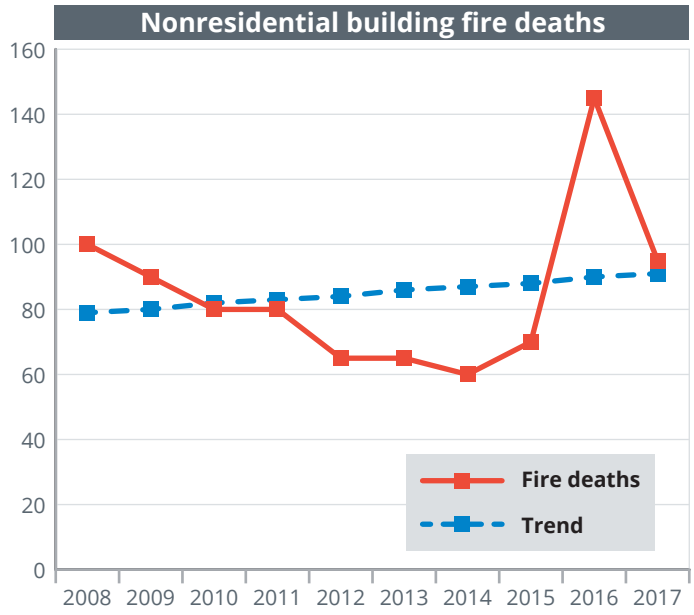
Figure 9. Trends in nonresidential building fires and fire losses (2008-2017)



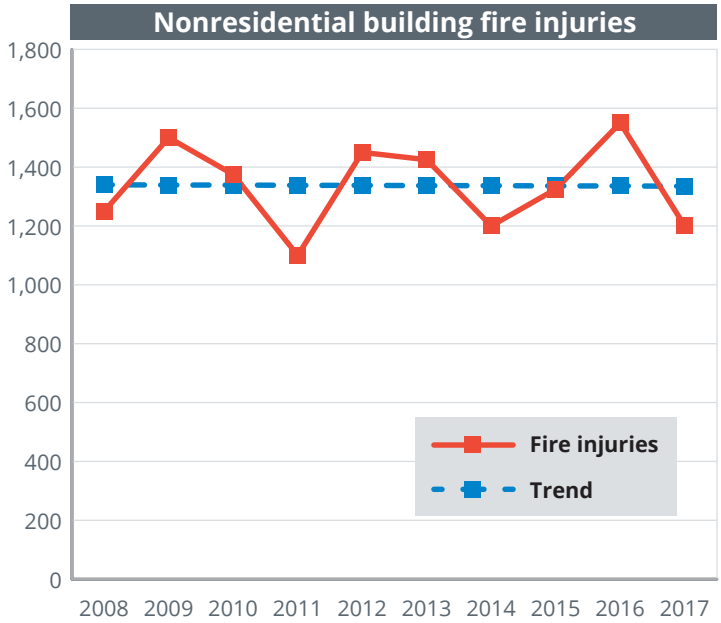
Fires (thousands)	
Year	Value
2008	97.1
2009	89.2
2010	84.9
2011	85.4
2012	92.8
2013	93.7
2014	99.5
2015	104.6
2016	96.8
2017	111.0
10-year trend (%)	**20.1%**

[23]The USFA's *Nonresidential Building Fires Estimate Summary Series (2008 to 2017)* is available at https://www.usfa.fema.gov/downloads/pdf/statistics/nonres_bldg_fire_estimates.pdf. To download an Excel file of nonresidential building fire and fire loss estimates by property use and cause, visit https://www.usfa.fema.gov/data/statistics/order_download_data.html (located under the section "Download select data sets"). The 2016 fire dollar-loss estimate for nonresidential buildings used in this document was revised based on an updated release of 2016 NFPA dollar-loss estimates (NFPA Errata No.: FLX10-September 2017_01) and does not match the estimate published in the *2008-2017 Fire Estimate Summary* series for 2016.

Figure 9. Trends in nonresidential building fires and fire losses (2008-2017) — continued

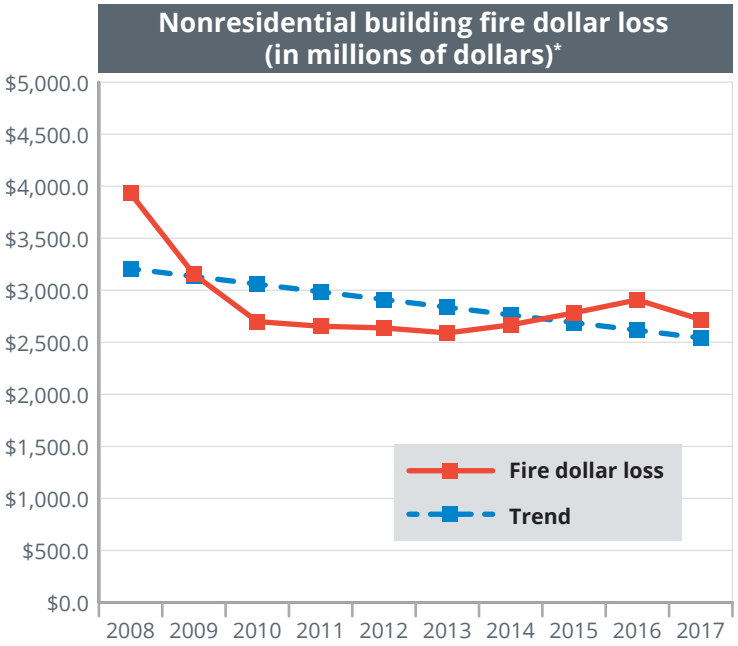


Deaths	
Year	Value
2008	100
2009	90
2010	80
2011	80
2012	65
2013	65
2014	60
2015	70
2016	145
2017	95
10-year trend (%)	**15.9%**



Injuries	
Year	Value
2008	1,250
2009	1,500
2010	1,375
2011	1,100
2012	1,450
2013	1,425
2014	1,200
2015	1,325
2016	1,550
2017	1,200
10-year trend (%)	**-0.3%**

Figure 9. Trends in nonresidential building fires and fire losses (2008-2017) — continued



Dollar loss (millions of dollars) *Adjusted to 2017 dollars	
Year	**Value**
2008	$3,930
2009	$3,153
2010	$2,699
2011	$2,654
2012	$2,638
2013	$2,590
2014	$2,667
2015	$2,783
2016	$2,908
2017	$2,719
10-year trend (%)	**-20.7%**

Sources: NFIRS, NFPA and CPI.

Note: The 2016 peak in fire deaths is attributed to a fire at a former warehouse in Oakland, California, that had been converted to mixed-use properties with an assembly area. The NFPA estimate of dollar loss in 2008 reflects three industrial property fire incidents that resulted in $775 million in property damage.

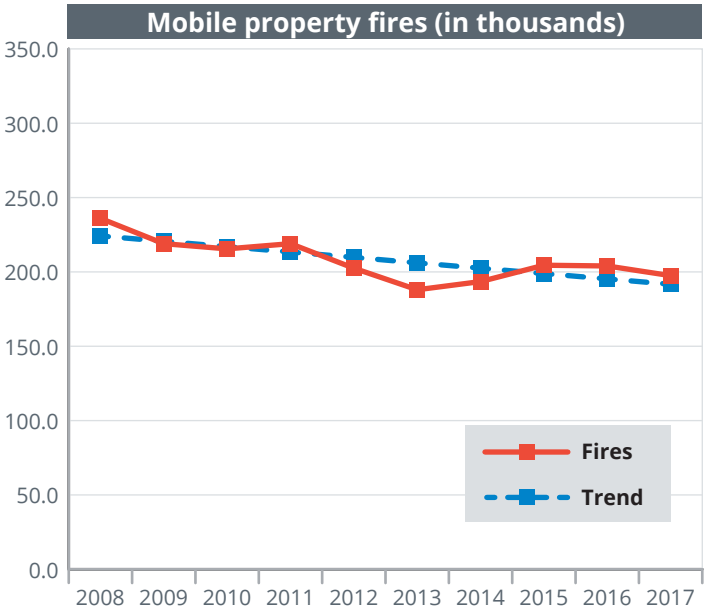
Vehicles and other mobile properties

Overall, mobile properties are comprised of vehicles and other mobile properties, which include passenger vehicles, construction vehicles, motor homes, recreational vehicles, farm machinery, trains, boats, ships and aircraft. Vehicle fires account for a larger portion of the fire problem than many people realize. In 2017, vehicles accounted for 15% of fire deaths overall, 7% of fire injuries, 14% of dollar losses, and 14% of all fires reported to NFIRS — approximately 1 in every 7 fires.[24]

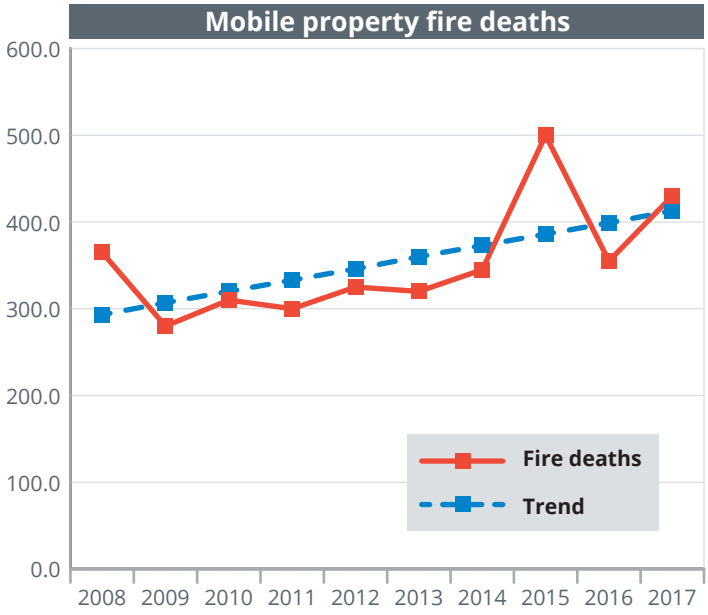
Figures 10 and 11 show the 10-year trends for mobile property fires and losses. Trends in overall mobile property fires declined over the 10 years, while the trends in mobile property fire deaths, injuries and dollar loss increased (Figure 10). For the years examined, the number of mobile property fire deaths was highest in 2015 with an estimated 500 deaths. Figure 11 shows that the vast majority of mobile property fires and losses are from highway vehicles. Trends in highway vehicles showed a 16% decrease in fires, a 30% increase in deaths, a 17% increase in injuries, and a 14% increase in dollar loss (adjusted for inflation). Although there was a substantial increase in the other mobile property fire death trend, this is due primarily to the fluctuations in the small numbers of deaths.

[24]When there are fatalities associated with a mobile property accident, such as a collision between two cars, it is often difficult to determine whether the fatalities were the result of the mechanical forces or the fire that ensued. Because of the very large number of vehicle fatalities occurring in this country each year and the frequency of fires associated with these accidents, there can be a substantial error in estimating the total number of fire deaths if this issue is not carefully addressed. A fire fatality should be counted only if a person was trapped and killed by the fire, rather than killed on impact and subsequently exposed to the fire.

Figure 10. Trends in mobile property fires and fire losses (2008-2017)

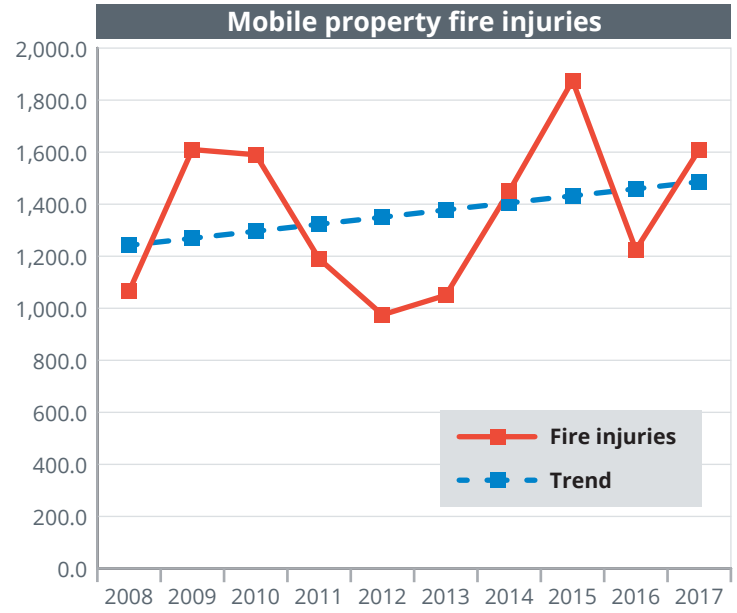


Fires (thousands)	
Year	Value
2008	236.0
2009	219.0
2010	215.5
2011	219.0
2012	202.5
2013	188.0
2014	193.5
2015	204.5
2016	204.0
2017	197.5
10-year trend (%)	**-14.5%**

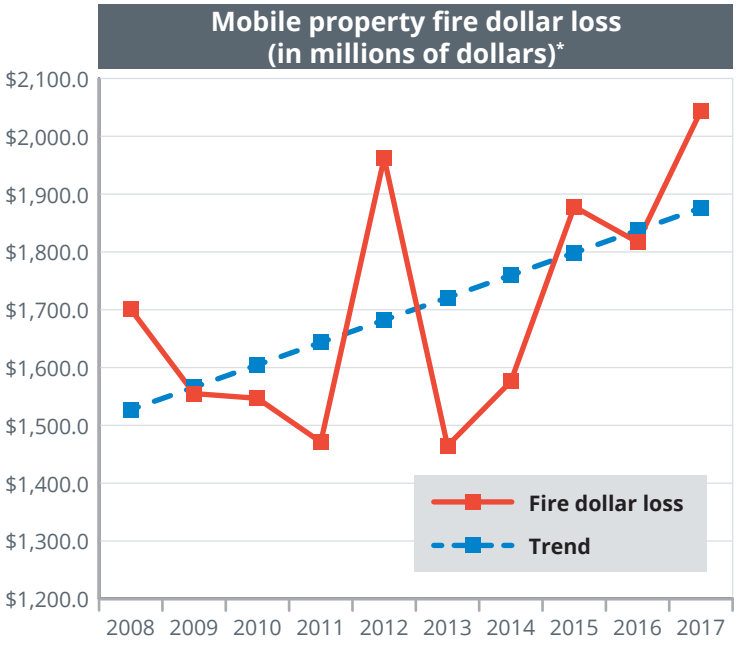


Deaths	
Year	Value
2008	365
2009	280
2010	310
2011	300
2012	325
2013	320
2014	345
2015	500
2016	355
2017	430
10-year trend (%)	**40.7%**

Figure 10. Trends in mobile property fires and fire losses (2008-2017) — continued



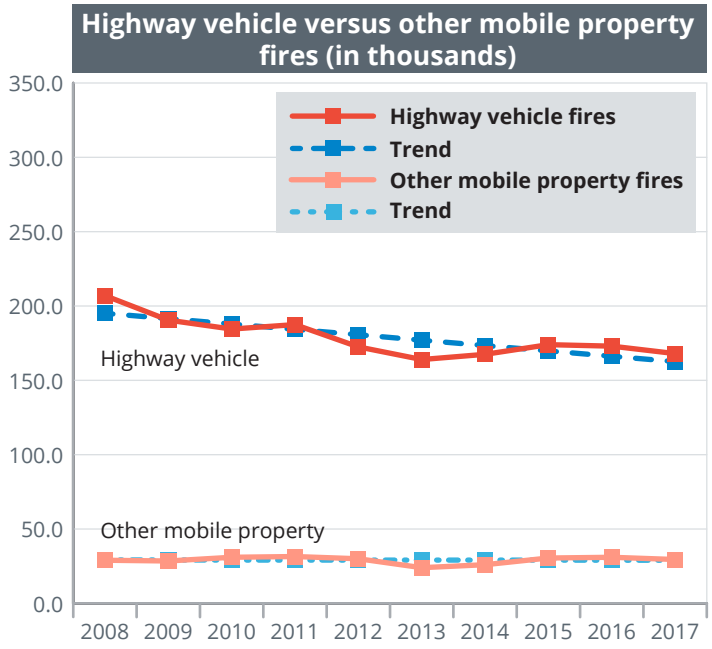
Injuries	
Year	Value
2008	1,065
2009	1,610
2010	1,590
2011	1,190
2012	975
2013	1,050
2014	1,450
2015	1,875
2016	1,225
2017	1,610
10-year trend (%)	**19.7%**



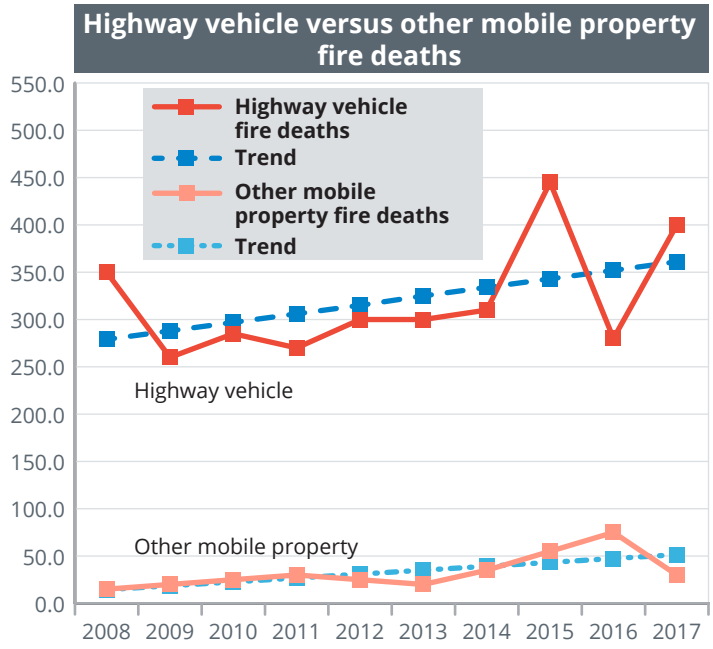
Dollar loss (millions of dollars) *Adjusted to 2017 dollars	
Year	Value
2008	$1,700.9
2009	$1,555.0
2010	$1,546.8
2011	$1,471.1
2012	$1,962.3
2013	$1,464.7
2014	$1,575.9
2015	$1,878.1
2016	$1,816.9
2017	$2,044.0
10-year trend (%)	**22.8%**

Sources: NFPA and CPI.
Note: The 2012 and 2015 spikes in dollar loss reflect the $400 million property damage to the USS Miami (submarine) and a large aircraft fire that occurred at Offutt Air Force Base, Nebraska.

Figure 11. Trends in highway vehicle versus other mobile property fires and fire losses (2008-2017)



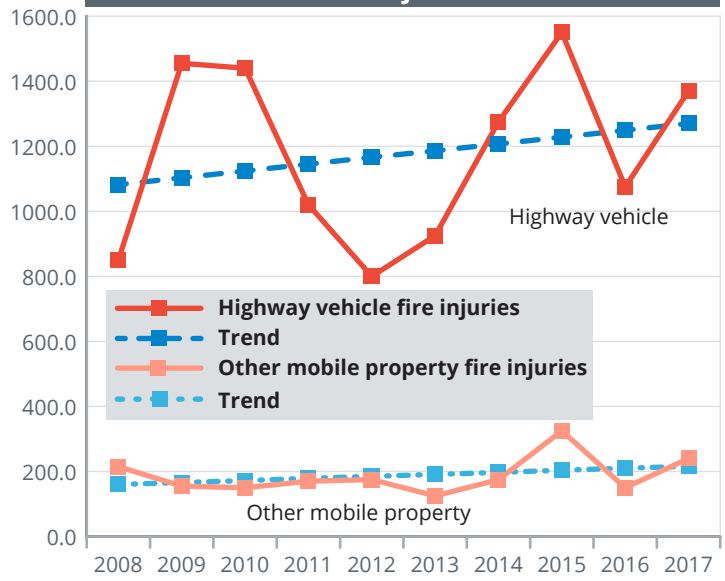
Fires (thousands)		
Year	Highway vehicle value	Other mobile value
2008	207.0	29.0
2009	190.5	28.5
2010	184.5	31.0
2011	187.5	31.5
2012	172.5	30.0
2013	164.0	24.0
2014	167.5	26.0
2015	174.0	30.5
2016	173.0	31.0
2017	168.0	29.5
10-year trend (%)	**-16.6%**	**-0.6%**



Deaths		
Year	Highway vehicle value	Other mobile value
2008	350	15
2009	260	20
2010	285	25
2011	270	30
2012	300	25
2013	300	20
2014	310	35
2015	445	55
2016	280	75
2017	400	30
10-year trend (%)	**29.5%**	**256.6%**

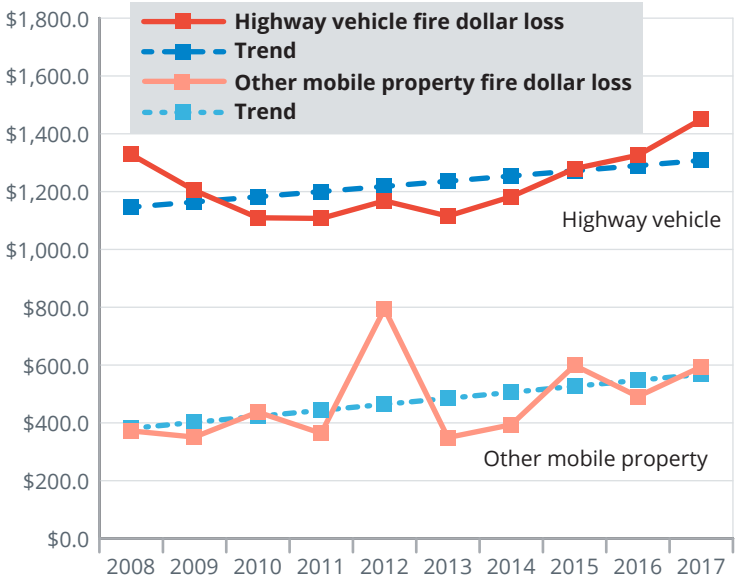
Figure 11. Trends in highway vehicle versus other mobile property fires and fire losses (2008-2017) — continued

Highway vehicle versus other mobile property fire injuries



Injuries		
Year	Highway vehicle value	Other mobile value
2008	850	215
2009	1,455	155
2010	1,440	150
2011	1,020	170
2012	800	175
2013	925	125
2014	1,275	175
2015	1,550	325
2016	1,075	150
2017	1,370	240
10-year trend (%)	**17.4%**	**35.1%**

Highway vehicle versus other mobile property fire dollar loss (in millions of dollars)*



Dollar loss (millions of dollars) *Adjusted to 2017 dollars		
Year	Highway vehicle value	Other mobile value
2008	$1,328.6	$372.3
2009	$1,204.3	$350.8
2010	$1,109.5	$437.3
2011	$1,107.2	$364.0
2012	$1,168.0	$794.3
2013	$1,115.3	$349.3
2014	$1,182.4	$393.5
2015	$1,279.3	$598.8
2016	$1,325.7	$491.2
2017	$1,450.0	$594.0
10-year trend (%)	**14.1%**	**49.1%**

Sources: NFPA and CPI.

Note: The large increase in the trend for other mobile property type fire deaths is due primarily to the fluctuations in the small numbers of deaths. The 2012 and 2015 spikes in dollar loss for other mobile property fires reflect the $400 million property damage to the USS Miami (submarine) and a large aircraft fire that occurred at Offutt Air Force Base, Nebraska.

Outside and other properties

The "Outside and Other Properties" category includes all fires that did not occur in buildings, other structures, or vehicles. In NFIRS terminology, this includes fires that occurred outside of structures — either where the burning material had a value or where the fires were confined to trees, brush, grass or refuse. A subset of outside fires is wildland fires. Grouped in the "Other" category are fires that were not specifically classified or were considered to be outside gas or vapor combustion incidents.

Outside and other fires constituted roughly half of all fires. These numbers may not, however, reflect the true nature of the problem because of under-reporting and the difficulty in setting a price tag on outside fires. Also, many wildland fires are not reported to agencies reporting to the NFIRS or to the NFPA annual survey.

