

# Winter Residential Building Fires (2014-2016)

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

## Findings

- ❶ Each year, from 2014 to 2016, an estimated 108,200 winter residential building fires were reported to fire departments within the United States. These fires caused an estimated 980 deaths, 3,575 injuries, and \$1.9 billion in property loss.
- ❷ Winter residential building fires accounted for only 8 percent of the total number of fires in the U.S., but they resulted in 30 percent of all fire deaths and 23 percent of all fire injuries.
- ❸ At 43 percent, cooking was the leading cause of winter residential building fires. Small, confined fires accounted for 90 percent of these cooking fires.
- ❹ Residential building fire incidence was collectively higher in the winter months of January, February and March, peaking in January at 11 percent.
- ❺ Winter residential building fires occurred most frequently in the early evening, peaking during the dinner hours from 5 to 8 p.m., when cooking fire incidence is high.
- ❻ Nonconfined winter residential building fires most often started in cooking areas and kitchens (20 percent).
- ❼ In 51 percent of nonconfined winter residential building fires, the fire extended beyond the room of origin. The leading causes of these larger fires were unintentional or careless actions (19 percent), electrical malfunctions (14 percent), open flames (12 percent), and heating (9 percent).
- ❽ The leading specific factor contributing to ignition in nonconfined winter residential building fires was a heat source too close to combustibles (16 percent).
- ❾ Smoke alarms were not present in 22 percent of nonconfined winter fires in occupied residential buildings. Additionally, automatic extinguishing systems (AESs) were present in only 4 percent of nonconfined winter fires in occupied residential buildings.

Each year, from 2014 to 2016, fire departments responded to an estimated 108,200 fires in residential buildings during the months of January, February and March across the nation.<sup>1,2</sup> These fires resulted in an estimated annual average of 980 deaths, 3,575 injuries, and \$1.9 billion in property loss.

The residential building portion of the fire problem is of great national importance as it accounts for the vast majority of civilian casualties, and winter residential building fires account for a considerable portion of that. National estimates for 2014 to 2016 show that 81 percent of all fire deaths and 75 percent of all fire injuries occurred in residential buildings.<sup>3</sup> Winter residential fires accounted for only 8 percent of the total number of fires, but they resulted in 30 percent of all fire deaths and 23 percent of all fire injuries. In addition, residential building fires accounted for over half (54 percent) of the total dollar loss from all fires, while winter residential fires were 16 percent of the total.<sup>4</sup>

The term “residential buildings” includes what are commonly referred to as “homes,” whether they are one- or 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



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16825 S. Seton Ave.

Emmitsburg, MD 21727

<https://www.usfa.fema.gov/data/statistics/>

individuals (patients with mental disabilities or drug addictions, or those formerly incarcerated) 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, even though people may reside in these facilities for short or long periods of time.

This report addresses the characteristics of winter residential building fires reported to the National Fire Incident Reporting System (NFIRS). The focus is on winter fires reported during the months of January, February and March from 2014 to 2016, the most recent data available at the time of the analysis.<sup>5</sup> NFIRS data is used for the analyses throughout this report.

For the purpose of this report, the term “winter residential fires” is synonymous with “winter residential building fires.” “Winter residential fires” is used throughout the body of this report; the findings, tables, charts, headings and endnotes reflect the full category, “winter residential building fires.”

## Type of fire

Building fires are divided into two classes of severity in the NFIRS: “confined fires” and “nonconfined fires.” Confined building fires are small fire incidents that are limited in extent to specific types of equipment or objects staying within pots, fireplaces or certain other noncombustible containers.<sup>6</sup> Confined fires rarely result in serious injury or large content loss and are expected to have no significant accompanying property loss due to flame damage.<sup>7</sup> Nonconfined fires extend beyond certain types of equipment or objects. They are generally larger fires resulting in more serious injury and losses of property and content.

Of the two classes of severity, confined fires accounted for 51 percent of winter residential fires. The larger, nonconfined fires accounted for the remaining 49 percent of winter residential fires. Cooking fires were the predominant type of smaller, confined fires during the winter in residential buildings (Table 1).

**Table 1. Winter residential building fires by type of incident (2014-2016)**

Incident Type	Percent
Nonconfined fires	49.2
Confined fires	50.8
Cooking fire, confined to container	32.9
Chimney or flue fire, confined to chimney or flue	9.9
Incinerator overload or malfunction, fire confined	0.2
Fuel burner/boiler malfunction, fire confined	3.3
Commercial compactor fire, confined to rubbish	0.3
Trash or rubbish fire, contained	4.2
Total	100.0

Source: NFIRS 5.0.

## Loss measures

Table 2 presents losses of reported residential building fires, averaged over the three-year period for the winter months of 2014 to 2016.<sup>8</sup> The average number of fatalities and injuries per 1,000