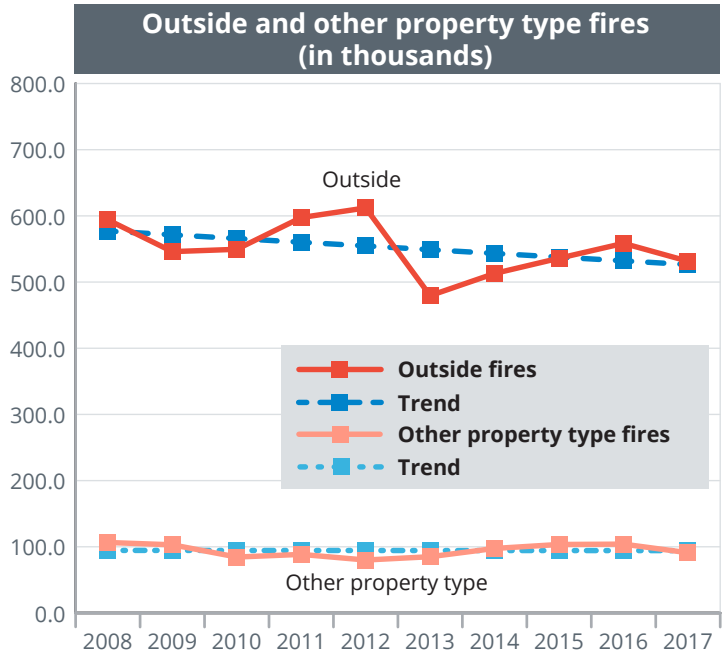
Figure 12 shows the 10-year trends for outside and other property type fires and losses. The numbers of reported outside fires alone were enormous — averaging 551,750 each year over the 10-year period. The "Other" category of fires added, on average, an additional 94,350 fires to this already large number. Over 10 years, an average of 75 deaths resulted each year from outside fires, plus the miscellaneous other properties not covered elsewhere; injuries averaged 775. Although deaths showed an upward trend of 213%, this is due primarily to the fluctuations in the small numbers of deaths. Injuries showed an upward trend of 23%. Dollar loss for only outside properties increased by 59% over the 10 years of 2008 to 2017; however, when several large-loss incidents that occurred in 2010 to 2013 and 2016 were excluded from the analysis, the trend in dollar loss for outside properties resulted in a 0.2% decrease.[25]

Estimating dollar loss for these fires is difficult.[26] In addition, part of the difference in property loss estimates is because the NFPA estimates property loss only for outside fires "with value," whereas the NFIRS permits property loss data collection for any fire. While both are reasonable approaches, neither may be definitive. Moreover, when there are large-loss fires, these fires may not necessarily be reported to the NFIRS.

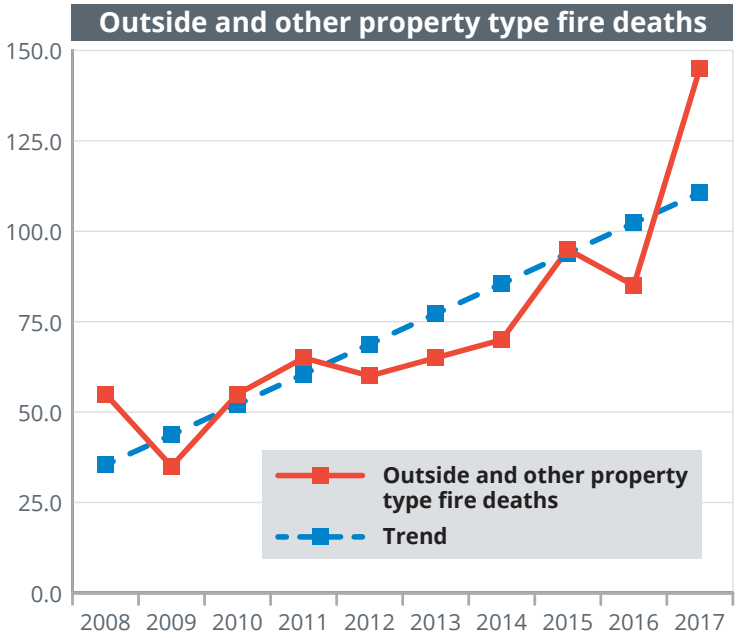
[25]NFPA. (2007, 2010 to 2012, 2014, 2016). *Fire loss in the United States.* The Fourmile Canyon Fire in Colorado totaled $217 million in damage in 2010; the Bastrop County, Texas, Complex wildfire totaled $400 million in damage in 2011; the Waldo Canyon Fire and the High Park Fire in Colorado accounted for a total of $567.4 million in damage in 2012; the Black Forest Fire in Colorado totaled $420.5 million in damage in 2013, noted in the 2014 NFPA report; and the Gatlinburg, Tennessee, wildfires totaled $911 million in damage in 2016.

[26]Setting a value for outside fire damage is always a problem. It is difficult to assign a dollar value to grass, tree and rubbish fires, yet the damage from these fires often requires labor beyond that of the fire department to clean up and restore the area. They also cause aesthetic problems that are intangible. Some outside fires spread to structural properties and may be reported as structural fires rather than outside fires with exposure to structures. Outside fires can have other indirect costs, such as the financial impact on agricultural communities where a fire destroys crops. Forest fires and other wildfires to which local departments are not called will not be reported to the NFIRS if the state or federal agency with principal authority for fighting the fire does not participate in the NFIRS. To better analyze outside fires, the NFIRS data needs to be complemented with data from these other agencies.

Figure 12. Trends in outside and other property type fires and fire losses (2008-2017)



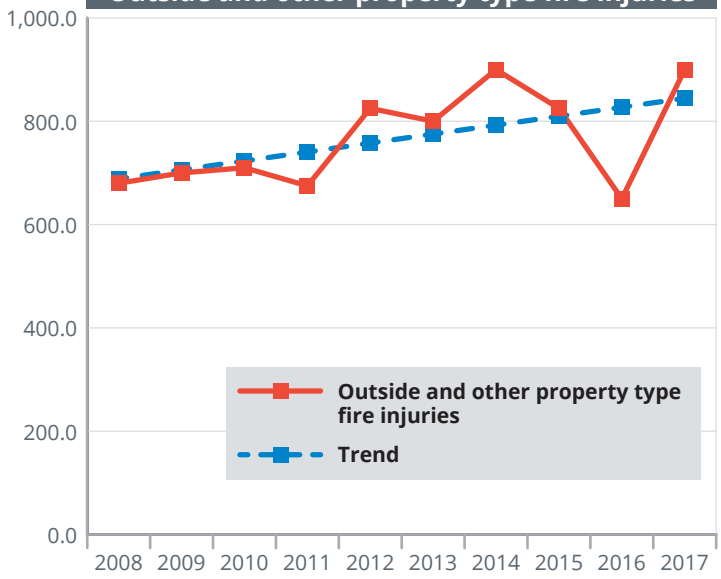
Fires (thousands)		
Year	Outside value	Other value
2008	594.0	106.5
2009	546.0	103.0
2010	549.5	84.5
2011	597.5	88.5
2012	612.0	80.0
2013	479.5	85.0
2014	513.0	97.5
2015	536.0	103.5
2016	558.5	104.0
2017	531.5	91.0
10-year trend (%)	**-8.8%**	**-0.3%**



Deaths	
Year	Outside and other value
2008	55
2009	35
2010	55
2011	65
2012	60
2013	65
2014	70
2015	95
2016	85
2017	145
10-year trend (%)	**212.9%**

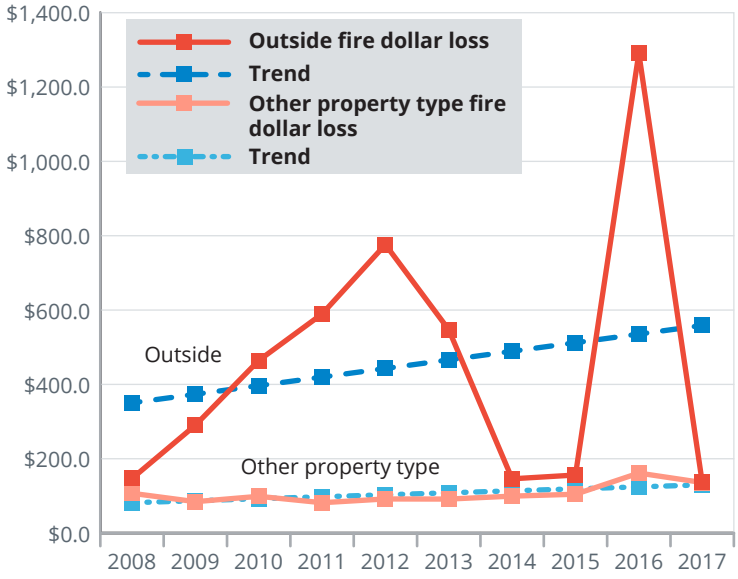
Figure 12. Trends in outside and other property type fires and fire losses (2008-2017) — continued

Outside and other property type fire injuries



Injuries	
Year	Outside and other value
2008	680
2009	700
2010	710
2011	675
2012	825
2013	800
2014	900
2015	825
2016	650
2017	900
10-year trend (%)	**22.6%**

Outside and other property type fire dollar loss (in millions of dollars)*



Dollar loss (millions of dollars) *Adjusted to 2017 dollars		
Year	Outside value	Other value
2008	$146.9	$107.0
2009	$290.2	$84.5
2010	$464.3	$98.9
2011	$589.5	$81.7
2012	$776.2	$91.8
2013	$547.1	$91.5
2014	$146.0	$99.4
2015	$156.2	$104.5
2016	$1,290.9	$161.4
2017	$137.0	$136.0
10-year trend (%)	**59.4%**	**58.7%**

Sources: NFPA and CPI.

Note: The large increase in the trend for outside and other property type fire deaths is due primarily to the fluctuations in the small numbers of deaths. The 2012 spike in dollar loss includes the Waldo Canyon Fire in Colorado with an estimated property loss of $453,700,000 and the High Park Fire, also in Colorado, with an estimated property loss of $113,700,000. The 2016 spike in dollar loss includes the $911,000,000 property damage resulting from the Gatlinburg, Tennessee, wildfires.

Causes of fires and losses

The following sections show, by property type, the fire cause profiles of the major causes of fires and fires that resulted in losses in 2017: fatal fires, fires resulting in injuries and fires resulting in dollar loss.[27]

Causes of residential building fires

Figure 13 shows the cause profiles for residential building fires and fires resulting in losses for 2017. Cooking, at 52%, was the leading cause of residential building fires. Heating caused another 9%. These percentages (and those that follow) are adjusted, which proportionally spreads the unknown causes over the other 15 cause categories.

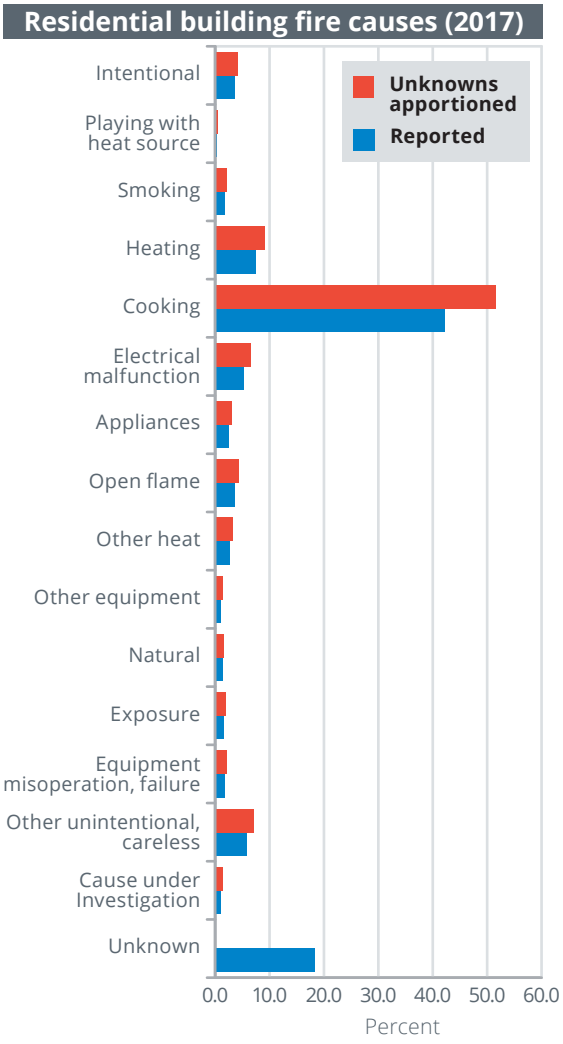
The leading causes of residential fatal fires were other unintentional or careless actions at 17%, cause under investigation at 14%, intentional actions at 13%, and smoking at 12%. These four causes accounted for more than half of the residential fatal fires.

The leading cause of residential fires that resulted in injuries was cooking (32%). Cooking was also the leading cause of fires resulting in dollar loss at 27%, followed by electrical malfunction and other unintentional or careless actions (12% each).[28]

[27]In principle, it is the cause of the fire that results in deaths and injuries which should be analyzed, not the numbers of deaths and injuries associated with fire causes.

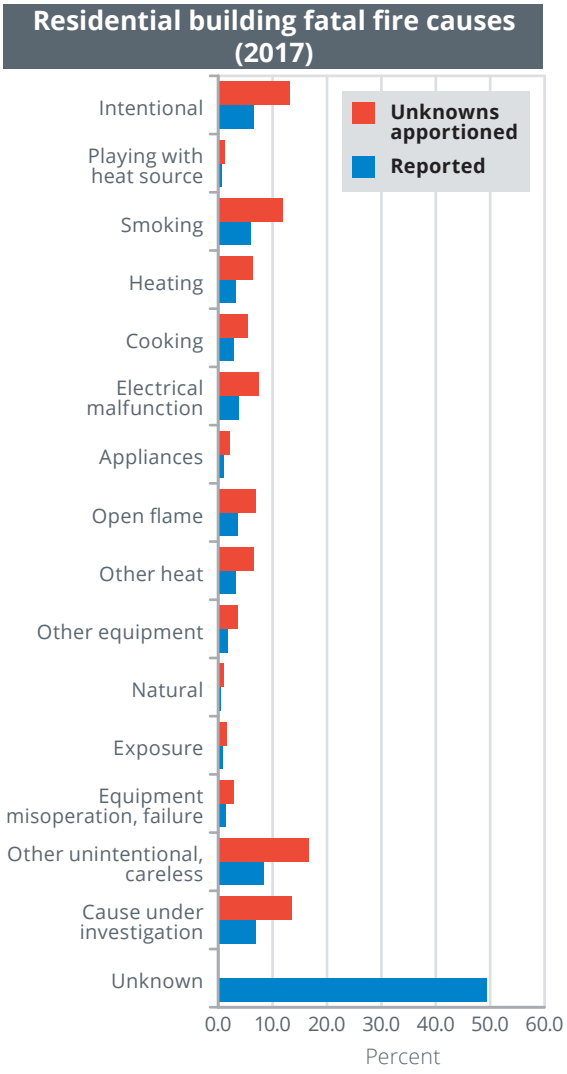
[28]Causes of residential building fires are presented in more detail as part of the USFA's *Residential Building Fire Estimate Summary* series (2008 to 2017) available at https://www.usfa.fema.gov/downloads/pdf/statistics/res_bldg_fire_estimates.pdf. To download an Excel file of residential building fire and fire loss estimates by property use and cause, visit https://www.usfa.fema.gov/data/statistics/order_download_data.html (located under the section "Download select data sets").

Figure 13. Causes of residential building fires and fires resulting in losses (2017)



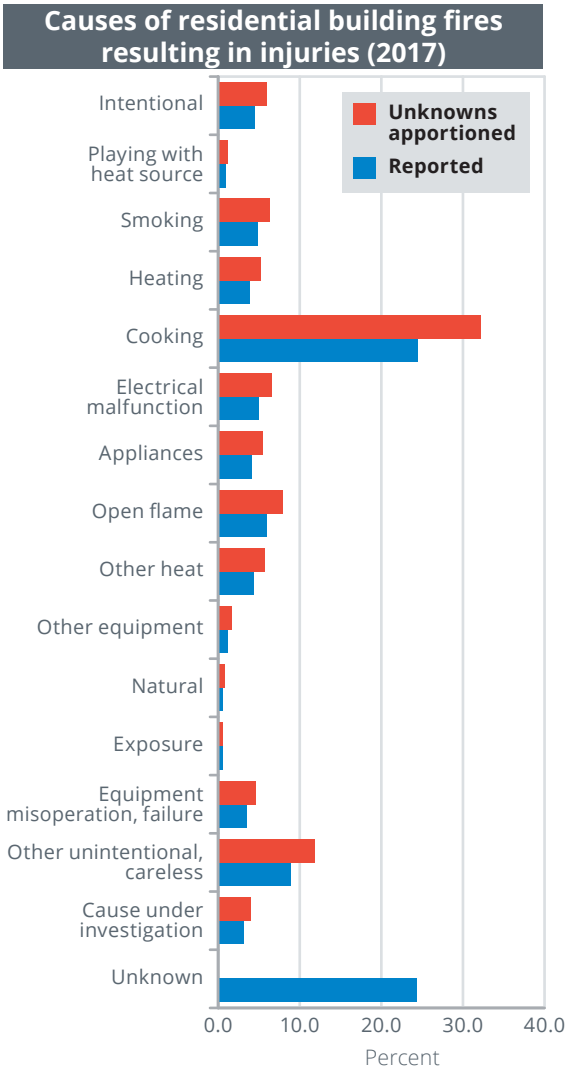
Cause	Reported	Unknowns apportioned
Intentional	3.5	4.2
Playing with heat source	0.3	0.4
Smoking	1.7	2.1
Heating	7.4	9.1
Cooking	42.2	51.6
Electrical malfunction	5.3	6.5
Appliances	2.5	3.1
Open flame	3.5	4.3
Other heat	2.7	3.3
Other equipment	1.0	1.3
Natural	1.3	1.6
Exposure	1.6	2.0
Equipment misoperation, failure	1.7	2.1
Other unintentional, careless	5.8	7.1
Cause under investigation	1.1	1.4
Unknown	18.2	0.0
Total	100.0	100.0

Figure 13. Causes of residential building fires and fires resulting in losses (2017) — continued



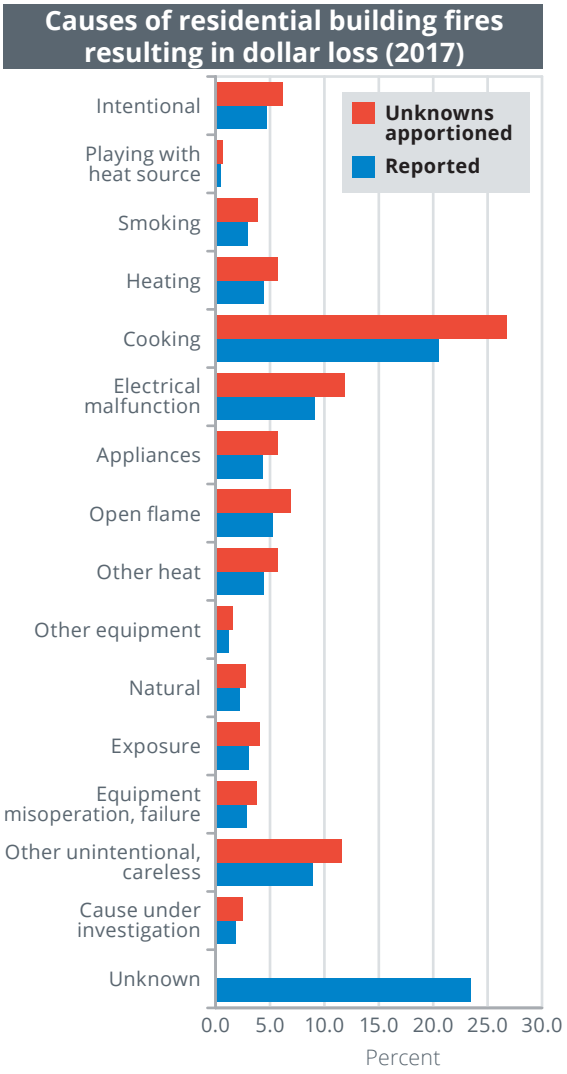
Cause	Reported	Unknowns apportioned
Intentional	6.6	13.1
Playing with heat source	0.6	1.2
Smoking	6.0	11.8
Heating	3.2	6.3
Cooking	2.8	5.5
Electrical malfunction	3.8	7.5
Appliances	1.1	2.1
Open flame	3.5	6.9
Other heat	3.3	6.6
Other equipment	1.8	3.6
Natural	0.5	1.0
Exposure	0.8	1.5
Equipment misoperation, failure	1.4	2.8
Other unintentional, careless	8.4	16.7
Cause under investigation	6.9	13.6
Unknown	49.4	0.0
Total	100.0	100.0

Figure 13. Causes of residential building fires and fires resulting in losses (2017) — continued



Cause	Reported	Unknowns apportioned
Intentional	4.5	5.9
Playing with heat source	0.9	1.2
Smoking	4.8	6.3
Heating	3.9	5.2
Cooking	24.4	32.2
Electrical malfunction	5.0	6.6
Appliances	4.1	5.4
Open flame	6.0	7.9
Other heat	4.3	5.7
Other equipment	1.2	1.6
Natural	0.6	0.8
Exposure	0.5	0.6
Equipment misoperation, failure	3.5	4.6
Other unintentional, careless	8.9	11.8
Cause under investigation	3.1	4.0
Unknown	24.3	0.0
Total	100.0	100.0

Figure 13. Causes of residential building fires and fires resulting in losses (2017) — continued



Cause	Reported	Unknowns apportioned
Intentional	4.7	6.2
Playing with heat source	0.5	0.7
Smoking	3.0	3.9
Heating	4.4	5.7
Cooking	20.5	26.8
Electrical malfunction	9.1	11.9
Appliances	4.3	5.7
Open flame	5.3	6.9
Other heat	4.4	5.7
Other equipment	1.2	1.6
Natural	2.2	2.8
Exposure	3.1	4.1
Equipment misoperation, failure	2.9	3.8
Other unintentional, careless	8.9	11.6
Cause under investigation	1.9	2.5
Unknown	23.5	0.0
Total	100.0	100.0

Source: NFIRS.

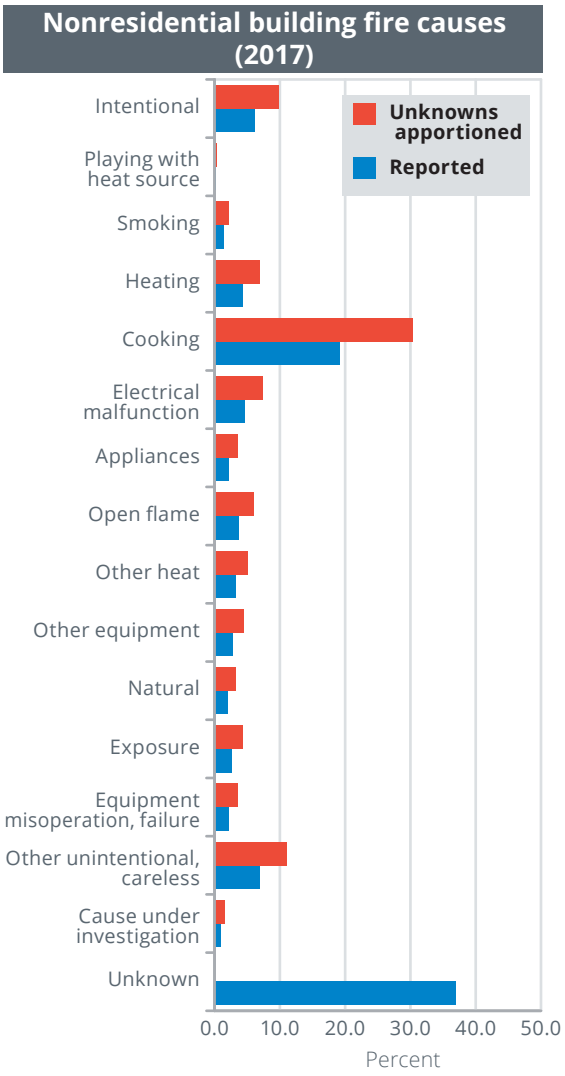
Notes: 1. Adjusted percentages (percentages with unknowns apportioned) proportionally spread the fire incidents with unknown causes over the other 15 cause categories. Totals may not add up to 100% due to rounding.
2. A large percentage of residential building fatal fire incidents reported to the NFIRS (49%) did not have sufficient information to determine the cause of the fire.

Causes of nonresidential building fires

Figure 14 shows the cause profiles for nonresidential building fires and fires resulting in dollar loss. Due to the small numbers of nonresidential building fatal fires and fires resulting in injuries reported to the NFIRS, and the large percentage of fires with insufficient information to determine fire cause, the distribution of causes for these fires is not shown.

For nonresidential building fires, three causes accounted for at least half of the fires: Cooking was the leading cause of fires (30%), followed by other unintentional or careless actions (11%), and intentional actions (10%). The leading causes of fires resulting in dollar loss in nonresidential buildings were other unintentional or careless actions (14%), as well as cooking and electrical malfunctions (both at 12%).[29]

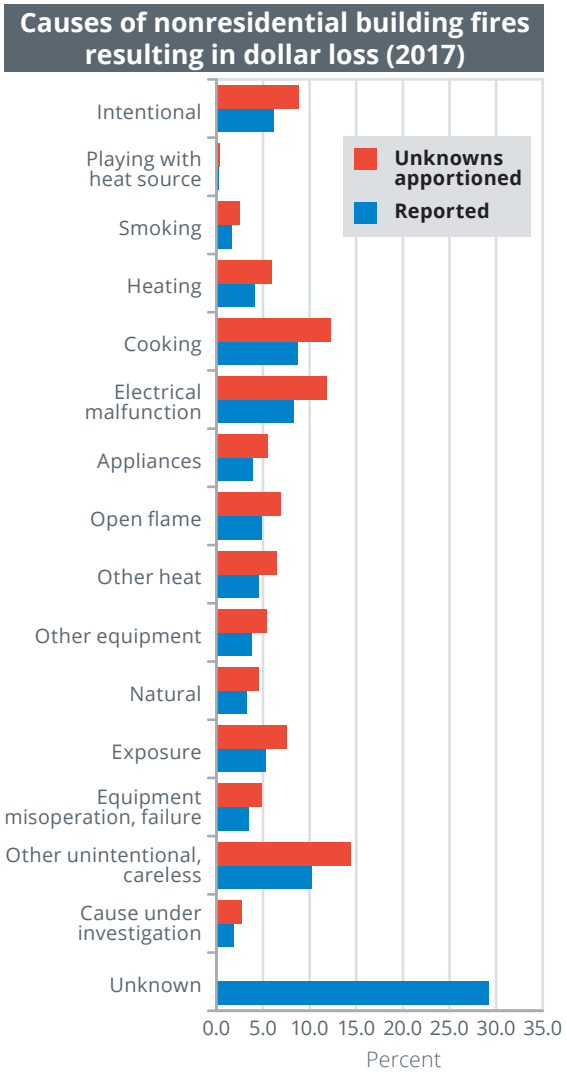
Figure 14. Causes of nonresidential building fires and fires resulting in dollar loss (2017)



Cause	Reported	Unknowns apportioned
Intentional	6.2	9.8
Playing with heat source	0.2	0.3
Smoking	1.4	2.2
Heating	4.3	6.9
Cooking	19.2	30.4
Electrical malfunction	4.7	7.4
Appliances	2.2	3.5
Open flame	3.8	6.0
Other heat	3.2	5.1
Other equipment	2.8	4.5
Natural	2.1	3.3
Exposure	2.7	4.3
Equipment misoperation, failure	2.2	3.5
Other unintentional, careless	7.0	11.1
Cause under investigation	1.0	1.6
Unknown	36.9	0.0
Total	100.0	100.0

[29]Causes of nonresidential building fires are presented in more detail as part of the USFA's *Nonresidential Building Fire Estimate Summary* series (2008 to 2017), available at https://www.usfa.fema.gov/downloads/pdf/statistics/nonres_bldg_fire_estimates.pdf. To download an Excel file of nonresidential building fire and fire loss estimates by property use and cause, visit https://www.usfa.fema.gov/data/statistics/order_download_data.html (located under the section "Download select data sets").

Figure 14. Causes of nonresidential building fires and fires resulting in dollar loss (2017) — continued



Cause	Reported	Unknowns apportioned
Intentional	6.2	8.8
Playing with heat source	0.3	0.4
Smoking	1.7	2.5
Heating	4.1	5.9
Cooking	8.7	12.3
Electrical malfunction	8.3	11.8
Appliances	3.9	5.5
Open flame	4.9	6.9
Other heat	4.6	6.5
Other equipment	3.8	5.4
Natural	3.3	4.6
Exposure	5.3	7.6
Equipment misoperation, failure	3.5	4.9
Other unintentional, careless	10.2	14.4
Cause under investigation	1.9	2.7
Unknown	29.2	0.0
Total	100.0	100.0

Source: NFIRS.

Note: Adjusted percentages (percentages with unknowns apportioned) proportionally spread the fire incidents with unknown causes over the other 15 cause categories. Totals may not add up to 100% due to rounding.

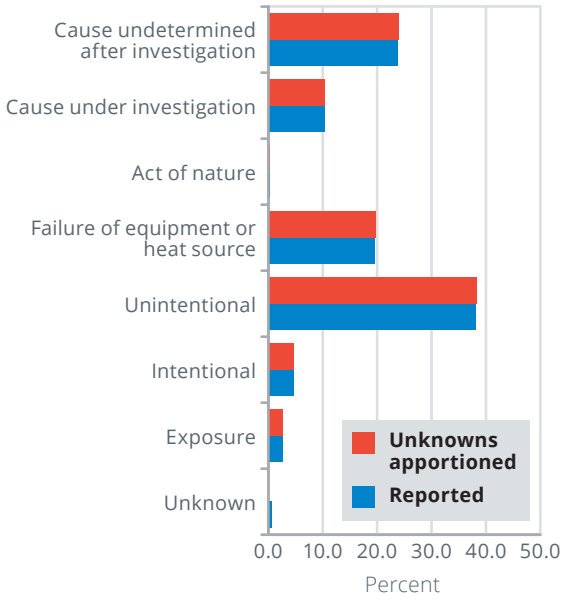
Causes of vehicle fires

Figure 15 shows the cause profiles for vehicle fires and fires resulting in dollar loss. Due to the small numbers of fatal vehicle fires and fires resulting in injuries reported to the NFIRS, the distribution of causes for these fires is not shown.

Unintentional actions were the leading cause of fires and fires resulting in dollar loss in vehicles (38% and 37%, respectively). In 24% of vehicle fires, the causes were undetermined after the investigations. Failure of equipment or heat source caused an additional 20% of vehicle fires. The cause was undetermined after the investigation in 23% of fires resulting in dollar loss.

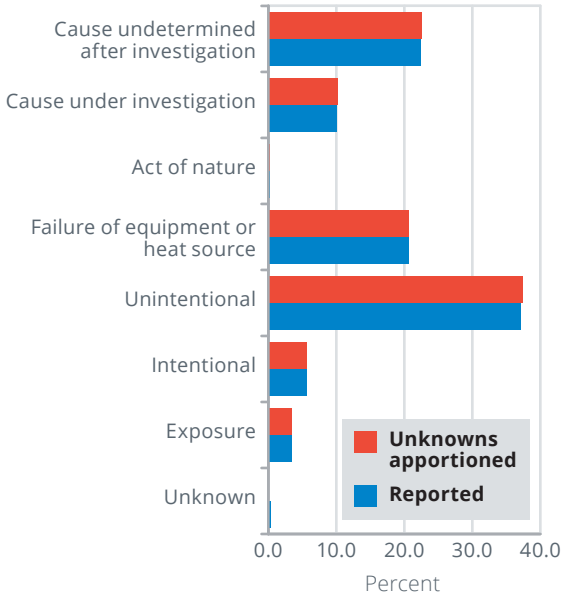
Figure 15. Causes of vehicle fires and fires resulting in dollar loss (2017)

Vehicle fire causes (2017)



Cause	Reported	Unknowns apportioned
Cause undetermined after investigation	23.8	24.0
Cause under investigation	10.3	10.4
Act of nature	0.3	0.3
Failure of equipment or heat source	19.6	19.7
Unintentional	38.1	38.4
Intentional	4.7	4.7
Exposure	2.6	2.6
Unknown	0.7	0.0
Total	100.0	100.0

Causes of vehicle fires resulting in dollar loss (2017)



Cause	Reported	Unknowns apportioned
Cause undetermined after investigation	22.4	22.5
Cause under investigation	10.1	10.2
Act of nature	0.2	0.2
Failure of equipment or heat source	20.6	20.7
Unintentional	37.2	37.4
Intentional	5.7	5.7
Exposure	3.4	3.4
Unknown	0.4	0.0
Total	100.0	100.0

Source: NFIRS.

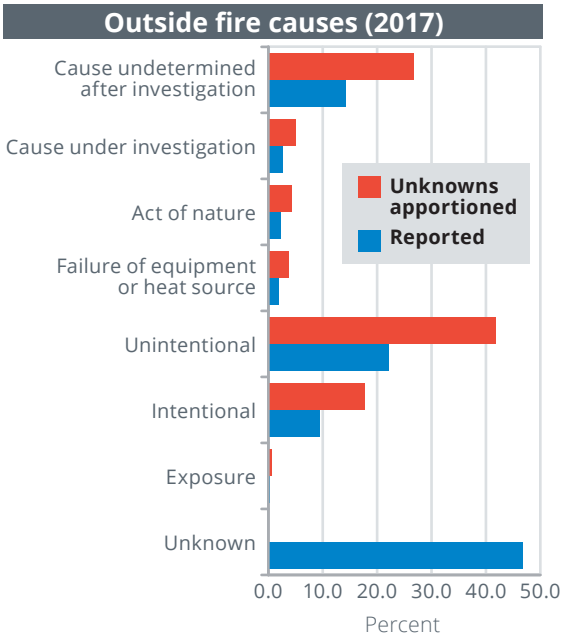
Note: Adjusted percentages (percentages with unknowns apportioned) proportionally spread the fire incidents with unknown causes over the other seven cause categories. Totals may not add up to 100% due to rounding.

Causes of outside fires

Figure 16 shows the cause profiles for outside fires and fires resulting in dollar loss. Due to the small numbers of outside fatal fires and fires resulting in injuries reported to the NFIRS, and the large percentage of fires with insufficient information to determine fire cause, the distribution of causes for these fires is not shown.

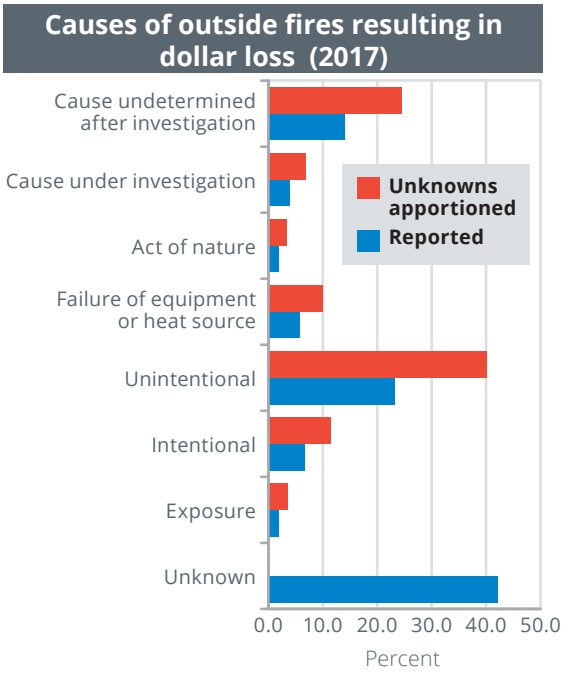
Unintentional actions were the leading cause of fires and fires resulting in dollar loss in outside fires (42% and 40%, respectively). In 27% of outside fires and in 25% of outside fires resulting in dollar loss, causes were undetermined after the investigations.

Figure 16. Causes of outside fires and fires resulting in dollar loss (2017)



Cause	Reported	Unknowns apportioned
Cause undetermined after investigation	14.3	26.8
Cause under investigation	2.7	5.0
Act of nature	2.3	4.3
Failure of equipment or heat source	2.0	3.7
Unintentional	22.2	41.8
Intentional	9.5	17.8
Exposure	0.3	0.6
Unknown	46.7	0.0
Total	100.0	100.0

Figure 16. Causes of outside fires and fires resulting in dollar loss (2017) — continued



Cause	Reported	Unknowns apportioned
Cause undetermined after investigation	14.1	24.5
Cause under investigation	3.9	6.8
Act of nature	2.0	3.4
Failure of equipment or heat source	5.8	10.1
Unintentional	23.2	40.2
Intentional	6.7	11.5
Exposure	2.0	3.5
Unknown	42.2	0.0
Total	100.0	100.0

Source: NFIRS.

Notes:
1. Adjusted percentages (percentages with unknowns apportioned) proportionally spread the fire incidents with unknown causes over the other seven cause categories. Totals may not add up to 100% due to rounding.
2. A large percentage of outside fire incidents reported to the NFIRS (47%) did not have sufficient information to determine the cause of the fire.

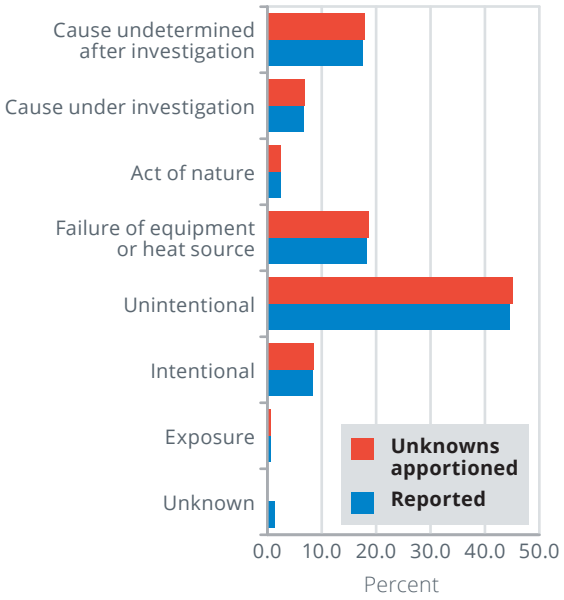
Causes of other fires

Figure 17 shows the cause profiles for other fires and fires resulting in dollar loss. Due to the small numbers of other fatal fires and fires resulting in injuries reported to the NFIRS, the distribution of causes for these fires is not shown.

As with vehicle and outside fires, unintentional actions were the leading cause of other fires and fires resulting in dollar loss (45% and 48%, respectively). Failure of equipment or heat source was the second leading cause of other fires (19%) and other fires resulting in dollar loss (24%).

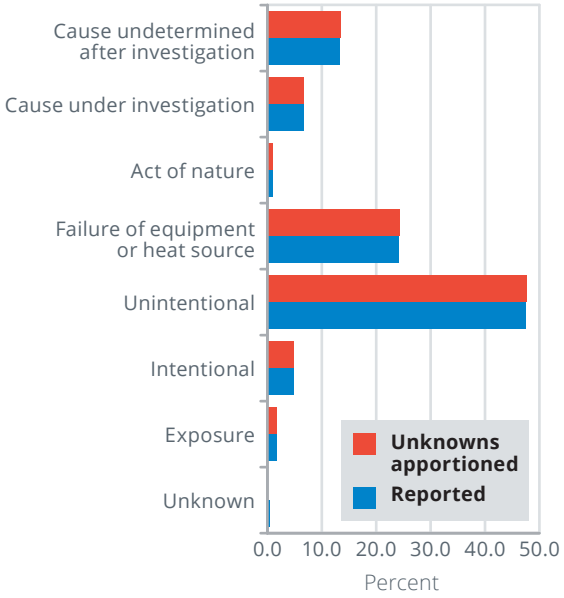
Figure 17. Causes of other fires and fires resulting in dollar loss (2017)

Causes of other fires (2017)



Cause	Reported	Unknowns apportioned
Cause undetermined after investigation	17.6	17.9
Cause under investigation	6.8	6.9
Act of nature	2.4	2.4
Failure of equipment or heat source	18.3	18.6
Unintentional	44.5	45.1
Intentional	8.4	8.5
Exposure	0.7	0.7
Unknown	1.3	0.0
Total	100.0	100.0

Causes of other fires resulting in dollar loss (2017)



Cause	Reported	Unknowns apportioned
Cause undetermined after investigation	13.4	13.5
Cause under investigation	6.7	6.7
Act of nature	1.1	1.1
Failure of equipment or heat source	24.2	24.3
Unintentional	47.5	47.7
Intentional	4.8	4.9
Exposure	1.8	1.8
Unknown	0.5	0.0
Total	100.0	100.0

Source: NFIRS.

Note: Adjusted percentages (percentages with unknowns apportioned) proportionally spread the fire incidents with unknown causes over the other seven cause categories. Totals may not add up to 100% due to rounding.

Fire casualties

Fire casualties affect all groups and races, rich and poor, Northern and Southern, urban and rural. But the problem is greater for some groups than for others.

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/Alaskan Natives. In the case of age, percentages of fire deaths were greatest for those ages 55 to 69, while percentages of fire injuries were greatest for adults ages 25 to 34.

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, there are far fewer American Indians/Alaskan Natives, for example, than white Americans living in the U.S. As a consequence, it is possible for a group to have greater (or fewer) deaths or injuries because the total number of individuals for whom it is possible to be injured is larger (or smaller) than other groups.

To account for population differences such as these, per capita rates are used. Per capita rates use a common population size, which then permits comparisons between different groups.[30] Perhaps the most useful way to assess fire casualties across groups is to determine the relative risk of dying or being injured. 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.

Fire deaths

In 2017, according to the NCHS, 3,645 deaths were caused by fire.[31,32] The risk of death from fire is not the same for everyone. When determining fire risk, geographic, demographic and socioeconomic factors all come into play.[33]

State profiles

The fire problem varies from region to region and state to state in the U.S. This is often a result of climate, poverty, education, demographics and other factors. Table 2 lists the 2017 civilian fire deaths, fire death rates per million population, and relative risk by state.[34]

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[30]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.
[31]NCHS, 2017 *Mortality Data File,* as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program.
[32]For each reported death certificate in the U.S., the NCHS assigns International Classification of Disease (ICD) codes for all reported conditions leading to death. Based on the NCHS mortality data, there were 3,645 fire-related deaths in 2017. These included 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. This latter condition is an expanded approach to capturing fire and fire-related deaths. With this current approach, deaths where such exposures were a contributing factor (i.e., the death may not have occurred without the exposure) can be captured. The ICD 10 codes included in the mortality statistics are F63.1, W39 to W40, X00 to X06, X08 to X09, X75 to X76, X96 to X97, Y25 to Y26, and Y35.1.
[33]For more information on U.S. fire deaths, fire death rates, and the risk of dying in a fire, visit https://www.usfa.fema.gov/data/statistics/fire_death_rates.html. Additionally, the USFA's topical report *Fire Risk in 2017* focuses on how fire risk, specifically the risk of death and injury, varies with age and how other demographic factors weigh upon that risk. This report is available at https://www.usfa.fema.gov/downloads/pdf/statistics/v20i3.pdf.
[34]This analysis includes only states where fire death rates were computed. Fire death rates were not computed for Delaware, Rhode Island and Wyoming due to very small numbers of fire deaths (fewer than 10 deaths). The fire death rates presented here reflect the crude death rates and are not age adjusted. The crude death rate is the total number of fire deaths per state divided by the total population per state and multiplied by one million.

Four states (Alaska, Arkansas, South Dakota and West Virginia) had fire death rates that exceeded 20 deaths per million population. The District of Columbia and 22 states, mostly situated in the Southeast and Midwest, had death rates between 11.3 and 20 deaths per million population. Additionally, 21 states had fire death rates at or below the national fire death rate (i.e., 11.2 deaths per million population[35]). Ten states, mostly largely populated states, accounted for 49% of the national total U.S. fire deaths. Unless their fire problems are significantly reduced, the national total may be difficult to lower.

Figure 18 ranks the order of states by relative risk of civilian fire death in 2017. The states with the highest relative risk of fire death in 2017 included Alaska, Arkansas and West Virginia. The populace of West Virginia was 2.6 times more likely to die in a fire than the general population; however, people living in New Jersey were 60% less likely to die in a fire than the population as a whole. Where relative risk was computed, 23 states and the District of Columbia had a relative risk higher than that of the general population. Five states — Illinois, Maine, Oregon, Washington and Wisconsin — had a relative risk comparable to that of the general population. In 19 states, the relative risk was lower than that of the general population.

Table 2. Fire deaths, rates and relative risk by state (2017)

State of occurrence	Fire deaths	Fire death rate per million population (crude rate)	Relative risk
Alabama	84	17.2	1.5
Alaska	20	27.0	2.4
Arizona	73	10.4	0.9
Arkansas	72	24.0	2.1
California	277	7.0	0.6
Colorado	48	8.5	0.8
Connecticut	24	6.7	0.6
Delaware	*	*	*
District of Columbia**	13	18.7	1.7
Florida	166	7.9	0.7
Georgia	150	14.4	1.3
Hawaii**	14	9.8	0.9
Idaho**	14	8.1	0.7
Illinois	146	11.4	1.0
Indiana	79	11.9	1.1
Iowa	61	19.4	1.7
Kansas	36	12.4	1.1
Kentucky	63	14.1	1.3
Louisiana	92	19.7	1.8

[35]The 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 resident population (325,147,121), multiplied by 1,000,000 people. This rate is equivalent to 11.2 fire deaths per 1 million population.

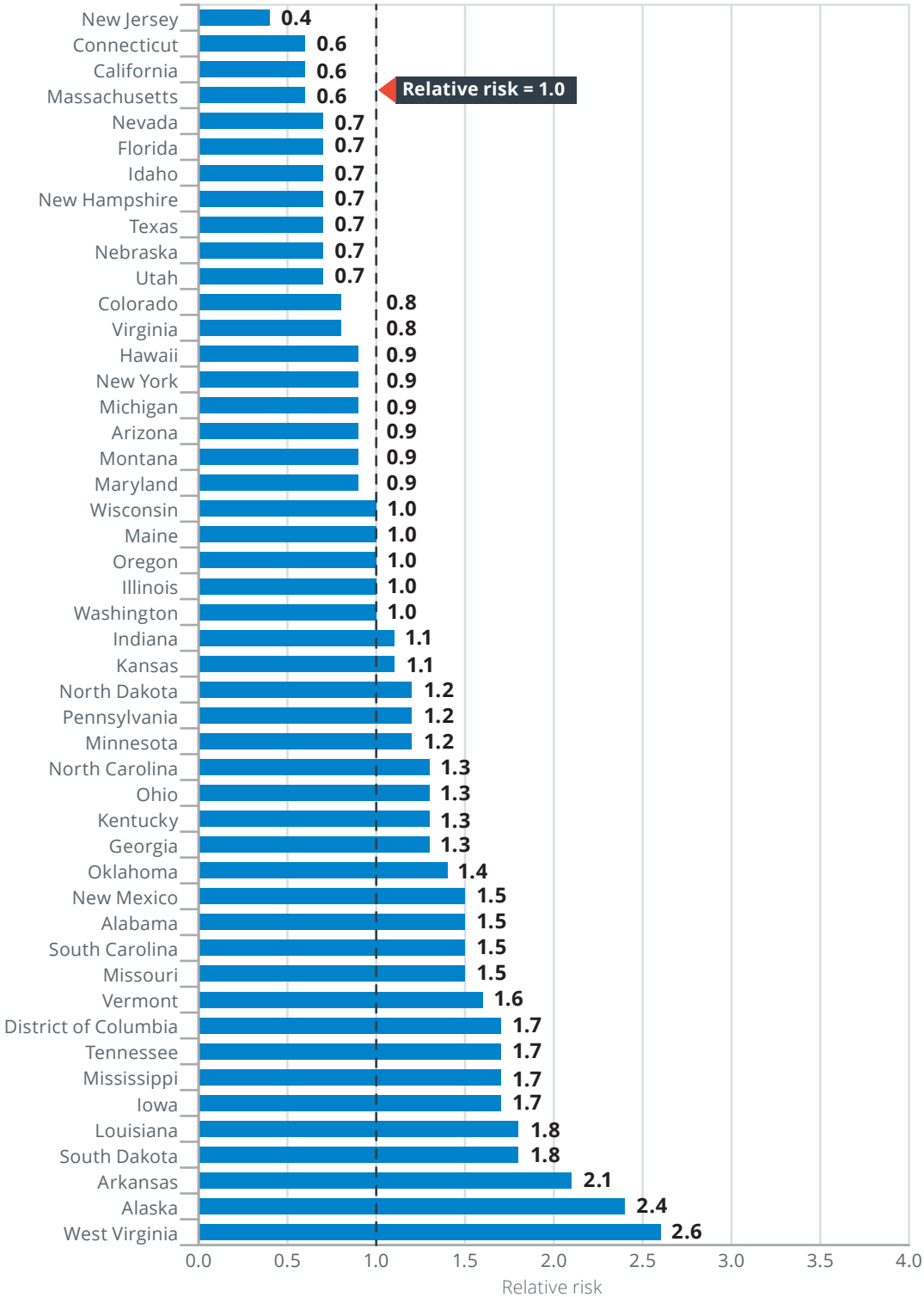
Table 2. Fire deaths, rates and relative risk by state (2017) — continued

State of occurrence	Fire deaths	Fire death rate per million population (crude rate)	Relative risk
Maine**	15	11.2	1.0
Maryland	63	10.5	0.9
Massachusetts	49	7.1	0.6
Michigan	100	10.0	0.9
Minnesota	78	14.0	1.2
Mississippi	58	19.4	1.7
Missouri	106	17.4	1.5
Montana**	11	10.4	0.9
Nebraska**	16	8.3	0.7
Nevada	23	7.7	0.7
New Hampshire**	11	8.1	0.7
New Jersey	41	4.6	0.4
New Mexico	35	16.7	1.5
New York	196	10.0	0.9
North Carolina	144	14.0	1.3
North Dakota**	10	13.2	1.2
Ohio	164	14.1	1.3
Oklahoma	62	15.8	1.4
Oregon	47	11.3	1.0
Pennsylvania	178	13.9	1.2
Rhode Island	*	*	*
South Carolina	87	17.3	1.5
South Dakota**	18	20.6	1.8
Tennessee	130	19.4	1.7
Texas	231	8.2	0.7
Utah	26	8.4	0.7
Vermont**	11	17.6	1.6
Virginia	74	8.7	0.8
Washington	86	11.6	1.0
West Virginia	53	29.2	2.6
Wisconsin	65	11.2	1.0
Wyoming	*	*	*
United States	3,645	11.2	1.0

* Indicates states where fire death rates and relative risk were not computed due to very small numbers of fire deaths (fewer than 10 deaths).

** Indicates fire death rates should be used with caution due to small numbers of deaths. Per the NCHS, *National Vital Statistics Reports,* Volume 60, Number 4, "Deaths: Preliminary data for 2010," a rate or percentage is based on at least 20 deaths. Rates based on fewer than 20 deaths are considered highly variable.

Figure 18. Rank order of states by relative risk of civilian fire death (2017)



Source: 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: Relative risk is not shown for Delaware, Rhode Island and Wyoming due to small numbers of fire deaths (fewer than 10).

Age

Figure 19 shows the percentage of fire deaths by age. Unlike relative risk, the percentages do not take into account the number of individuals in an age group, and the distributions are somewhat different. Children younger than 15 accounted for 9% of all fire deaths, while older adults (ages 65 and older) accounted for 40% of all fire deaths in 2017. Adults ages 55 to 64 accounted for an additional 21% of the deaths.

People ages 50 and older had a higher fire death rate than the average population (11.2 deaths per million population). For people ages 80 and older, the fire death rate was higher still — over three times the national average (Figure 20).

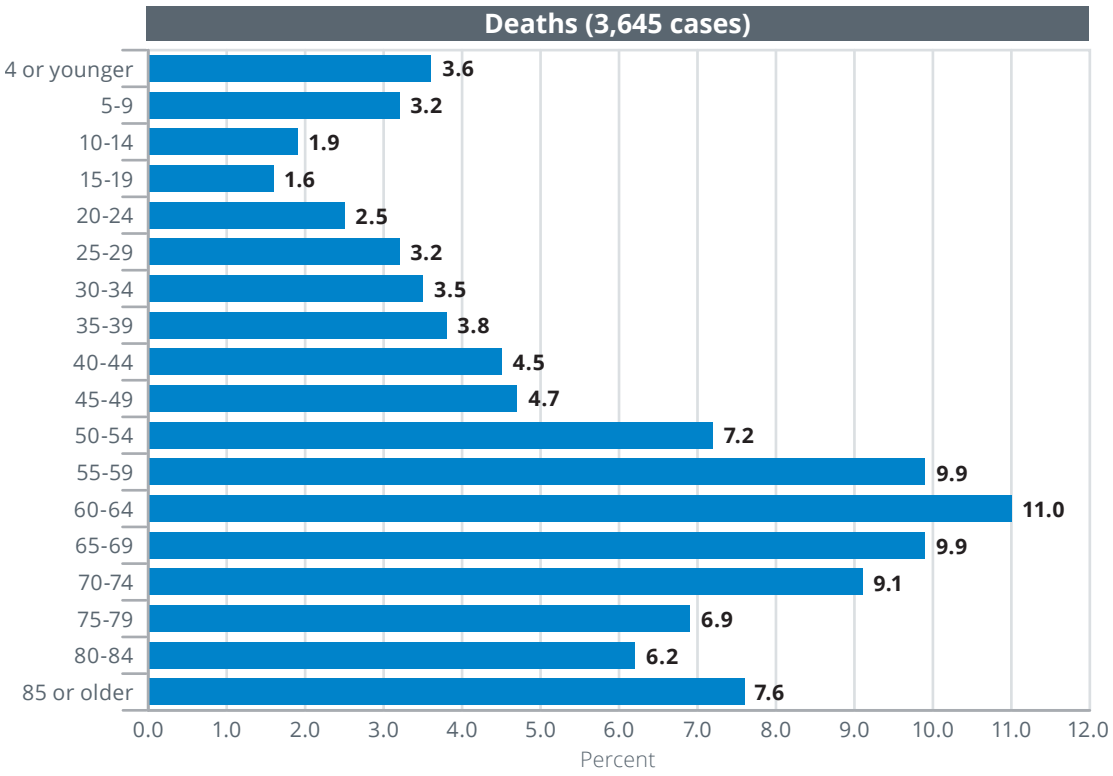
In 2017, adults ages 50 and older had a greater relative risk of dying in fires than the general population (Figure 21). Moreover, older adults ages 80 to 84 had a risk of fire death over three times that of the general population. Those ages 85 and older had the highest risk of fire death — nearly four times that of the general population.

People with limited physical and cognitive abilities, especially older adults, are at a higher risk of death from fire than other groups. As baby boomers enter retirement age, the demographic profile of the U.S. is expected to change dramatically. The older adult population (ages 65 or older) is expected to increase from its current 16% of the total population to 23% by 2060,[36] 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 almost triple, increasing from 6.5 million in 2017 to 19.0 million in 2060.[37] 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.

In the past, children ages 4 and younger were also considered to be at a high risk of death from fire; however, data indicates that the trend is changing. From 2008 to 2017, the fire death rates of children ages 4 and younger were less than or the same as the general population. Although the relative risk of children ages 4 and younger dying in a fire was 40% less than that of the general population in 2017, children ages 4 and younger faced an elevated risk of death in a fire when compared to older children (ages 5 to 14).

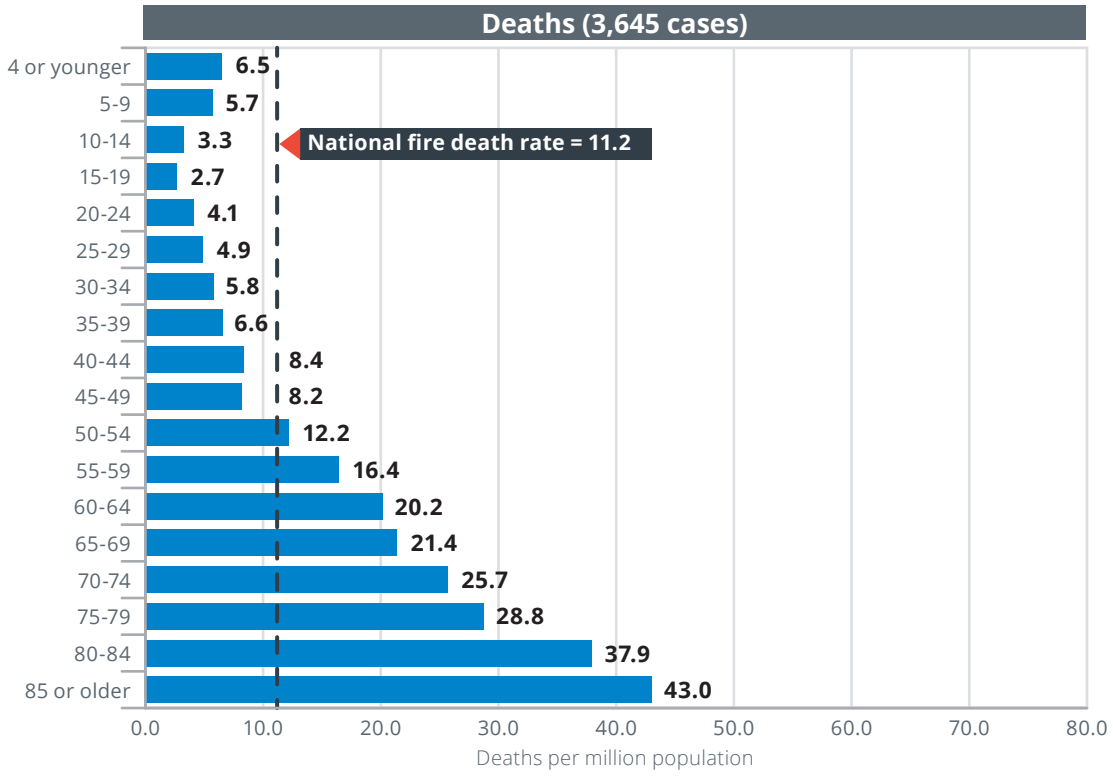
[36]U.S. Census Bureau, Population Division, Table 2. Projected Age Groups and Sex Composition of the Population: Main Projection Series for the United States: 2017 to 2060 (NP2017-T2). Release date: September 2018, https://www.census.gov/data/tables/2017/demo/popproj/2017-summary-tables.html (accessed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

Figure 19. Percent of fire deaths by age (2017)



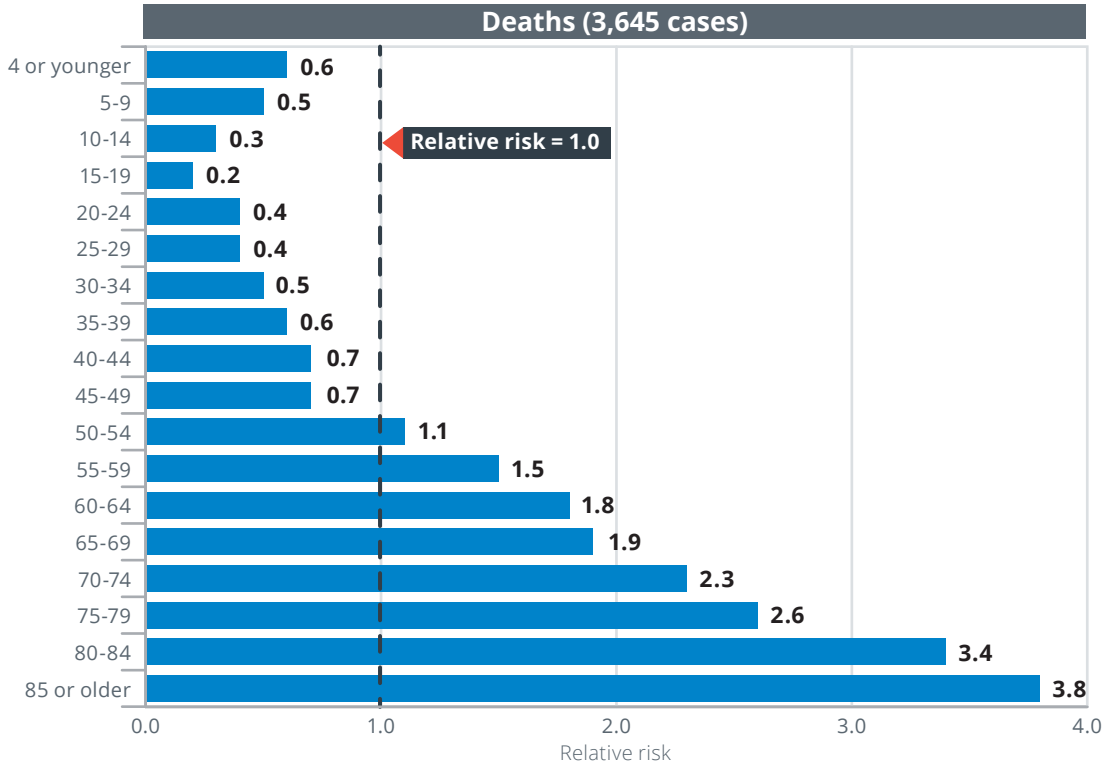
Source: NCHS.
Note: Data have been adjusted to account for unknown or unspecified ages. Total does not add up to 100% due to rounding.

Figure 20. Fire death rates by age (2017)



Sources: NCHS and U.S. Census Bureau.
Note: Data have been adjusted to account for unknown or unspecified ages.

Figure 21. Relative risk of fire deaths by age (2017)



Sources: NCHS and U.S. Census Bureau.

Notes:
1. Relative risk compares the per capita rate for a particular group (e.g., age group) to the overall per capita rate (i.e., the general population). For the general population, the relative risk is set at 1, as indicated by the dashed line in the figure above.
2. Data have been adjusted to account for unknown or unspecified ages.

Gender

As shown in Table 3, more men (61%) died in fires than women (39%) in 2017. The high proportion of male to female fire deaths has remained steady from year to year.

Table 3. Percent of fire deaths by gender (2017)

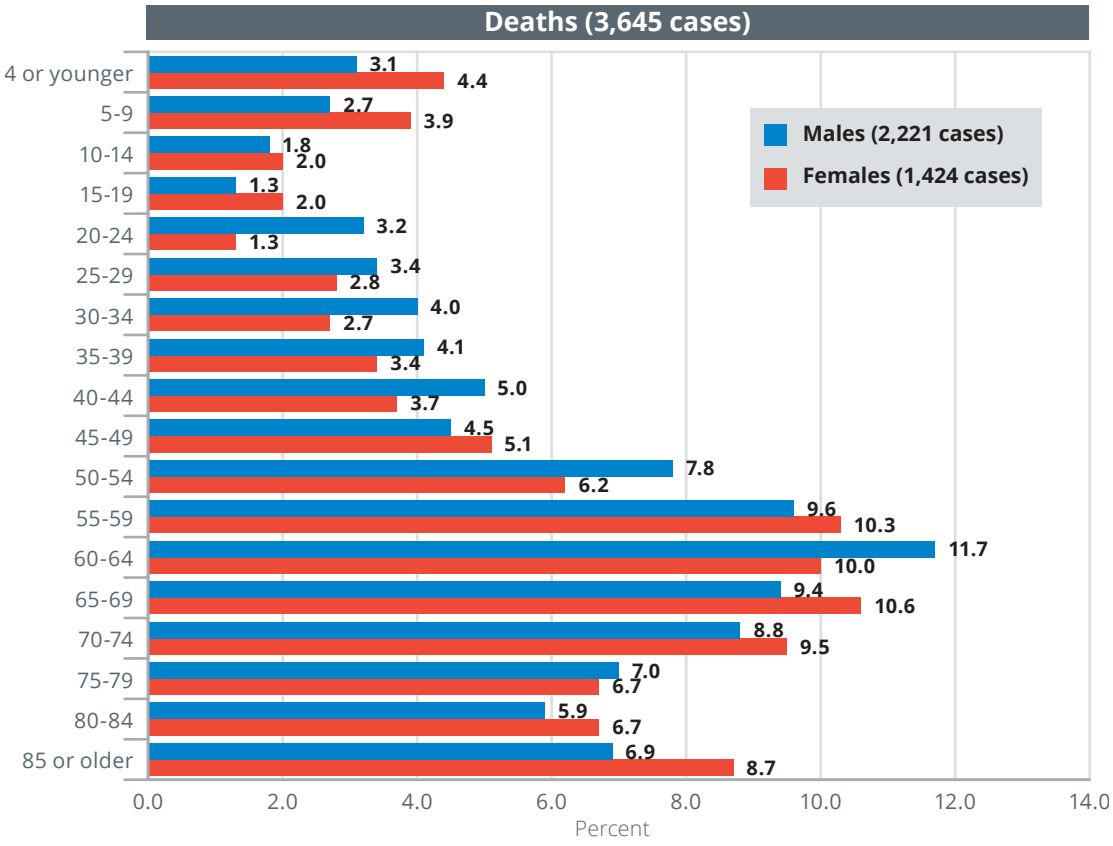
Casualty type	Males (percent)	Females (percent)
Deaths	60.9	39.1

Source: NCHS.

Figures 22 and 23 present the percent of fire deaths by age and gender and fire death rates by age and gender, respectively. The distribution of fire deaths by age is somewhat different for males versus females. Female fire deaths in the 65 and older age group accounted for 42% of female fire deaths. Male fire deaths, by contrast, were highest for those adults ages 55 to 64, accounting for 21% of male fire deaths.

Overall, in 2017, males had a fire death rate of 13.9 deaths per million population, while females had a fire death rate of 8.6 deaths per million population. Males were 1.6 times more likely to die in fires than females.[38] In fact, males had a higher fire death rate per million population than females for all age groups, except for those ages 15 to 19 where the rate was the same for both genders (Figure 23).

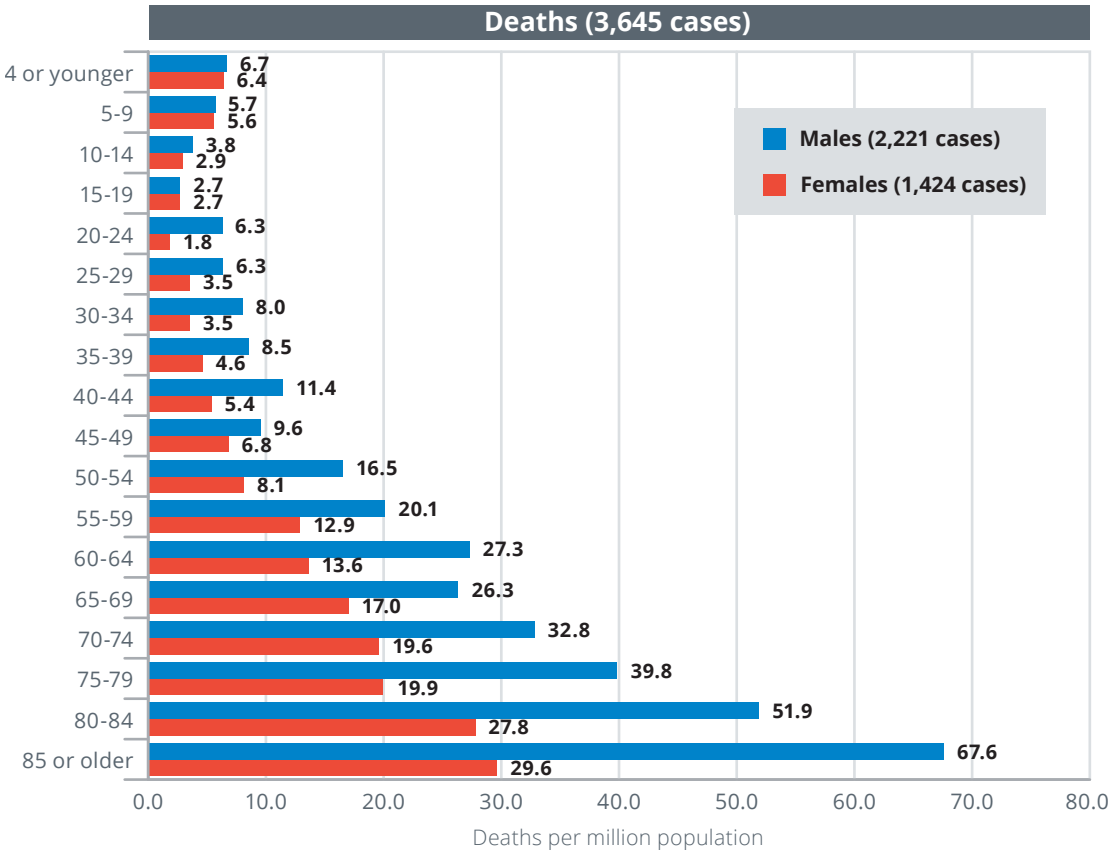
Figure 22. Percent of fire deaths by age and gender (2017)



Source: NCHS.
Note: Data have been adjusted to account for unknown or unspecified ages. Totals may not add up to 100% due to rounding.

[38]USFA. (2019). *Fire risk in 2017.* Emmitsburg, MD: National Fire Data Center. This report is available at https://www.usfa.fema.gov/downloads/pdf/statistics/v20i3.pdf.

Figure 23. Fire death rates by age and gender (2017)



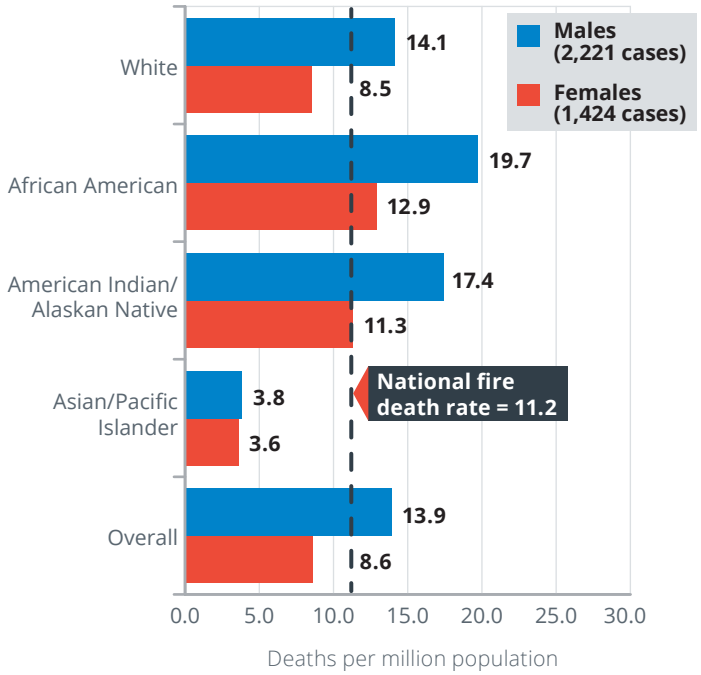
Sources: NCHS and U.S. Census Bureau.
Note: Data have been adjusted to account for unknown or unspecified ages.

Race

Figure 24 shows the fire death rates by race and gender in 2017. Males, African Americans and American Indians/Alaskan Natives had higher fire death rates than the national average.[39] Asians/Pacific Islanders had the lowest death rates. 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.

[39]USFA. (2019). *Fire risk in 2017.* Emmitsburg, MD: National Fire Data Center. https://www.usfa.fema.gov/downloads/pdf/statistics/v20i3.pdf.

Figure 24. Fire death rates by race and gender (2017)



Sources: NCHS and U.S. Census Bureau.

Notes: 1. The overall male and female population 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.
2. This figure uses NCHS data in the computation of the national fire death rate for data consistency within this chart. Based on the 2017 NFPA fire death estimate, this rate is 10.5.

Fire injuries

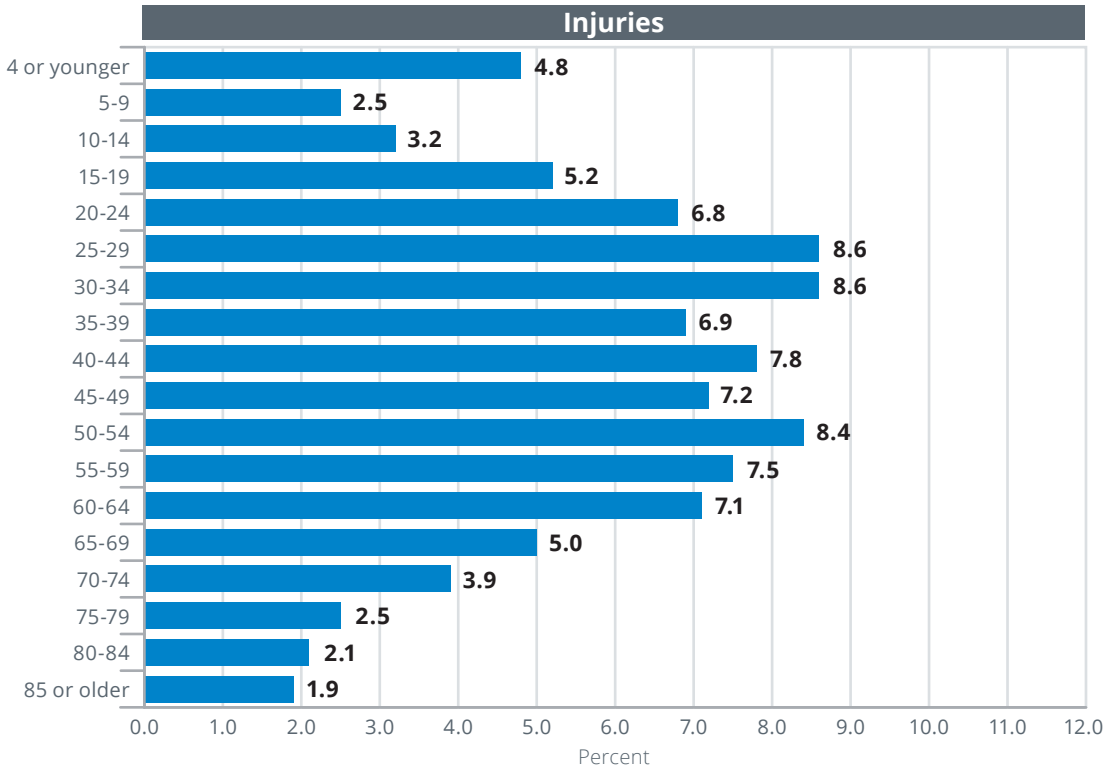
According to the NFPA, in 2017 there were an estimated 14,670 civilian fire injuries. In general, the age profile for fire injuries was very different from that for deaths. This difference is thought to be the result of both cognitive and mobility issues that affect many older adults. As a result, these adults were generally less likely to escape the effects of fire and thus suffered fatal injuries.

Age

Figures 25 and 26 show the percentage of fire injuries by age and fire injury rates by age in 2017, respectively. In 2017, children younger than 15 accounted for 11% of fire injuries, young adults (ages 25 to 34) accounted for 17%, and older adults (ages 65 and older) accounted for 15%. Most fire-related injuries occurred in adults ages 20 to 64. This age group accounted for 69% of the fire injuries in 2017 (Figure 25). Adults ages 20 to 64 and 80 to 84 experienced higher fire injury rates than the average population (i.e., 45.1 injuries per million population), yet those ages 20 to 49 have some of the lowest fire death rates (Figure 20). Adults ages 40 to 44 and 50 to 54 experienced the highest fire injury rate at 58 injuries per one million people. Fire injury rates were below average for children and teenagers ages 19 or younger and for people ages 65 to 79 and 85 and older (Figure 26).

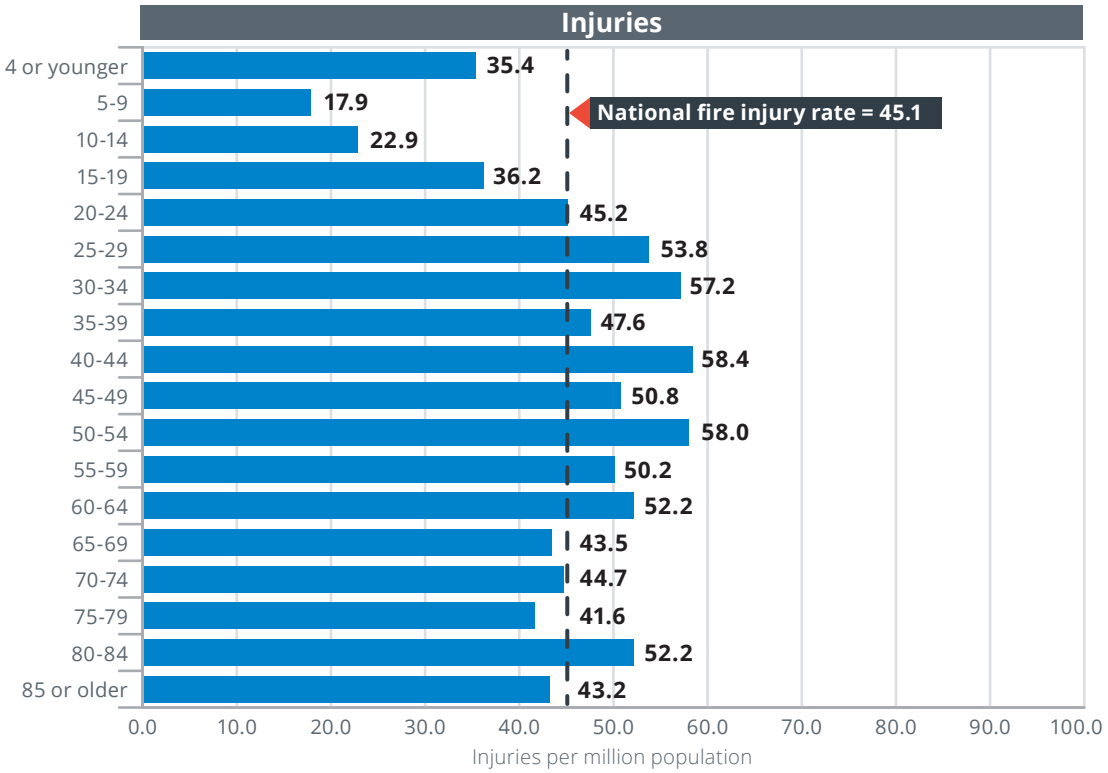
In 2017, adults ages 25 to 64 and those 80 to 84 were at the greatest risk of fire injury (Figure 27). The risk for injury was lowest for the younger age groups and those ages 75 to 79. The risk for injury from fire for adults ages 20 to 24, 65 to 74, and 85 and older was comparable to that of the general population. Although most of the older adult age groups had a lower or average level of fire injury risk, there were fewer of them in the total population. If their risk continues to be the same, we could expect more and more elderly fire injuries and deaths as the older adult proportion of the population increases. In the meantime, the focus for fire injury prevention should be on adults ages 25 to 64 and those ages 80 to 84.

Figure 25. Percent of fire injuries by age (2017)



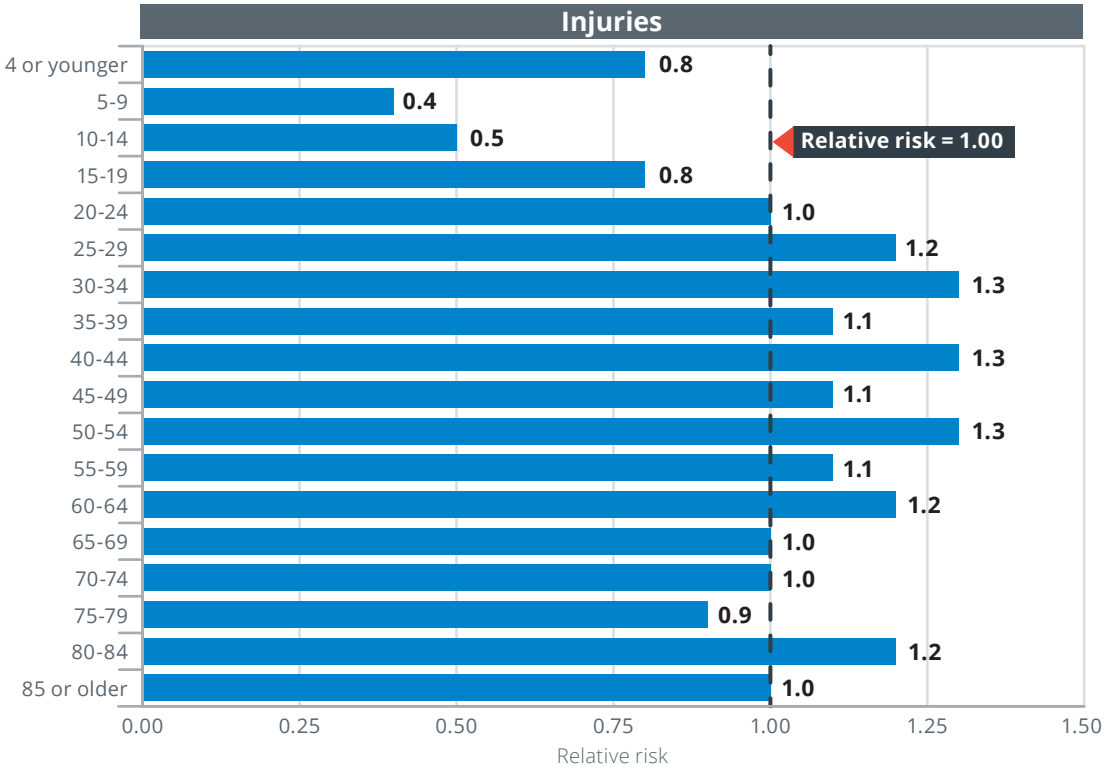
Source: NFIRS.
Note: Data have been adjusted to account for unknown or unspecified ages.

Figure 26. Fire injury rates by age (2017)



Sources: NFIRS, NFPA and U.S. Census Bureau.
Note: Data have been adjusted to account for unknown or unspecified ages.

Figure 27. Relative risk of fire injuries by age (2017)



Sources: NFIRS, NFPA and U.S. Census Bureau.

Notes:
1. Relative risk compares the per capita rate for a particular group (e.g., age group) to the overall per capita rate (i.e., the general population). For the general population, the relative risk is set at 1, as indicated by the dashed lines in the figure above.
2. Data have been adjusted to account for unknown or unspecified ages.

Gender

The male-to-female ratio for fire injuries was similar to that for fire deaths, except that the gender gap was slightly smaller. In 2017, more men (60%) were injured in fires than women (40%), as shown in Table 4.

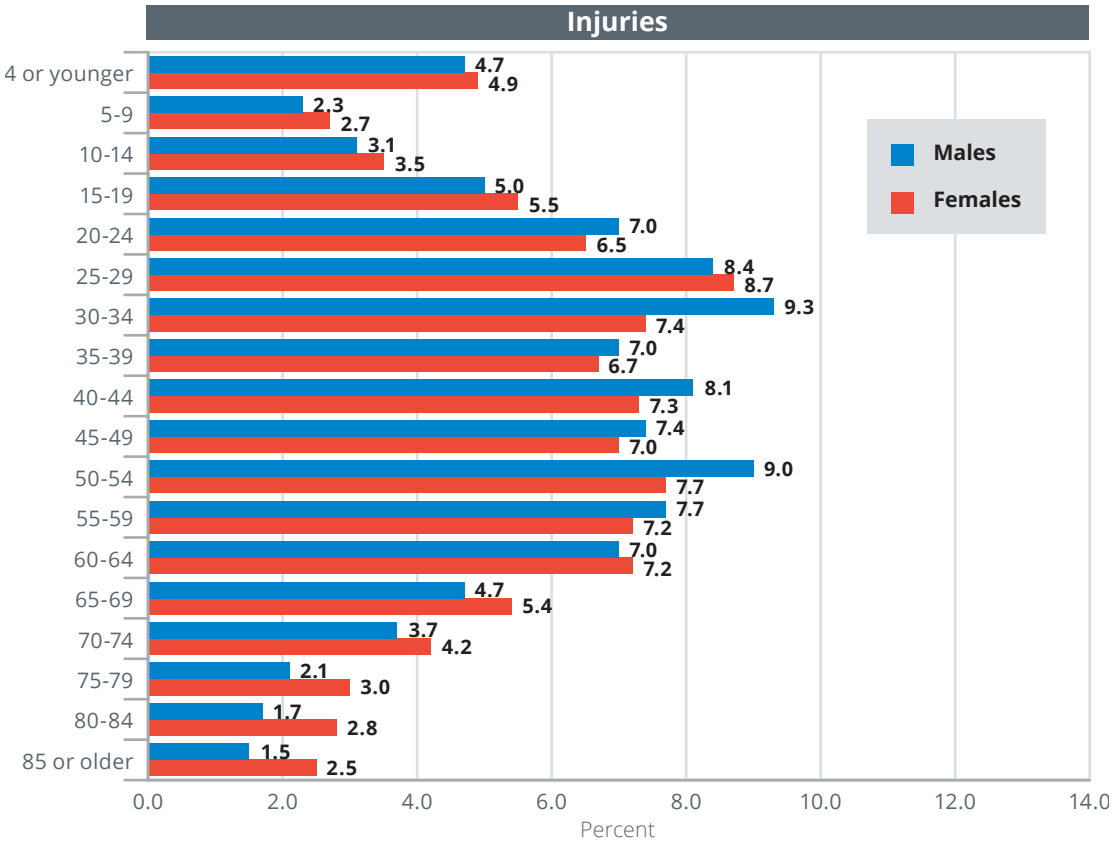
Table 4. Percent of fire injuries by gender (2017)

Casualty type	Males (percent)	Females (percent)
Injuries	59.52	40.48

Source: NFIRS.

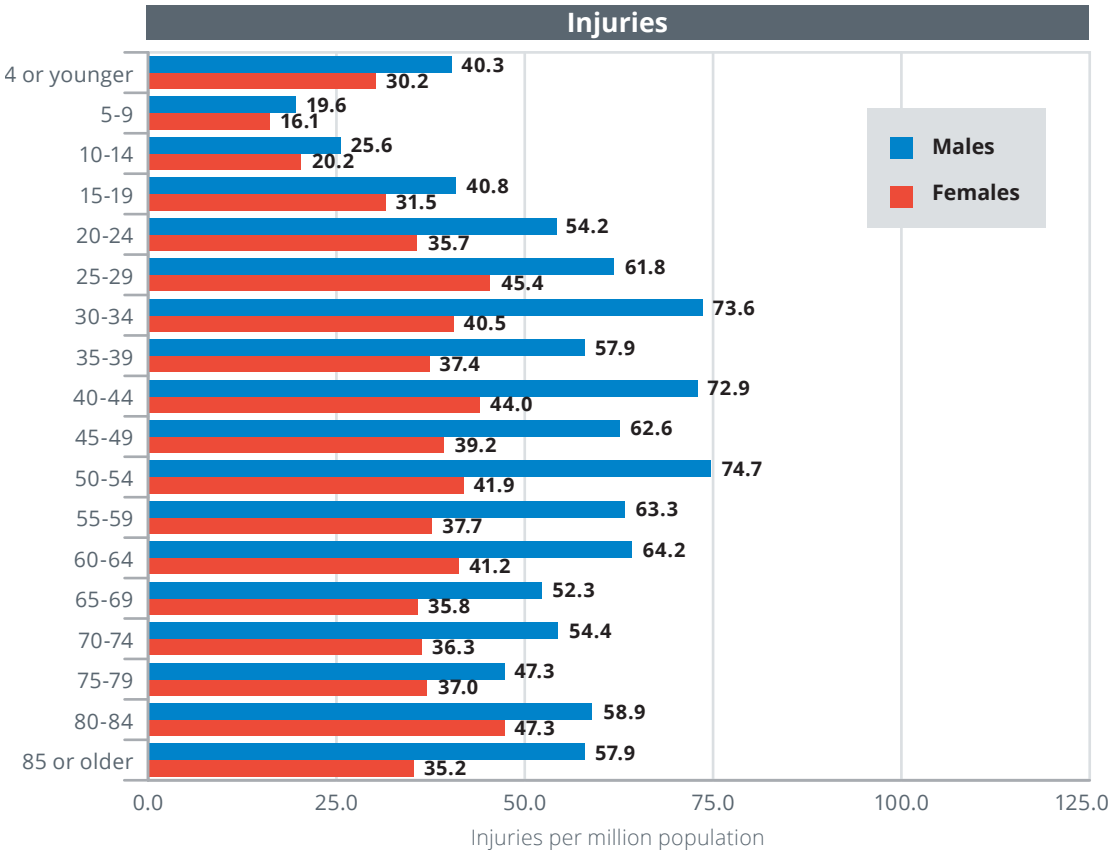
Figures 28 and 29 present the percentages of fire injuries by age and gender and fire injury rates by age and gender, respectively. The percentage distribution of fire injuries by age was somewhat different for males versus females. Males ages 20 to 24 and 30 to 59 had a higher proportion of injuries than females, while older adult females had more injuries than older adult males (Figure 28). For all age groups, males had a substantially higher fire injury rate per million population than females (Figure 29).

Figure 28. Percent of fire injuries by age and gender (2017)



Source: NFIRS.
Note: Data have been adjusted to account for unknown or unspecified ages. Totals may not add up to 100% due to rounding.

Figure 29. Fire injury rates by age and gender (2017)



Sources: NFIRS, NFPA and U.S. Census Bureau.
Note: Data have been adjusted to account for unknown or unspecified ages.

Data Sources and Methodology

Data sources

The USFA's data analyses are based primarily on the NFIRS data, but use other sources as well. Summary estimates for fires, deaths, injuries and dollar loss are from the NFPA's annual survey of fire departments.[40] Other data sources used by the USFA include 2017 NCHS mortality data[41] as compiled from data provided by the 57 vital statistics jurisdictions through the Vital Statistics Cooperative Program, resident population estimates from the U.S. Census Bureau, inflation adjustments from the Bureau of Labor Statistics' CPI, and state statistics from state fire marshals' offices or their equivalents. Because the NCHS mortality data are based on a census or enumeration of deaths based on death certificates rather than an estimate, it is used as the primary source for the computation of fire death rates and relative risk. The most current year available for the NCHS mortality data is 2017. Please note that, for consistency, national trend data are based on the NFPA survey estimates, not the NCHS mortality data.

The USFA gratefully acknowledges the use of the data and information provided by these groups. Data sources are cited for each graph and table.

National Fire Incident Reporting System

The NFIRS was established in 1975 as one of the first programs of the National Fire Prevention and Control Administration, which later became the USFA. The basic concept of the NFIRS has not changed since the system's inception. All states and all fire departments within them have been invited to participate on a voluntary basis. Participating fire departments collect a common core of information on an incident and any casualties that ensue by using a common set of definitions. In very few departments, the data may be written by hand on paper forms; however, the majority of the data are collected electronically through third-party software, the NFIRS Data Entry Tool (DET) or the Data Entry Browser Interface (DEBI), or the reporting department's own system. Local agencies forward the completed NFIRS modules to the state agency responsible for NFIRS data. The state agency combines the information with data from other fire departments into a statewide database and then transmits the data to the NFDC at the USFA. Data on individual incidents and casualties are preserved incident by incident at local, state and national levels. Once limited to fire incidents only, the NFIRS encompasses all incidents to which the fire department responds: fire, emergency medical services (EMS), hazardous materials or hazmat, and the like.

From an initial six states in 1976, the NFIRS has grown in both participation and use. Over the life of the system, all 50 states, the District of Columbia and more than 40 major metropolitan areas have reported to the NFIRS. More than 30,000 fire departments

[40]The NFPA summary estimates are used for the overall U.S. fire losses; for fire losses from vehicle, outside and other fires; and as the basis for estimates of residential and nonresidential building fires. The alternative approach for these summary estimates is to use the relative percentage of fires (or other loss measures) from the NFIRS and scale up (multiply by) to the NFPA estimate of total fires. The results would be somewhat different from those based on the NFPA subtotals. These differences are discussed in the section "Differences Between the National Fire Incident Reporting System Data and the National Fire Protection Association Survey Data." Better estimates of fire loss measures will not be available from the NFIRS until a more robust method of estimation is developed.
[41]The NCHS data provides additional details not available from the NFPA survey: state of fire death occurrence, age, gender and race.

have been assigned participating NFIRS fire department identification (FDID) numbers by their states. In 2017, nearly 1.2 million fire incident records and about 26.7 million nonfire incident records were added to the database. The NFIRS is the world's largest collection of incidents to which fire departments respond.[42]

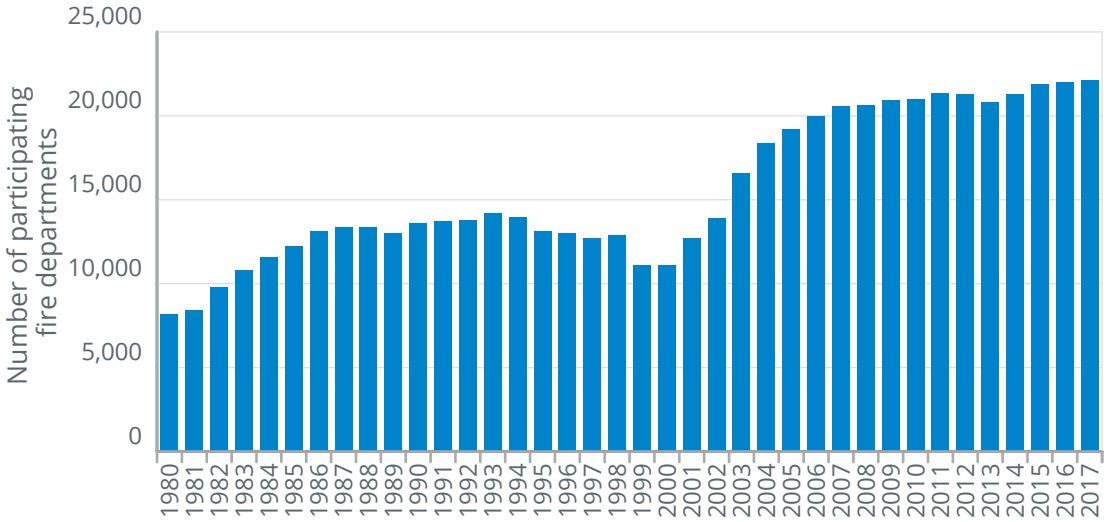
Figure 30 shows the growth in the number of fire departments participating in the NFIRS over the last 38 years from 1980 to 2017.[43] Between 1985 and 1999, the level of participation remained relatively constant: A few states came in or left the system each year, and at least 39 states reported to the NFIRS. Most years also included participation from the District of Columbia. The number of fire departments participating within the states remained relatively constant as well, with a slight dip in participation during the system migration from Version 4.1 to 5.0 in 1999. In 2000, the number of states increased to 43, and fire department participation began to bounce back from the Version 5.0 transition. State and fire department participation began steadily increasing. In 2003, the NFIRS reached a milestone with participation by all 50 states. The following year, the NFIRS achieved another significant goal: the NFIRS not only achieved the national goal of 100% state participation, including the District of Columbia, but also for the first time, the Native American tribal authorities submitted data.

The NFIRS continued to grow and mature. By 2007, a new level of participation had been achieved: all 50 states, the District of Columbia, Native American tribal authorities, Northern Mariana Islands and Puerto Rico all participated in the NFIRS for a total of 54 state, district, tribal authority and commonwealth entities (Table 5). Although the Northern Mariana Islands and Puerto Rico are no longer reporting incident data to the NFIRS, the USFA continues to work with the U.S. territories to encourage participation.

From 2009 to 2017, the level of participation remained relatively constant, and data were submitted by the District of Columbia, the Native American tribal authorities and all 50 states.[44] In 2017, the most recent year of data available, 21,246 fire departments reported fire incidents to the NFIRS. Across participating entities, 71% of the estimated fire departments in the U.S. reported fire incidents to the NFIRS in 2017.[45] With over two-thirds of all fire departments nationwide reporting fire incidents to the NFIRS 5.0, the reporting departments represent a very large dataset that enables the USFA to make reasonable estimates of various facets of the fire problem. Although some states do require their departments to participate in the state system, participation in the NFIRS is voluntary. However, if a fire department is a recipient of an Assistance to Firefighters Grant, participation is required.[46]

[42]USFA, "About the National Fire Incident Reporting System," https://www.usfa.fema.gov/data/nfirs/about/index.html.
[43]Figure 30 reflects fire departments that reported fire incidents (includes mutual aid and automatic aid given); all other types of incidents were excluded from this figure.
[44]For 2013, Wyoming data were not included on the NFIRS public data release file, as the data were submitted by the state past the cutoff date set by the USFA's NFDC; however, the data resides in the NFIRS production database and Enterprise Data Warehouse.
[45]For 2017, the NFPA estimated that there were 29,819 fire departments in the U.S. Source: NFPA. (2019). *U.S. fire department profile 2017.* https://www.nfpa.org/News-and-Research/Data-research-and-tools/Emergency-Responders/US-fire-department-profile.
[46] From the fiscal year (FY) 2017 Assistance to Firefighters Grant (AFG) Notice of Funding Opportunity (NOFO) — while NFIRS reporting is strongly encouraged, NFIRS reporting is not a requirement to apply for or be awarded a grant within the AFG Program. However, fire departments that receive funding under this program must agree to provide information to the NFIRS for the period covered by the assistance. If a recipient does not currently participate in the NFIRS and does not have the capacity to report at the time of the award, that recipient must agree to provide information to the system for a 12-month period commencing as soon as possible after it develops the capacity to report. Capacity to report to the NFIRS must be established prior to the termination of the one-year performance period. In order to be compliant and close out the grant, the grantee may be asked by the Federal Emergency Management Agency to provide proof of compliance in reporting to the NFIRS. Any grantee that stops reporting to the NFIRS during the grant's period of performance is subject to having the award(s) modified or withdrawn. See the FY 2017 AFG NOFO at https://www.fema.gov/media-library-data/1515081517499-e26f234398e048e897410250055c916e/NOFO1.3.18.pdf.

Figure 30. National Fire Incident Reporting System fire department participation (1980-2017, fire incidents only)



Source: NFIRS.

Notes: 1. 1999 to 2008 includes participation from NFIRS 4.1 and NFIRS 5.0; 2009 and later only includes participation from NFIRS 5.0.

2. Includes fire departments that reported mutual and automatic aid given at fire incidents.

Table 5. States reporting fire incidents to the National Fire Incident Reporting System (2008-2017)

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Alabama	X	X	X	X	X	X	X	X	X	X
Alaska	X	X	X	X	X	X	X	X	X	X
Arizona	X	X	X	X	X	X	X	X	X	X
Arkansas	X	X	X	X	X	X	X	X	X	X
California	X	X	X	X	X	X	X	X	X	X
Colorado	X	X	X	X	X	X	X	X	X	X
Connecticut	X	X	X	X	X	X	X	X	X	X
Delaware	X	X	X	X	X	X	X	X	X	X
District of Columbia		X	X	X	X	X	X	X	X	X
Florida	X	X	X	X	X	X	X	X	X	X
Georgia	X	X	X	X	X	X	X	X	X	X
Hawaii	X	X	X	X	X	X	X	X	X	X
Idaho	X	X	X	X	X	X	X	X	X	X
Illinois	X	X	X	X	X	X	X	X	X	X
Indiana	X	X	X	X	X	X	X	X	X	X
Iowa	X	X	X	X	X	X	X	X	X	X
Kansas	X	X	X	X	X	X	X	X	X	X
Kentucky	X	X	X	X	X	X	X	X	X	X
Louisiana	X	X	X	X	X	X	X	X	X	X

Table 5. States reporting fire incidents to the National Fire Incident Reporting System (2008-2017) — continued

State	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Maine	X	X	X	X	X	X	X	X	X	X
Maryland	X	X	X	X	X	X	X	X	X	X
Massachusetts	X	X	X	X	X	X	X	X	X	X
Michigan	X	X	X	X	X	X	X	X	X	X
Minnesota	X	X	X	X	X	X	X	X	X	X
Mississippi	X	X	X	X	X	X	X	X	X	X
Missouri	X	X	X	X	X	X	X	X	X	X
Montana	X	X	X	X	X	X	X	X	X	X
Nebraska	X	X	X	X	X	X	X	X	X	X
Nevada	X	X	X	X	X	X	X	X	X	X
New Hampshire	X	X	X	X	X	X	X	X	X	X
New Jersey	X	X	X	X	X	X	X	X	X	X
New Mexico	X	X	X	X	X	X	X	X	X	X
New York	X	X	X	X	X	X	X	X	X	X
North Carolina	X	X	X	X	X	X	X	X	X	X
North Dakota	X	X	X	X	X	X	X	X	X	X
Ohio	X	X	X	X	X	X	X	X	X	X
Oklahoma	X	X	X	X	X	X	X	X	X	X
Oregon	X	X	X	X	X	X	X	X	X	X
Pennsylvania	X	X	X	X	X	X	X	X	X	X
Rhode Island	X	X	X	X	X	X	X	X	X	X
South Carolina	X	X	X	X	X	X	X	X	X	X
South Dakota	X	X	X	X	X	X	X	X	X	X
Tennessee	X	X	X	X	X	X	X	X	X	X
Texas	X	X	X	X	X	X	X	X	X	X
Utah	X	X	X	X	X	X	X	X	X	X
Vermont	X	X	X	X	X	X	X	X	X	X
Virginia	X	X	X	X	X	X	X	X	X	X
Washington	X	X	X	X	X	X	X	X	X	X
West Virginia	X	X	X	X	X	X	X	X	X	X
Wisconsin	X	X	X	X	X	X	X	X	X	X
Wyoming	X	X	X	X	X	X	X	X	X	X
Native American	X	X	X	X	X	X	X	X	X	X
Puerto Rico	*	*								
Total	51	52	52	52	52	52	52	52	52	52

Source: NFIRS.

Notes: For 2008, includes fire incidents submitted in both NFIRS Versions 4.1 and 5.0. Beginning in 2009, includes only fire incidents submitted in NFIRS Version 5.0.

*Puerto Rico submitted fire incident data to the NFIRS in 2008 to 2009, but the data were excluded from all fire data analyses due to data quality issues.

Table 6. Fire departments reporting fire incidents to the National Fire Incident Reporting System in 2017

State	Number of fire departments in state	Number of reporting fire departments (NFIRS 5.0)	Percentage of reporting fire departments (NFIRS 5.0)
Alabama	1,100	313	28
Alaska	235	136	58
Arizona	197	125	63
Arkansas	976	677	69
California	1,038	499	48
Colorado	385	247	64
Connecticut	259	224	86
Delaware	61	59	97
District of Columbia	1	1	100
Florida	568	342	60
Georgia	608	515	85
Hawaii	6	4	67
Idaho	243	166	68
Illinois	1,127	966	86
Indiana	861	498	58
Iowa	848	490	58
Kansas	631	467	74
Kentucky	805	561	70
Louisiana	553	364	66
Maine	498	241	48
Maryland	362	259	72
Massachusetts	366	342	93
Michigan	1,074	839	78
Minnesota	778	716	92
Mississippi	757	626	83
Missouri	930	372	40
Montana	433	155	36
Nebraska	471	204	43
Nevada	78	40	51
New Hampshire	228	205	90
New Jersey	719	603	84
New Mexico	367	315	86
New York	1,786	994	56
North Carolina	1,243	1,006	81
North Dakota	375	180	48
Ohio	1,192	1,155	97

Table 6. Fire departments reporting fire incidents to the National Fire Incident Reporting System in 2017 — continued

State	Number of fire departments in state	Number of reporting fire departments (NFIRS 5.0)	Percentage of reporting fire departments (NFIRS 5.0)
Oklahoma	930	349	38
Oregon	314	170	54
Pennsylvania	2,300	1,535	67
Rhode Island	70	35	50
South Carolina	471	415	88
South Dakota	337	215	64
Tennessee	696	529	76
Texas	2,022	903	45
Utah	263	131	50
Vermont	233	145	62
Virginia	668	413	62
Washington	595	269	45
West Virginia	439	416	95
Wisconsin	821	748	91
Wyoming	133	62	47
Native American	48	5	10
Total	**32,499***	**21,246**	**65**

Sources: NFIRS (2017) and state fire marshal's offices or equivalent organizations (October 2016).
Note: For 2017, Oregon changed its state database and was unable to import all its incidents to the national database due to data conversion issues. Compared to 2016 data, only 74% of its fire departments reported to the NFIRS in 2017, and only 29% of its incidents were imported. In addition, there are 701 Department of Defense (DOD) fire departments in the U.S. These departments are not included in the totals here as the DOD does not release their incident data to the USFA at the national level.
* This total differs from the 2017 NFPA estimate of 29,819 fire departments. The NFPA estimate is the official estimate used by the USFA as its benchmark for the National Fire Department Registry.

Corresponding to increased participation, the numbers of fires, deaths and injuries, as well as estimates of dollar loss reported to the NFIRS have also grown. An estimated 69% of all U.S. fires to which fire departments responded in 2017 were captured in the NFIRS.[47]

There are, of course, many problems in assembling a real-world database, and the NFIRS is no exception. Although the NFIRS does not represent 100% of incidents reported to fire departments each year, the enormous dataset and strong efforts by the fire service result in a huge amount of useful information. Because of advances in computer technology and data collection techniques over the past 40 years, and improvements suggested by participants, the NFIRS has been revised periodically. The latest revision, NFIRS 5.0, became operational in January 1999.

NFIRS 5.0 captures information on all incidents, not just fires, to which a fire department responds. NFIRS 5.0 provides 11 modules that recognize the increasingly diverse activities of fire departments today. Together, these modules contain 567 data elements or fields.

[47]This percentage excludes mutual-aid fire incidents to avoid counting the same fire more than once.

The Basic Module is the main module, which is completed for every incident. The other modules are filled out, when appropriate, to provide additional information on an incident. All 11 modules are listed below:

Module	Description
Basic Module	General information for each incident
Fire Module	Fire incident information
Structure Fire Module	Information on structure fires
Civilian Fire Casualty Module	Fire-related injuries or deaths to civilians
Fire Service Casualty Module	Injuries or deaths to firefighters
EMS Module	Medical incidents
Hazardous Materials Module	Hazardous materials incidents
Wildland Fire Module	Wildland or vegetation fires
Apparatus/Resources Module	Apparatus-specific information
Personnel Module	Personnel associated with apparatus
Arson Module	Intentionally set fire information

Data from the modules are grouped together each calendar year to create the public data release (PDR) files in delimited text (.txt) format, which are then released annually into the public domain. For NFIRS data submitted prior to 2012, the PDR files were released in dBASE (.dbf) format. The Apparatus/Resources and Personnel Modules are excluded from the PDR because they are intended for local fire department use, and the PDR dataset's main utility is intended for national analyses. The PDR files consist of a subset of the data fields contained within the NFIRS national production database. For example, data elements with sensitive or identifying information are removed, as are data elements that are wholly used for maintenance or production purposes. The data structure of the PDR files has been considerably simplified from the production database's schema for ease of use. The PDR files from 2004 to 2013 only include fire and hazmat incidents and their related data tables (available on CD). Prior to 2004, all incidents were included in the PDR files. Beginning with the 2014 NFIRS data, both the fire and hazmat incident PDR file (CD) and the full, all-incident PDR file (DVD) are available upon request from the USFA's NFDC.

In its basic form, the NFIRS PDR files have a relational data structure where data from each incident module is represented by a row in a data table. The primary tables (basic incident and incident address) contain most of the Basic Module data. There is exactly one record in the basic incident table for every incident reported to the NFIRS. All other modules, represented by data tables with similar names (fire incident, civilian casualties, etc.), have records that are linked to the basic incident table through unique incident identification key fields (e.g., STATE, FDID, INC_DATE, INC_NO and EXP_NO). Some module data are split across several tables (e.g., basic incident, incident address, and basic aid tables); one table (fire incident) combines data from two modules (i.e., Fire Module and Structure Fire Module). Some tables, such as fire incident, will only have one record for each relevant incident in the basic incident table, while tables such as civilian casualty may have several records linked to a single incident in the case where multiple injuries and/or deaths occur in the same incident.

State participation is voluntary, and each state specifies NFIRS reporting requirements for its fire departments. States have the flexibility to adapt their state reporting systems to their specific needs. As a result, the design of a state's data collection system varies from state to state. NFIRS 5.0 was designed so that data from state systems can be converted to a single format that is used at the national level to aggregate and store NFIRS data.

All data in the system, regardless of the entry mechanism, are in NFIRS 5.0 format; non-NFIRS 5.0 data are converted to the 5.0 format. The proportion of native 5.0 data steadily increased since the introduction of NFIRS 5.0 in 1999 (Table 7). This proportion rose to 99% in the 2008 data. Since Jan. 1, 2009, NFIRS 4.1 data have no longer been accepted by the system. Prior to 2009, NFIRS 4.1 data in its converted form had been accepted by the system; however, the USFA only used native 5.0 data in its NFIRS-based analyses.

Table 7. National Fire Incident Reporting System fire incident data reporting by version (percent)

Year	Percent of NFIRS 4.1 (converted to 5.0 format)	Percent of Native NFIRS 5.0
1999	92	8
2000	77	23
2001	48	52
2002	31	69
2003	19	81
2004	11	89
2005	5	95
2006	5	95
2007	2	98
2008	1	99
2009	0	100

Source: NFIRS.

National Fire Incident Reporting System enhancements

Under the USFA Reauthorization Act of 2008, the U.S. Congress authorized and funded the USFA to develop enhancements to the NFIRS. The upgrades to the system began in October 2008 and included a simplified NFIRS web-based reporting interface and a data warehouse for generating output reports for use in analyses. These improvements make reporting and accessing the NFIRS data much easier for fire departments.

In July 2010, the USFA completed and deployed the new web-based version of the DET. The DEBI is a one-purpose tool for use by the fire service to document incident information within the NFIRS. While the functionality is the same as the NFIRS client DET that has been available for use for many years, the DEBI allows entry of incidents using a standard web browser, eliminating the need to download, install and configure client software.

In 2016, a modernization effort began to upgrade the architecture to support the Department of Homeland Security (DHS)/Federal Emergency Management Agency security requirements and to move all functions of the USFA software's System Admin Tool, which

is used to administer users and groups in the NFIRS system, available in a web-based or browser interface. This must be completed before "sunsetting" of the USFA software can occur. The upgrades include a single-sign on portal to simplify access to the NFIRS online tools and adhere to DHS and industry standards, as well as expand browser choices for the users. Included in the modernization is the much-needed account and password self-reset mechanism. In 2017, service to a "mass-email" communication tool was restored, enabling NFDC NFIRS staff to send important alerts to NFIRS users and vendors.

The development of a flexible NFIRS Data Warehouse (DW) with comprehensive data-mining capabilities was completed in July 2011 and is currently being deployed to NFIRS state and fire department users on request. The DW allows NFIRS users to access and report on nationally collected data with significantly increased functionality over the current report generation tool. The data have been transformed into a custom schema that greatly increases the speed of report generation and data access. NFIRS users are able to generate reports using data from other departments and states, which was not previously possible. USFA NFIRS staff have been able to take users' recommendations and requests for particular queries and develop new reports according to usefulness.

National Fire Incident Reporting System training and resources

The USFA offers several free classroom (on- and off-site) and online NFIRS training courses for fire departments, including the "Introduction to NFIRS 5.0" (W0497) course, the "National Fire Incident Reporting System 5.0 Self-Study" (Q0494) course, the "National Fire Incident Reporting System: Program Management" (NFIRS: PM) (R0491) course, and the "NFIRS Data Warehouse Training" (R0483). The Introduction to the NFIRS 5.0 and the NFIRS 5.0 Self-Study (online) courses provide an introduction to the NFIRS reporting standard, where incident coding, modules, and reporting rules are discussed. A course revision is underway for Q0494, the online NFIRS 5.0 Self-Study course. The NFIRS: PM course enables participants to successfully promote, support and manage NFIRS data collection, use and reporting. In 2017 and 2018, initial training materials were created for the NFIRS DW pilot release, and an invitational NFIRS Data Warehouse Training course for state program managers was offered in 2019, with much success. For more information on NFIRS training courses, visit https://www.usfa.fema.gov/data/nfirs/support/training.html.

In addition to the NFIRS training courses, USFA also offers the "Analytical Tools for Decision-Making" (R0387) course. This on-site course enables the student to leverage technology to support community risk reduction as well as fire and EMS emergency preparedness planning. A substantial portion of the course involves geospatial technologies and their applications.

Periodically, the USFA issues NFIRSGrams, which are short bulletins that provide coding help to fire department personnel who use the NFIRS. NFIRSGrams address frequently asked questions (FAQ) and common mistakes made when completing incident forms. Examples include "Computer-Assisted/Aided Dispatch (CAD) systems and autopopulated fields," "Determining property use at the incident location," "Data quality," "Calculating fire loss," "Documenting confined structure fires," and "The difference between reported fire incident data and estimated fire incident data." In addition to NFIRSGrams, the "NFIRS 5.0 Coding Questions Manual" includes common NFIRS coding inquiries and instructions on how to code NFIRS 5.0 incident reports in a question-and-answer format. NFIRSGrams and the "NFIRS 5.0 Coding Questions Manual" are available at https://www.usfa.fema.gov/data/nfirs/support/training.html.

The USFA also offers on-site technical support to the NFIRS state program managers. The purpose of the support is to help address problems states have in the management of the NFIRS and in their support to their fire departments.

Furthermore, the USFA's NFIRS Support Center offers a consolidated national help desk to provide technical support to users, fire departments, tribal nations fire departments and NFIRS state program managers regarding all aspects of the NFIRS. Support Center staff may be reached by email at FEMA-NFIRSHELP@fema.dhs.gov or by calling toll free at 888-382-3827. Questions about or requests for NFIRS technical assistance can also be submitted online at https://apps.usfa.fema.gov/contact/ntsc/.

Uses of the National Fire Incident Reporting System

NFIRS data are used extensively at all levels of government for major fire protection decisions. At the local level, incident and casualty information is used for setting priorities and targeting resources. The data collected is particularly useful for designing fire prevention programs, educational programs and EMS-related activities specifically suited to the real emergency problems that local communities face.

At the state level, the NFIRS is used in many capacities. One valuable contribution is that some state legislatures use this data to justify budgets and to pass important bills on fire-related issues, such as sprinklers, fireworks and arson. Many federal agencies, in addition to the USFA, make use of NFIRS data. The NFIRS data are used, for example, by the Consumer Product Safety Commission (CPSC) to identify problem products and to monitor corrective actions. The Department of Transportation uses NFIRS data to identify fire problems in automobiles, which has resulted in mandated recalls. The Department of Housing and Urban Development uses NFIRS data to evaluate the safety of manufactured housing (mobile homes). The USFA uses the data to design prevention programs, to prioritize firefighter safety initiatives, to assist in the development of training courses at the National Fire Academy, and to serve a host of other purposes.

In addition to government agencies, the NFIRS data are also used for research and prevention programs by a variety of other entities, including nonprofit fire-related organizations, colleges and universities, courts and law firms, and the media. For example, since October 2014, the American Red Cross (ARC) has been linking NFIRS residential fire data to information gathered from their disaster response teams to identify neighborhoods that have a high fire risk, and then installing smoke alarms in homes within these communities as part of the nationwide Home Fire Campaign. By September 2019, the ARC and its partners have saved over 600 lives and installed nearly 1.9 million smoke alarms as part of this campaign to reduce the number of home fire deaths and injuries.[48]

Thousands of fire departments, scores of states and hundreds of industries have used the data. The potential for even greater use remains. The USFA report, "Uses of NFIRS: The Many Uses of the National Fire Incident Reporting System," further describes the uses of the data and is available online at https://usfa.kohalibrary.com/app/work/159371.

[48]The American Red Cross Home Fire Campaign is available at: https://www.redcross.org/get-help/how-to-prepare-for-emergencies/types-of-emergencies/fire/prevent-home-fire.html, accessed September 9, 2019.

U.S. fire departments

The number of fire departments in each state (Table 6) was provided by each state's NFIRS program manager. The USFA also maintains a database of fire departments. The USFA established the National Fire Department Census and its subsequent database in the fall of 2001 when the USFA launched a nationwide campaign for voluntary registration of fire departments.

From 2001 to 2016, the number of registered fire departments grew from about 16,000 to over 27,000. Because the census was cumulative over time, it did not reflect a typical census in the way that the data were collected.[49] As a result, in the fall of 2016, the USFA renamed the census to the National Fire Department Registry. As of January 2019, there were 27,224 registered fire departments, about 91% of the estimated number of U.S. fire departments.[50] The NFPA estimated that there were 29,819 fire departments in the U.S. in 2017.

The database provides a current directory of registered fire departments and includes basic information, such as addresses, department types, website addresses (if applicable), number of fire department personnel and number of stations. Population-protected and area-protected data are also collected. However, in previous analyses of the population-protected field, it was determined that the registered fire departments reported protecting a population two times that of the U.S. population estimated by the U.S. Census Bureau. Similar results were seen for the area protected. The National Fire Department Registry also collects information on specialized services that is released only in summary format.

The database is intended for use by the fire protection and prevention communities, allied professions, the general public, and the USFA. The USFA uses the database to conduct special studies, guide program decision-making, and improve direct communication with individual fire departments. For more information about the National Fire Department Registry, or to download the list of registered fire departments, visit https://apps.usfa.fema.gov/registry/.

Methodology

An attempt has been made to keep the data presentation and analysis as straightforward as possible. It is also the desire of the USFA to make the data analyses widely accessible to many different users, so it avoids unnecessarily complex methodology. The term "fire casualties" refers to deaths and injuries; the term "fire losses" collectively includes fire casualties and dollar loss.

Analytic issues and considerations

There are several long-standing issues regarding how to analyze NFIRS data when they are neither as complete nor as accurate as desired. The sections that follow discuss how the analyses address these and other issues.

Moreover, the USFA developed the "National Fire Incident Reporting System Version 5.0 Fire Data Analysis Guidelines and Issues" document to address some of these issues and

[49] A *census* is an official count or a complete enumeration of a population.
[50] USFA. (2019). *National fire department registry summary.* Retrieved from https://www.usfa.fema.gov/downloads/pdf/registry_summary_2019.pdf.

discuss analytic considerations and methods of analyzing NFIRS fire incident data.[51] Topics include the NFIRS 5.0 data structure, general quality assurance issues, and definitions and parameters of common fire analyses (e.g., residential building fires or casualties), including the methodology for determining structure fire causes. The methods, techniques and considerations discussed are those used by USFA analysts, and they do not necessarily reflect methods, techniques and considerations used by fire data analysts from other agencies and organizations. NFIRS data partners may (and do) employ their own methods for analyzing the data and may make differing assumptions when encountering data issues.

Representativeness of the sample

The percentage of fire departments participating in the NFIRS varies from state to state, with some states not participating at all in some years. To the best that the USFA can determine, the distribution of participants is reasonably representative of the entire nation, even though the sample is not random. The dataset is so large — on average about 68% of all fires — and reasonably distributed geographically and by size of community that it is used as input to developing national estimates.

In a joint study effort, the USFA and the NFPA examined the biases in NFIRS participation, specifically whether the fire experience of NFIRS-reporting departments differed systematically from the fire experience of other nonreporting departments within the same population. Results based on data from 1997 and 2002 indicated that there were differences in total fire loss estimates derived from the NFIRS reporting departments and non-NFIRS reporting departments; however, the degree of difference was not great enough to merit adjusting current scaling methodologies. Thus, the USFA and fire data analysts from other organizations continue to use the long-standing methodology of scaling NFIRS estimates with NFPA total fire estimates.

In the fall of 2008, as required by the U.S. Office of Management and Budget (OMB), the USFA undertook a study of the NFIRS dataset to examine the potential bias in the NFIRS due to fire department non-response. As a result, the USFA completed an analysis to identify fire departments that do not participate in the NFIRS, characteristics of these departments, and whether their non-response impacted the representativeness of the NFIRS. Undertaken on a regional and county basis, the analysis provided insight into what, if any, adjustments could be made to minimize the impact of possible reporting bias on the fire loss estimates. States of particular concern for nonreporting were located in the Northeastern and Western regions of the country, where the average rates of reporting were approximately 72% for each of these regions. By contrast, the Midwestern region had an estimated 87% reporting rate.

In 2011, the USFA also completed a second NFIRS representativeness study as required by the OMB. For this study, the USFA compared the NFIRS database to NFPA proprietary data to determine the percentage of departments responding to the NFPA survey that also reported fires to the NFIRS. It was determined that 87% of the 2009 NFPA survey respondents also reported fire incidents to the NFIRS from 2007 to 2009. In 2009 alone, more than 18,000 additional departments (i.e., in addition to those responding to the NFPA survey) reported fires to the NFIRS.

[51]The "National Fire Incident Reporting System Version 5.0 Fire Data Analysis Guidelines and Issues," July 2011, is available at https://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs_data_analysis_guidelines_issues.pdf.

It is important to note that the USFA, along with other federal agencies, does not use NFIRS data to derive state-level fire estimates. The NFIRS data are used to show the fire problem at the national level. Because the findings in the USFA's NFIRS representativeness studies show high reporting rates, fire departments across the country appear to be well-represented in the NFIRS.

Moreover, most of the NFIRS data exhibit 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, another indication of data reliability. Although improvements could be made — the individual incident reports could and should be filled out more completely and more accurately than they are today (as can be said about most real-world data collections as large as the NFIRS), and all participating departments should have the same reporting requirements — the overall portrayal is a reasonably accurate description of the fire situation in the U.S.

National estimates

National estimates are estimates of the number of fire losses (i.e., fires, deaths, injuries and dollar loss) associated with a subset of the fire data.[52] High-level summarized national estimates of the numbers for fires, deaths, injuries and dollar loss are based on the NFPA's annual Survey of Fire Departments for U.S. Fire Experience.[53] With the exception of the NFPA estimates for total fires, structure fires (i.e., residential and nonresidential), vehicle, outside and other fires, all other estimates are scaled-up national estimates or percentages, not just the raw totals from the NFIRS. Because the NFIRS 5.0 data are not based on a statistically selected sample and do not represent a "complete" census of fire incidents, the raw counts of NFIRS data must be scaled up to national estimates.[54] These estimates are based on a method of apportioning the NFPA estimates for total fires, structure fires, vehicle, outside and other fires.[55] Generally speaking, the national estimates are derived by computing a percentage of fires, deaths, injuries or dollar loss in a particular NFIRS category and multiplying it by the corresponding total estimate from the NFPA annual survey.[56] For example, the national estimate for the number of injuries by age group used in the calculation for the fire injury rate per million population was computed by taking the percentage of NFIRS fire injuries (with known age) and multiplying it by the estimated total number of fire injuries from the NFPA survey. This methodology is the accepted practice of national fire data analysts.

Ideally, one would like to have all of the data come from one consistent data source. Because the "residential population protected" is not reported to the NFIRS by many fire departments, and the reliability of that data element is suspect in many other cases, especially where a county or other jurisdiction is served by several fire departments that

[52]An *estimate* is an approximation of a count or total.
[53]For information on the NFPA's survey methodology, please see the NFPA's report on fire loss in the U.S.: http://www.nfpa.org/news-and-research/fire-statistics-and-reports/fire-statistics/fires-in-the-us/overall-fire-problem/fire-loss-in-the-united-states.
[54]For an explanation of the difference between raw fire incident data and estimated fire incident data, see the USFA NFIRSGram "The Difference Between Reported Fire Incident Data and Estimated Fire Incident Data," https://www.usfa.fema.gov/data/nfirs/support/nfirsgrams/nfirsgram_reported_versus_estimates.html.
[55]National estimates are based on "The National Estimates Approach to U.S. Fire Statistics" by Hall and Harwood: https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/NFPA-estimates-and-methodology/NationalEstimatesApproach.pdf.
[56]The NFPA summary estimates are used for the overall U.S. fire losses; for fire losses from structure, vehicle, outside and other fires; and as the basis for the USFA's estimates of residential and nonresidential building fires. The alternative approach for these summary numbers is to use the relative percentage of fires (or other loss measures) from the NFIRS and scale up (multiply by) to the NFPA estimate of total fires.

each report their population protected independently, this data element was not used. Instead, extrapolations of the NFIRS sample to national estimates were made using the NFPA survey for the gross totals of fires, deaths, injuries and dollar loss.

One problem with this approach is that the proportions of fires and fire losses differ between the large NFIRS sample and the NFPA survey sample. Nonetheless, to be consistent with approaches being used by other fire data analysts, the NFPA estimates of fires, deaths, injuries and dollar loss are used as a starting point. The details of the fire problem below this level are based on proportions from the NFIRS. Because the proportions of fires and fire losses differ between the NFIRS and the NFPA estimates, from time to time, this approach leads to minor inconsistencies. These inconsistencies will remain until all estimates can be derived from NFIRS data alone.

Future national estimates methodology

As a result of the differences between the NFIRS and the NFPA data, the USFA has performed extensive work to develop a new method for calculating national estimates relying entirely upon the NFIRS and other publicly available data, such as population and socio-economic data from the U.S. Census Bureau's American Community Survey. Imputation (i.e., data substitution) methods were used to adjust for missing or unreported data. Various approaches were considered, most notably population scaling and multivariate regression methods.

The findings of this study were published in June 2018 on the USFA website as an academically peer-reviewed white paper (https://www.usfa.fema.gov/downloads/pdf/statistics/national_fire_estimation_using_nfirs_data.pdf). Further research on the new methodology is currently underway.

Data quality

Data quality is an area of great importance. The following three criteria are used in monitoring data in the NFIRS during the year: the data are complete, the data are accurate, and the data are current. These criteria are monitored by creating reports from the database that show the number of reporting fire departments, the number of incidents by state, the number of invalid incidents, and the number of unreleased incidents. The USFA provides the reports to the state NFIRS program managers and works with them to resolve any data issues. Technical assistance (e.g., telephone support or site visits) is provided to states to help address any data quality and data reporting needs.

Audits of the data are performed during the year to identify any inconsistencies. The audits focus on three criteria: gaps in reporting, critical errors in the data, and outliers in the data. In particular, the USFA works closely with states to monitor the quality of data coming from third-party vendor software. Each state is responsible to enforce that the NFIRS third-party software sold by vendors in their state is compliant with NFIRS standards. The USFA assists states in monitoring vendor data quality issues or contacts vendors directly to discuss an issue at a state's request. Other data quality issues are questionable, high dollar-loss incidents and questionable, high numbers of fire deaths. Quarterly, USFA staff queries the database for questionable values (i.e., outliers) and verifies the values with state- and local-level NFIRS program managers. The data quality steps are important to ensure that the data meet the USFA's three criteria before the data are released in the NFIRS PDR format.

The USFA published the report "Review and Assessment of Data Quality in the National Fire Incident Reporting System" (May 2017). This document covered a review of the system, the many robust data quality checks and mechanisms which are an integral part of the NFIRS, and an assessment of the data quality both at the state level and at the data element level. The data element assessment focused on the most common data elements used in NFIRS data analyses. The three most recent years of NFIRS data available at the time of the report's development (2009 to 2011) were reviewed. Additionally, a section drawn from published NFPA documents covering the NFPA survey methodology was also included. The "Review and Assessment of Data Quality in the National Fire Incident Reporting System" document is available at https://www.usfa.fema.gov/downloads/pdf/publications/nfirs_data_quality_report.pdf.

Unknown entries, incomplete loss reporting, and unreported fires are also important considerations when assessing NFIRS data quality. These topics are discussed in more detail in the sections that follow.

Unknown entries

Unknown entries are of the highest concern for data quality. On a fraction of the incident reports or casualty reports sent to the NFIRS, the desired information for many data items either is not reported or is reported as "unknown." The total number of blank or unknown entries is often larger than some of the important subcategories. For example, 48% of fatal fires in residential buildings reported from 2015 to 2017 did not have sufficient data recorded in the NFIRS to determine fire cause. The lack of data, especially for these residential fatal fires, masks the true picture of the fire problem.

Many prevention and public education programs use NFIRS data to target at-risk groups or to address critical problems. Fire officials use the data in decision-making that affects the allocation of firefighting resources, and consumer groups and litigators use the data to assess product fire incidence. When the numbers of unknown entries are large, the credibility of the data suffers. In some cases, even after the best attempts by fire investigators, the information is truly unknown. In other cases, the information reported as unknown in the initial NFIRS report is not updated after the fire investigation is completed. Fire departments need to be more aware of the effect of incomplete data reporting, and they need to update the initial NFIRS report if additional information is available after the investigation. Through various USFA and NFDC training initiatives and efforts by various fire organizations, fire departments are encouraged to reduce the number of unknown entries by fully documenting the fire incident.

In making national estimates, the unknowns should not be ignored. The approach taken by the USFA in presenting the data is to provide not only the "raw" percentages of each category but also the "adjusted" percentages computed using only those incidents for which data were provided. This calculation, in effect, distributes the fires for which the data are unknown in the same proportion as the fires for which the data are known, which may or may not be approximately right. Both the reported data and the adjusted data (if unknowns are present) are plotted on bar charts.

To illustrate, using the cause of residential building fires, cooking was determined as the fire cause for 42.1% of reported residential building fires from 2015 to 2017; another 17.4% of reported fires had unknown causes. Thus, the percent of fires that had their cause reported was 100 minus 17.4, which equals 82.6%. With the unknown causes apportioned like the known causes, the adjusted percent of cooking fires in residential buildings can then be computed as 42.1 divided by 82.6, which equals 51.0%.

Incomplete loss reporting

Although it is troublesome that insufficient data for the various NFIRS data elements can mask the true picture of the fire problem and impact the credibility of the data, the apparent nonreporting of injuries and property loss associated with many fire incidents is equally challenging. For example, there are many reported fires where the flame spread indicates damage, but property loss is not reported. It is notoriously difficult to estimate dollar loss, but an approximation is more useful than leaving the data element blank. Analysts need to be aware that this apparent lack of property-loss data affects the understanding of those fires that cause substantial loss.

Unreported fires

The NFIRS only includes fires to which the fire service responded. In some states, fires attended by state fire agencies (such as forestry) are included; in other states, they are not.

Nonreporting to the National Fire Incident Reporting System

The NFIRS includes fires from all states, but does not include incidents from all fire departments within participating states. The percentage of fire departments reporting varies greatly from state to state. However, if the fires from the reporting departments are reasonably representative, this omission does not cause a problem in making useful national estimates for any but the smallest subcategories of data and some geographic analyses.

Some fire departments submit information on most, but not all, of their fires. Sometimes the confusion is systematic, such as when no-loss cooking fires or chimney fires are not reported. Sometimes it is inadvertent, such as when incident reports are lost or accidentally not submitted. The information that is received is assumed to be the total for the department and is extrapolated as such.

Nonreporting to the fire service

A very large number of fires are not reported to the fire service at all. Most are believed to be small fires in the home or industry that go out by themselves or are extinguished by the occupant. Special surveys of homes and businesses are needed to estimate the unreported fires. No attempt is made here to estimate them. Studies undertaken in the mid-1970s, mid-1980s and again in the mid-2000s on unreported residential fires indicated that a substantial number of fires are not reported to local fire departments. The 2004 to 2005 CPSC study on unreported residential fires noted that of the estimated number of fires in residences, only 3% were reported to fire departments and 97% were not.[57] Although the vast majority of fire incidents are unreported because they are small, confined and immediately extinguished, they are still fires. Even the largest fire starts small. Hence, all fires, regardless of size, merit prevention attention and analytic investigation.

Structures versus buildings

NFIRS 5.0 allows for the differentiation between buildings and nonbuildings. In the NFIRS, a structure is a built object that can include platforms, tents, connective structures (e.g., bridges, fences, telephone poles) and other various structures in addition to buildings. From 2008 to 2017, analyses of NFIRS structure fires show that, in general, the majority (95%) of structure fires occurred in buildings.

[57]Greene, M. A., & Andres C. (2009). *2004-2005 national sample survey of unreported residential fires.* U.S. Consumer Product Safety Commission.

Structure fires are defined by the NFIRS incident type — Incident Type 110 series (structure fires) and Incident Type 120 series (fires in mobile property used as a fixed structure).[58] These incident types are:

- 111 Building fire.
- 112 Fires in structure other than in a building.[59]
- 113 Cooking fire, confined to container.
- 114 Chimney or flue fire, confined to chimney or flue.
- 115 Incinerator overload or malfunction, fire confined.
- 116 Fuel burner/boiler malfunction, fire confined.
- 117 Commercial compactor fire, confined to rubbish.
- 118 Trash or rubbish fire, contained.
- 120 Fire in mobile property used as a fixed structure, other.
- 121 Fire in mobile home used as fixed residence.
- 122 Fire in motor home, camper, recreational vehicle.
- 123 Fire in portable building, fixed location.

As building fires are a subset of structure fires, they are defined as structure fires where the structure type is an enclosed building, or a fixed portable or mobile structure. By definition, this excludes nonbuilding structures. Previous USFA analyses demonstrated that confined structure fire incidents with full incident reporting primarily occurred in buildings. To accommodate the confined fire incident types with abbreviated incident reporting, the incident is also assumed to be a building if the structure type is not specified. In terms of the NFIRS data, building fires are therefore defined using the following criteria:

- NFIRS Version 5.0 data.
- Aid Types:
  - 1 Mutual aid received.
  - 2 Automatic aid received.
  - 5 Other aid given.

  Note: Mutual aid given and automatic aid given (Aid Types 3 and 4) were excluded to avoid counting a single incident more than once.
- Incident Types 111 to 123 (excluding Incident Type 112):
  - 111 Building fire.
  - 113 Cooking fire, confined to container.
  - 114 Chimney or flue fire, confined to chimney or flue.
  - 115 Incinerator overload or malfunction, fire confined.
  - 116 Fuel burner/boiler malfunction, fire confined.
  - 117 Commercial compactor fire, confined to rubbish.
  - 118 Trash or rubbish fire, contained.
  - 120 Fire in mobile property used as a fixed structure, other.
  - 121 Fire in mobile home used as fixed residence.
  - 122 Fire in motor home, camper, recreational vehicle.
  - 123 Fire in portable building, fixed location.

  Notes: 1. Incident Types 113 to 118 do not specify if the structure is a building.
  2. Incident Type 112 was included in data analyses prior to 2008, as previous analyses showed that Incident Types 111 and 112 were used interchangeably. As of 2008, Incident Type 112 was excluded.

[58]Note that Incident Type 110 is not included. Incident Type 110 is a conversion code for NFIRS 4.1. Incident Type 110 is not a valid code for data collected in NFIRS 5.0. Incidents in the NFIRS 5.0 database with Incident Type 110 are incidents collected under the NFIRS 4.1 system that are converted to NFIRS 5.0 compatible data.
[59]Preliminary findings noted that the fires coded as Incident Type 112 appear to be in buildings. A more detailed look at these incident types is required to determine whether they were coded correctly.

- Structure Type:
  - For Incident Types 113 to 118:
    - 1—Enclosed building, or
    - 2—Fixed portable or mobile structure, or
    - Structure Type not specified (null entry).
  - For Incident Types 111 and 120 to 123:
    - 1—Enclosed building, or
    - 2—Fixed portable or mobile structure.

The distinction between buildings and nonbuildings is particularly important when determining the effectiveness of engineered fire safety features, such as smoke alarms and residential sprinklers. These important components of early fire detection and automatic suppression apply to buildings and not necessarily to other types of structures. To facilitate analysis of these components and to acknowledge that prevention efforts are generally focused on buildings, the USFA separates the subset of buildings from the rest of the structures. For these reasons, the USFA focuses on producing building fire and loss estimates.

The USFA's "Fire Estimate Summary" series, as well as 2003 to 2017 national estimates of residential and nonresidential building fires and losses, are published at https://www.usfa.fema.gov/data/statistics/order_download_data.html. Information regarding the USFA's methodology for computing national estimates of residential and nonresidential building fires and losses is published in the USFA's "National Estimates Methodology for Building Fires and Losses" (August 2012) available at https://www.usfa.fema.gov/downloads/pdf/statistics/national_estimate_methodology.pdf.

Computing trends

One FAQ is how much a particular aspect of the fire problem has changed over time. The usual response is in terms of a percent change from one year to another. In dealing with real-world data that fluctuates from year to year, a percent change from one specific year to another can be misleading. This is especially true when the beginning and ending data points are extremes, either high or low. For example, Table 8 shows that the percent change from 4,200 fire injuries in multifamily residential buildings in 2008 to 3,800 fire injuries in 2017 would be a substantial decrease of 9.5%; however, if 2009 is chosen as the beginning data point (4,050 fire injuries), this change would show a 6.2% decrease. As trends in the U.S. fire problem are of interest, the USFA presents the computed best-fit linear trend line (which smoothes fluctuations in the year-to-year data) and presents the change over time based on this trend line. In this example, the overall 10-year trend is a decrease in injuries of 12.7%. Trends that incorporate the NFIRS data from both Version 4.1 and Version 5.0 may have subtle changes as a result of the Version 5.0 system design and not a true trend change.

Table 8. Comparison of percent change indicators

Year	Multifamily residential building fire injuries	Best-fit linear trend	Change between 2008 and 2017	Change between 2009 and 2017
2008	4,200	4,335	4,200	
2009	4,050	4,274		4,050
2010	4,250	4,213		
2011	4,450	4,152		
2012	4,325	4,091		
2013	3,975	4,029		
2014	4,100	3,968		
2015	3,825	3,907		
2016	3,625	3,846		
2017	3,800	3,785	3,800	3,800
Percent change		-12.7	-9.5	-6.2

Source: USFA national estimates of multifamily residential building fire injuries.

Rounding

Percentages on each chart are rounded to one decimal point. Textual discussions cite these percentages as whole numbers. Thus, 13.4% is rounded to 13%, and 13.5% is rounded to 14%. National estimates are rounded as follows: Fires are rounded to the nearest 100 fires, deaths to the nearest five deaths, injuries to the nearest 25 injuries, and loss to the nearest million dollars.

Comparing statistics

Differences between the current NFIRS and older versions have, or may have, an effect on the analyses of fire topics. These differences, the result of both coding changes and data element design changes, required revisions to long-standing groupings and analyses. The revisions have caused some challenges when comparing current data to past data.

Data collection and reporting in NFIRS 5.0

The following are among the areas that are unique to NFIRS 5.0: abbreviated or streamlined reporting for qualified incidents, the collection of smoke alarm and automatic extinguishing system data (formerly called sprinklers), the differentiation between buildings and structures, and the cause methodology.[60] These areas have resulted in changes in overall trends, some subtle and some substantial.

[60]The NFIRS 5.0 documentation at https://www.usfa.fema.gov/data/nfirs/support/documentation.html provides detailed information.

Confined fires

"Confined fires" are fires contained to certain types of equipment or objects within a structure. In the NFIRS, a confined structure fire is defined by Incident Type Codes 113 to 118.[61] Confined structure fires are typically small fire incidents that are limited in extent to specific types of equipment or objects staying within pots, fireplaces or certain other noncombustible containers. Confined structure fires rarely result in serious injury or large content loss and are expected to have no significant accompanying property loss due to flame damage.[62]

The NFIRS allows abbreviated reporting for confined structure fires. For these incident types, the Basic Module is required to be completed. NFIRS users may also optionally complete the Fire Module and the Structure Fire Module for confined fires, although it is not required. If any civilian or firefighter injuries occurred as a result of the confined fire, the Civilian Fire Casualty Module and/or the Fire Service Casualty Module are required to be completed for each injury reported on the Basic Module.

The limited reporting of confined, low-loss structure fires allows the fire service to capture incidents that either may have gone unreported prior to the introduction of NFIRS 5.0 or were reported, but as a nonfire incident, as little to no loss was involved.[63] Data from this reporting option for structure fires was investigated in a 2006 USFA report, "Confined Structure Fires." The addition of these fires results in increased proportions of cooking and heating fires in analyses of structure fire cause. In other analyses, the inclusion of confined fires may result in larger percentages of unknown values, as detailed reporting of fire specifics is not required. In many of the USFA's analyses, the confined fires are analyzed separately from the nonconfined fires to account for the fact that detailed reporting is not required for the confined fires. In 2017, confined structure fires accounted for 19% of all reported fires and 49% of all reported structure fires. Of the confined structure fires, 78% were no- or low-loss cooking fires (68%) and heating fires (10%).

Structure fire cause methodology

Since the introduction of NFIRS 5.0, the implementation of the cause hierarchy has resulted in a steady increase in the percentages of unknown fire causes. This increase may be due, in part, to the fact that the original cause hierarchy (described in "Fire in the United States 1995-2004," 14th edition) does not apply as well to NFIRS 5.0. Causal information collected as part of NFIRS 5.0 was not incorporated in the old hierarchy. As a result, many incidents were assigned to the unknown cause category. As the hierarchy was originally designed for structures, incidents that did not fit well into the structure cause categories were also assigned to the unknown category.

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[61]The confined structure fire incident type code descriptions are as follows: 113-Cooking fire, confined to container; 114-Chimney or flue fire, confined to chimney or flue; 115-Incinerator overload or malfunction, fire confined; 116-Fuel burner/boiler malfunction, fire confined; 117-Commercial compactor fire, confined to rubbish; and 118-Trash or rubbish fire, contained.

[62]Content loss includes losses to the contents of a structure due to damage by fire, smoke, water and overhaul. Property loss includes losses to the structure itself or to the property itself. For confined fires, the expectation is that the fire did not spread beyond the container (or rubbish for Incident Type code 118), and therefore, there was no property damage (damage to the structure itself) from the flames. However, there could be property damage as a result of smoke, water and overhaul.

[63]Some states routinely reported such nonloss fires as smoke scares. The result, from a reporting viewpoint, is that the incident is reported but not coded as a fire incident.

Structure fires

To capture the wealth of data available in NFIRS 5.0, the USFA developed a modified version of the previous cause hierarchy for structure fires as shown in Table 9. The revised schema provides three levels of cause descriptions: a set of more detailed causes (priority cause description), a set of midlevel causes (cause description), and a set of high-level causes (general cause description). The priority cause description and the cause description existed previously as part of the original cause hierarchy but have been expanded to capture the 5.0 data.

Table 9. Three-level structure fire cause hierarchy

Priority cause description (in hierarchical order)	Cause description	General cause description
Exposure	Exposure	Exposure
Intentional	Intentional	Firesetting
Cause under investigation	Cause under investigation	Unknown
Children playing	Playing with heat source	Firesetting
Other playing		
Natural	Natural	Natural
Fireworks	Other heat	Flame, heat
Explosives		
Smoking	Smoking	
Heating	Heating	Equipment
Cooking	Cooking	
Air conditioning	Appliances	
Electrical distribution	Electrical malfunction	Electrical
Appliances	Appliances	Equipment
Special equipment	Other equipment	
Processing equipment		
Torches	Open flame	Flame, heat
Service equipment	Other equipment	Equipment
Vehicle, engine		
Unclassified fuel-powered equipment		
Unclassified equipment with other or unknown fuel source	Unknown	Unknown
Unclassified electrical malfunction	Electrical malfunction	Electrical

Table 9. Three-level structure fire cause hierarchy — continued

Priority cause description (in hierarchical order)	Cause description	General cause description
Matches, candles	Open flame	Flame, heat
Open fire		
Other open flame, spark	Other heat	
Friction, hot material		
Ember, rekindle	Open flame	
Other hot object	Other heat	
Natural condition, other	Natural	Natural
Heat source or product misuse	Other unintentional, careless	Unknown
Equipment operation deficiency	Equipment misoperation, failure	Equipment
Equipment failure, malfunction		
Trash, rubbish	Unknown	Unknown
Other unintentional	Other unintentional, careless	
Exposure (fire spread, other)	Exposure	Exposure
Unknown	Unknown	Unknown

Source: USFA.

Note: Fires are assigned to a cause category in the hierarchical order shown. For example, if the fire is judged to be intentionally set and a match was used to ignite it, it is classified as intentional and not open flame because intentional is higher on the list.

The causes of fires are often a complex chain of events. To make it easier to grasp the "big picture," the 16 midlevel categories of fire causes, such as heating, cooking, and playing with heat source, are used by the USFA. The alternative is to present scores of detailed cause categories or scenarios, each of which would have a relatively small percentage of fires. For example, heating includes subcategories such as misuse of portable space heaters, wood stove chimney fires, and fires involving gas central heating systems. Experience has shown that the larger categories are useful for an initial presentation of the fire problem. A more detailed analysis can follow.

Fires are assigned to one of the 16 midlevel cause groupings using a hierarchy of definitions, as shown in Table 10.[64] A fire is included in the highest category into which it fits on the list. If it does not fit the top category, then the second one is considered, and if not that one, the third, and so on. (See the note section in Table 9 for an example.)

[64]The structure fire cause hierarchy and definitions can be found in the document "National Fire Incident Reporting System Version 5.0 Fire Data Analysis Guidelines and Issues," July 2011, available at https://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs_data_analysis_guidelines_issues.pdf. The hierarchy involves a large number of subcategories that are later grouped into the 16 midlevel cause categories, then the seven high-level cause groupings.

Vehicle, outside and other fires

While these cause categories have usefulness for the other property types — vehicle, outside and other fires — there are limitations. For these property types, the causes of fires are based on the distributions of the NFIRS cause of ignition data element. This data element captures a very broad sense of the cause of the fire.

Deaths, injuries and dollar loss

In previous analyses, the cause sections have included the distributions of deaths, injuries and dollar loss by fire cause. In principle, it is the cause of the fire that results in deaths, injuries and dollar loss that should be analyzed — not numbers of deaths and injuries associated with fire causes. Therefore, analyses of fire cause address fires that result in deaths (fatal fires), fires that result in injuries, and fires that result in dollar loss.

Other considerations

An additional problem to keep in mind, when considering the rank order of causes, is that sufficient data to categorize the causes was not reported to the NFIRS for all fatal fires in the database. The rank order of causes might be different than shown here if the cause profile for the fires where causes were not reported to the NFIRS was substantially different from the profile for the fires where causes were reported. However, there is no information available to indicate that there is a major difference between the known causes and the unknown causes, so the USFA's best present estimate of fire causes is based on the distribution of the fires with known causes.

Table 10. Midlevel cause groupings

Cause category	Definition
Exposure	Caused by heat spreading from another hostile fire.
Intentional[65]	Cause of ignition is intentional, or fire is deliberately set.
Cause under investigation	Cause is under investigation, and a valid NFIRS Arson Module is present. (This category was formerly called "Investigation with Arson Module.")
Playing with heat source	Includes all fires caused by individuals playing with any materials contained in the categories below, as well as fires where the factors contributing to ignition include playing with heat source. Children playing with fire is included in this category.
Natural	Caused by the sun's heat, spontaneous ignition, chemicals, lightning, static discharge, high winds, storms, high water including floods, earthquakes, volcanic action, and animals.
Other heat	Includes fireworks, explosives, flame/torch used for lighting, heat or spark from friction, molten material, hot material, heat from hot or smoldering objects.

[65]Fires caused by intentional actions include, but are not limited to, fires that are deemed to be arson. Intentional fires are those fires that are deliberately set, and they include fires that result from the deliberate misuse of a heat source and fires of an incendiary nature (arson) that require fire service intervention. For information and statistics on arson fires only, refer to the Uniform Crime Reporting Program arson statistics from the U.S. Department of Justice, FBI, Criminal Justice Information Services Division, https://www.fbi.gov/about-us/cjis/ucr/ucr.

Table 10. Midlevel cause groupings — continued

Cause category	Definition
Smoking	Cigarettes, cigars, pipes, and heat from undetermined smoking materials.
Heating	Includes confined chimney or flue fire, fire confined to fuel burner/boiler malfunction, central heating, fixed and portable local heating units, fireplaces and chimneys, furnaces, boilers, water heaters as source of heat.
Cooking	Includes confined cooking fires, stoves, ovens, fixed and portable warming units, deep fat fryers, open grills as source of heat.
Appliances	Includes televisions, radios, video equipment, phonographs, dryers, washing machines, dishwashers, garbage disposals, vacuum cleaners, hand tools, electric blankets, irons, hair dryers, electric razors, can openers, dehumidifiers, heat pumps, water cooling devices, air conditioners, freezers and refrigeration equipment as source of heat.
Electrical malfunction	Includes electrical distribution, wiring, transformers, meter boxes, power switching gear, outlets, cords, plugs, surge protectors, electric fences, lighting fixtures, electrical arcing as source of heat.
Other equipment	Includes special equipment (radar, X-ray, computer, telephone, transmitters, vending machine, office machine, pumps, printing press, gardening tools, agricultural equipment), processing equipment (furnace, kiln, other industrial machines), service, maintenance equipment (incinerator, elevator), separate motor or generator, vehicle in a structure, unspecified equipment.
Open flame, spark (heat from)	Includes torches, candles, matches, lighters, open fire, ember, ash, rekindled fire, backfire from internal combustion engine as source of heat.
Other unintentional, careless	Includes misuse of material or product, abandoned or discarded materials or products, heat source too close to combustibles, other unintentional (mechanical failure/ malfunction, backfire).
Equipment misoperation, failure	Includes equipment operation deficiency, equipment malfunction.
Unknown	Cause of fire undetermined or not reported.

Source: USFA.

NFIRS fire causal data can be analyzed in many ways, such as by the heat source, equipment involved in ignition, factors contributing to ignition, or many other groupings. The hierarchy of causes has proven to be useful in understanding the fire problem and targeting prevention, but other approaches are useful too. Because the NFIRS database stores records fire-by-fire, and not just in summary statistics, a wide variety of analyses is possible.

The cause categories displayed in the graphs of the USFA's NFIRS data-related reports are listed in the same order to make comparisons easier from one to another. The y-scale varies from figure to figure, depending on the largest percentage that is shown; the y-scale on a figure with multiple charts, however, is always the same.

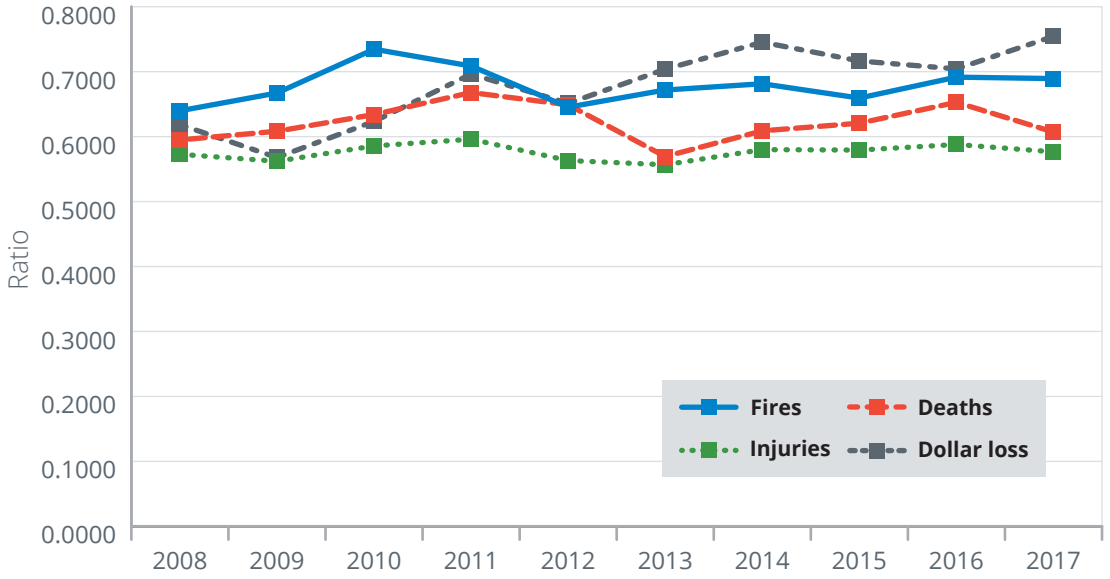
Differences between the National Fire Incident Reporting System data and the National Fire Protection Association survey data

As there are differences between any two analysts using NFIRS data because of the many assumptions and decisions about how to analyze incomplete and imperfect data, there can be inconsistencies between different data sources. In particular, there are discrepancies between the NFIRS data and the NFPA annual survey data. In general, NFIRS deaths and injuries per 1,000 fires are lower than those of the NFPA. In addition, NFIRS dollar loss per fire was higher than that of the NFPA except for 2008 to 2011.

From 2013 to 2017, the NFIRS collected fire incident data from an average of 20,850 fire departments each year.[66] The NFPA annual survey of fire departments[67] collects data from nearly 3,000 fire departments. The NFIRS is not a statistically selected sample; however, it is a very large set of fire incidents estimated to be, on average, two-thirds of reported fires. The NFPA survey is based on a statistical sample. These two datasets often yield dramatically different fire rates. The NFPA survey collects tallied totals, whereas the NFIRS collects individual incident reports. It is not surprising, therefore, that there are differences between the NFPA annual survey results and the NFIRS results. In the years examined (2008 to 2017), the common thread was the increase in the ratios of reported NFIRS data to the NFPA estimates for fires, deaths, injuries and dollar loss. In general, the deaths reported to the NFIRS represented a smaller fraction of the NFPA national estimate of deaths than the NFIRS number of fires represented of the NFPA estimate of fires; the same was true for NFIRS reported injuries. Estimates of dollar loss are notoriously inexact; it is not surprising that the NFIRS dollar loss changed from year to year with respect to NFPA totals (Figure 31).

[66]This count excludes fire departments that reported mutual-aid incidents only.
[67]"Fire Loss in the United States," *NFPA Journal,* generally the September/October issue each year.

Figure 31. Ratio of raw National Fire Incident Reporting System data to National Fire Protection Association national estimates



	Fires	Deaths	Injuries	Dollar loss
2008	0.64	0.59	0.57	0.62
2009	0.67	0.61	0.56	0.57
2010	0.73	0.63	0.59	0.62
2011	0.71	0.67	0.60	0.70
2012	0.65	0.65	0.56	0.65
2013	0.67	0.57	0.56	0.70
2014	0.68	0.61	0.58	0.75
2015	0.66	0.62	0.58	0.72
2016	0.69	0.65	0.59	0.70
2017	0.69	0.61	0.58	0.75

Sources: NFIRS and NFPA.

Note: The 2008 dollar loss excludes the one-time large loss of an estimated $1.4 billion associated with the 2008 California wildfires. These losses do not have associated property uses. The 2010 dollar loss excludes the Fourmile Canyon Fire in Colorado with an estimated property loss of $217 million. The 2012 dollar loss excludes the Waldo Canyon Fire in Colorado with an estimated property loss of $453.7 million, the High Park Fire also in Colorado with an estimated property loss of $113.7 million, and the $400 million property damage to the USS Miami (submarine). The 2013 dollar loss excludes the Black Forest Fire in Colorado with an estimated property loss of $420.5 million. The 2015 dollar loss excludes the 2015 California wildfires with an estimated property loss of $1.95 billion (this figure includes total property loss for the Valley and Butte Wildfires). The 2016 dollar loss excludes the 2016 Gatlinburg, Tennessee, wildfires with an estimated property loss of $911 million. The 2017 dollar loss excludes the 2017 Northern California wildfire with an estimated property loss of $10 billion.

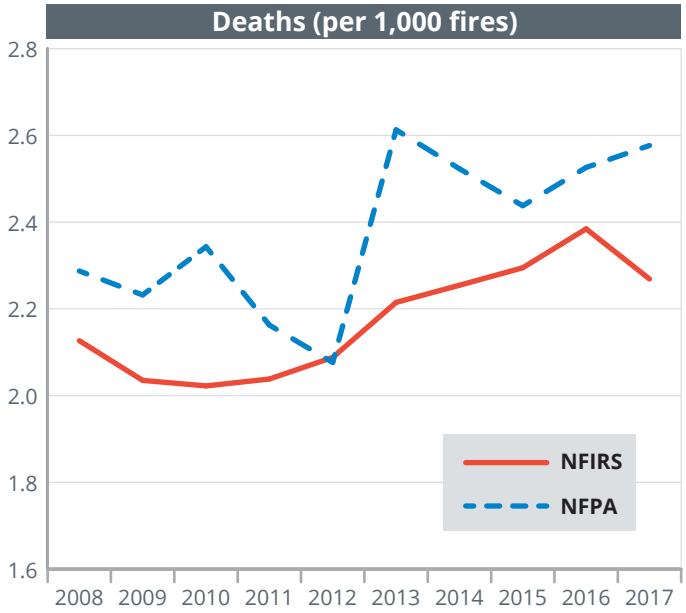
Looking at the problem from a different perspective, Figure 32 shows the number of deaths per 1,000 fires, injuries per 1,000 fires, and dollar loss per fire from the NFIRS and the NFPA from 2008 to 2017. In general, deaths and injuries per 1,000 fires were lower for the NFIRS than for the NFPA. The NFIRS dollar loss per fire was higher than that of the NFPA except for 2008 to 2011.

Between 2008 and 2017, the NFIRS had, on average, a difference of 9% fewer fire deaths per 1,000 fires than the NFPA survey data. Annually, the NFIRS percent differences of fire deaths per 1,000 fires ranged from 0.6% more to 15% less than that of the NFPA. In 2017, the NFIRS showed 12% fewer fire deaths per 1,000 fires than the NFPA.

Injuries per 1,000 fires revealed a greater disparity between the two datasets. On average, between 2008 and 2017, the NFIRS had a difference of 15% fewer fire injuries per 1,000 fires than the NFPA survey.

On average, over the 10-year period, the NFIRS dollar loss per fire was 0.5% lower than that of the NFPA survey, yet for 2012 to 2017, the NFIRS dollar loss per fire was higher than that of the NFPA.[68] In 2008 and 2011, NFIRS dollar loss was only 3% and 2% lower, respectively, than the dollar loss estimates from the NFPA survey, but a much greater disparity was revealed in 2009 (15% lower), 2010 (15% lower), 2014 (9% higher), 2015 (9% higher), and 2017 (9% higher). For each of the years 2012, 2013 and 2016, 1%, 5% and 2%, respectively, more dollar loss was reported to the NFIRS per fire than was reflected by the NFPA survey estimates.

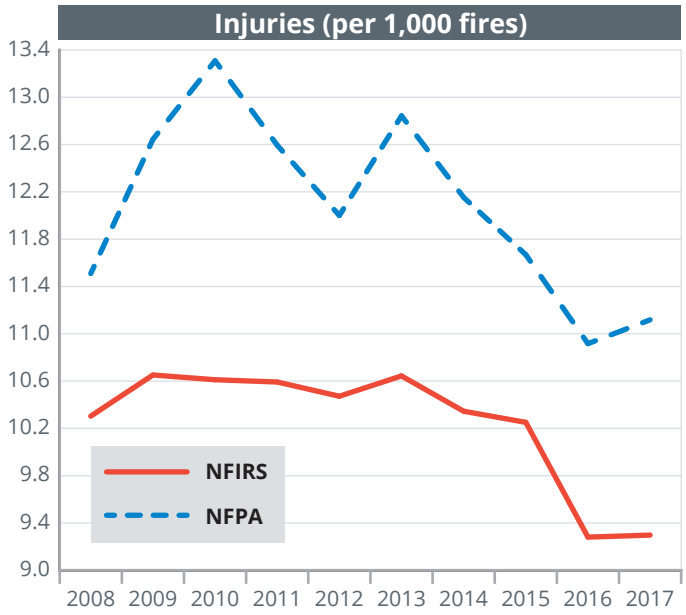
Figure 32. National Fire Incident Reporting System data versus National Fire Protection Association survey: losses per fire



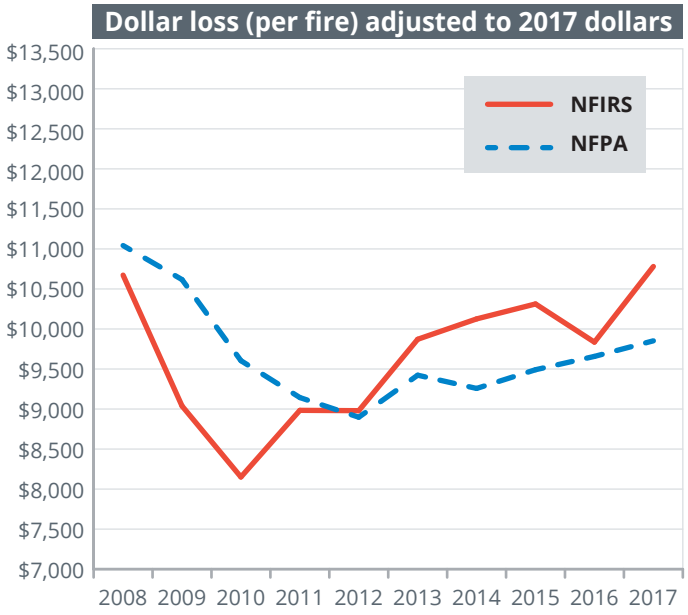
Deaths (per 1,000 fires)		
Year	NFIRS	NFPA
2008	2.13	2.29
2009	2.04	2.23
2010	2.02	2.34
2011	2.04	2.16
2012	2.09	2.08
2013	2.21	2.61
2014	2.25	2.52
2015	2.29	2.44
2016	2.38	2.53
2017	2.27	2.58

[68]The greater NFIRS dollar loss per fire may be, in part, due to the result of an NFIRS edit that was implemented in January 2012 that generates the following warning message: "Estimated dollar losses are required for all fires. If there was no loss or no pre-incident value, check or mark the appropriate 'None' boxes. If loss cannot be estimated, do not enter a loss value and no further action is required." NFIRS Version 5.0 Design Documentation (January 2012), https://www.usfa.fema.gov/downloads/pdf/nfirs/NFIRS_Spec_2012.pdf, Relational Edit #184.

Figure 32. National Fire Incident Reporting System data versus National Fire Protection Association survey: losses per fire — continued



Injuries (per 1,000 fires)		
Year	NFIRS	NFPA
2008	10.30	11.51
2009	10.65	12.64
2010	10.61	13.31
2011	10.59	12.59
2012	10.47	12.00
2013	10.64	12.84
2014	10.34	12.15
2015	10.25	11.67
2016	9.28	10.92
2017	9.30	11.12



Dollar loss (per fire)*		
Year	NFIRS	NFPA
2008	10,673	11,042
2009	9,038	10,617
2010	8,151	9,604
2011	8,984	9,144
2012	8,980	8,898
2013	9,871	9,423
2014	10,126	9,257
2015	10,313	9,491
2016	9,836	9,657
2017	10,781	9,852

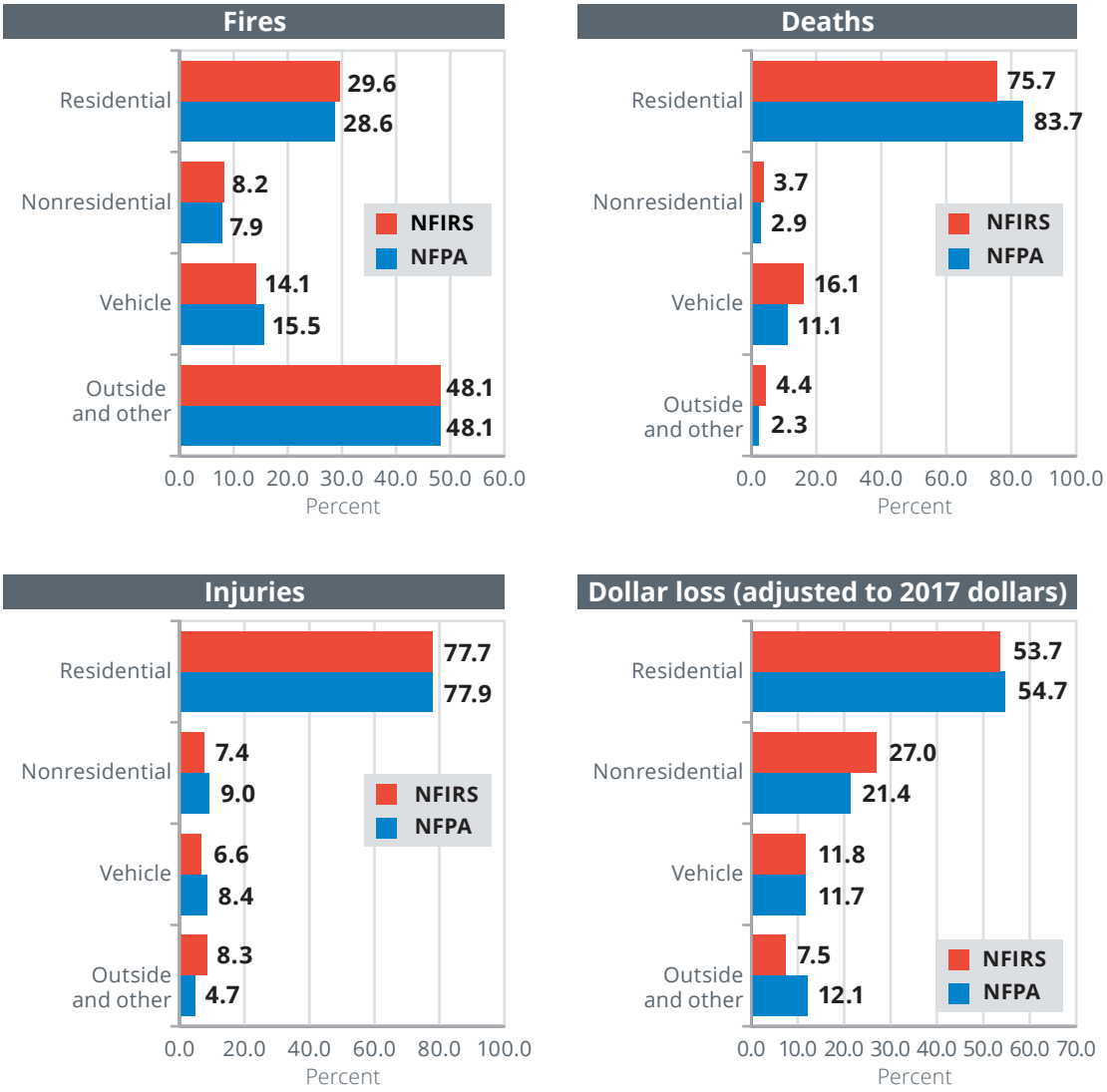
Sources: NFIRS, NFPA and CPI.

Notes: The 2008 dollar loss excludes the one-time large loss of an estimated $1.4 billion associated with the 2008 California wildfires. These losses do not have associated property uses. The 2010 dollar loss excludes the Fourmile Canyon Fire in Colorado with an estimated property loss of $217 million. The 2012 dollar loss excludes the Waldo Canyon Fire in Colorado with an estimated property loss of $453.7 million, the High Park Fire also in Colorado with an estimated property loss of $113.7 million, and the $400 million property damage to the USS Miami (submarine). The 2013 dollar loss excludes the Black Forest Fire in Colorado with an estimated property loss of $420.5 million. The 2015 dollar loss excludes the 2015 California wildfires with an estimated property loss of $1.95 billion (this figure includes total property loss for the Valley and Butte wildfires). The 2016 dollar loss excludes the 2016 Gatlinburg, Tennessee, wildfires with an estimated property loss of $911 million. The 2017 dollar loss excludes the 2017 Northern California wildfire with an estimated property loss of $10 billion.

*Adjusted to 2017 dollars.

Other minor differences appear when reviewing losses by general property type as shown in Figure 33. Specifically, the distributions of fires across property types between the NFIRS and the NFPA were quite similar, which is reassuring. Over the 10-year period, the proportions of structure fires (both residential and nonresidential) were slightly higher in the NFIRS reported data, while the proportion of vehicle fires represented by the NFPA estimate was higher than what was reported to the NFIRS. Regardless of the specifics, the distributions were reasonably comparable.

Figure 33. Comparison of National Fire Incident Reporting System data with National Fire Protection Association estimates by general property type (10-year average, 2008-2017)



Sources: NFIRS and NFPA.

The deaths and dollar losses that resulted from these fires were consistently more heavily represented in residential structures in the NFPA estimates. For the other major property categories, the NFPA percentages of losses were less than those resulting from the NFIRS data except for nonresidential structure fire injuries, vehicle fire injuries, and outside and other fire dollar loss.

One of the more important consequences of these distributions is in the creation of estimates of the various parts of the U.S. fire problem. For example, it is noted that the 2017 NFPA residential structure fire estimates reflect 80% of all fire deaths (2,710 of 3,400) and 74% of all fire injuries (10,910 of 14,670). If the 2017 NFIRS percentages for residential structure fire deaths (77.57%) and injuries (76.09%) were applied to the overall 2017 NFPA estimates of fire deaths and injuries, the estimates would yield nearly 2,635 deaths and 11,150 injuries resulting from residential structure fires.[69] The scaled up NFIRS estimate of residential structure fire deaths is 3% lower than the NFPA estimate of residential structure fire deaths, whereas the scaled up estimate of residential structure fire injuries is 2% higher than the NFPA estimate of residential structure fire injuries.

The reasons for these differences in distributions between the NFPA and the NFIRS are not known. It may be that some departments reporting summary data to the NFPA inadvertently undercount their casualties and losses when reporting on the NFPA survey forms. Another possibility is that there are data entry errors in the NFIRS, with larger numbers of deaths and dollar loss per incident record being entered into the database despite edit checks at state and federal levels. (It appears that at least some of the dollar loss difference is due to this.)

A third possibility for the differences is that, with the abbreviated reporting of small, low- or no-loss confined fires in the NFIRS, the NFPA sample of these fires is not adequately represented. It is known that, prior to abbreviated NFIRS reporting, some departments did not fill out NFIRS forms for minor fires, such as food on stoves or chimney fires. It is not clear whether these fires are included in the department's report to the NFPA, particularly if the department does not also report to the NFIRS. It may be that confined fires are underreported to the NFPA. Also unknown is the actual extent of this problem.

A fourth possibility is that some jurisdictions use the NFIRS as a tracking system for fire casualty information without providing the related incident data or vice versa. This situation does indeed occur from time to time in the NFIRS. Again, it is unclear how these incidents and their corresponding losses are reported to the NFPA.

Lastly, it could be that techniques used to generate the NFPA estimates unintentionally favor residential buildings, or that the NFIRS may result in fewer residential losses because it is a voluntary system and not based on a statistical sample.

Resolving the differences between the two major sources of fire statistics in the U.S. is important to prevent confusion among users of the data.

The analyses contained in this report reflect the current methodologies used by the USFA. The USFA is committed to providing the best and most current information on the U.S. fire problem and continually examines its data and methodology to fulfill this goal. Because of this commitment, data collection strategies and methodological changes are possible and do occur. As a result, analyses and estimates of the fire problem may change slightly over time. Previous analyses and estimates on specific issues (or similar issues) may have used different methodologies or data definitions and may not be directly comparable to the current ones.

Provide feedback on this report.

[69] Estimates of fire deaths are rounded to the nearest five; estimates of fire injuries are rounded to the nearest 25.

Appendix A — Acronyms

AFG	Assistance to Firefighters Grant
ARC	American Red Cross
CPI	Consumer Price Index
CPSC	Consumer Product Safety Commission
DEBI	Data Entry Browser Interface
DET	Data Entry Tool
DHS	Department of Homeland Security
DOD	Department of Defense
DW	Data Warehouse
EMS	emergency medical services
FAQ	frequently asked questions
FDID	fire department identification
FY	fiscal year
ICD	International Classification of Disease
NCHS	National Center for Health Statistics
NFDC	National Fire Data Center
NFIRS	National Fire Incident Reporting System
NFIRS: PM	"National Fire Incident Reporting System: Program Management"
NFPA	National Fire Protection Association
NOFO	Notice of Funding Opportunity
NWS	National Weather Service
OMB	Office of Management and Budget
PDR	public data release
USFA	U.S. Fire Administration

Appendix B — Fire in the United States Editions

Previous editions of this report include:

- First edition, published in 1978, included 1975 and 1976 fire data.
- Second edition, published in 1982, included 1977 and 1978 fire data.
- Third through fifth editions produced as working papers, but not published.
- Sixth edition, published in 1987, included 1983 fire data.
- Seventh edition, published in 1990, included 1983 to 1987 fire data.
- Eighth edition, published in 1993, included 1983 to 1990 fire data.
- Ninth edition, published in 1997, included 1985 to 1994 fire data, and it focused on the residential/nonresidential fire problem, as well as firefighter casualties.
- Tenth edition, published in 1998, included 1986 to 1995 fire data, and it provided a state-by-state profile of fires and an examination of firefighter casualties.
- Eleventh edition, published in 1999, included 1987 to 1996 fire data, and it focused on the residential/nonresidential fire problem, as well as firefighter casualties.
- Twelfth edition, published in 2001, included 1989 to 1998 fire data and was the last edition to use the NFIRS 4.1 data system. It included analyses of all of the previous topics under one cover: residential and nonresidential fire problems, state-by-state profiles, and firefighter casualties.
- Thirteenth edition, published in 2004, included 1992 to 2001 fire data and was the first edition to include the new NFIRS 5.0 data in the analyses. It included the residential and nonresidential fire problem, as well as firefighter casualties.
- Fourteenth edition, published in 2007, included 1995 to 2004 fire data, with a primary focus on 2004. For the first time, only native NFIRS 5.0 data were used for NFIRS-based analyses. It addressed the overall national fire problem and provided detailed analyses of the residential and nonresidential fire problem. Firefighter casualties and other subsets of the national fire problem were not included.
- Fifteenth edition, published in 2009, covered the five-year period of 2003 to 2007, with a primary focus on 2007. As in the 14th edition, only native NFIRS 5.0 data were used for NFIRS-based analyses.[70] This report addressed only the overall national fire problem. Detailed analyses of the residential and nonresidential fire problem, firefighter casualties, and other subsets of the national fire problem were addressed as separate, stand-alone publications.

[70] Previous editions of "Fire in the United States" presented 10-year trends. As many of the trends are based on national estimates that use the proportion of native NFIRS 5.0 data to allocate estimated fires and fire losses, trends in this edition are limited to 2003 and the years after when the proportion of native NFIRS 5.0 data exceeded 80% of the submitted data.

- Sixteenth edition, published in 2013, was entirely web-based and covered the five-year period of 2007 to 2011, with a primary focus on 2011. The document was renamed "Data Sources and Methodology Documentation," with all of the data presented in an Excel file.
- Seventeenth edition, published in 2016, covered the 10-year period of 2004 to 2013, with a primary focus on 2013. This report addressed the overall national fire problem and was published as a PDF document.
- Eighteenth edition, published in January 2017, covered the 10-year period of 2005 to 2014, with a primary focus on 2014. This report addressed the overall national fire problem and was published as a PDF document.
- Nineteenth edition, published in December 2017, covered the 10-year period of 2006 to 2015, with a primary focus on 2015. This report addressed the overall national fire problem and was published as a PDF document.

U.S. Fire Administration

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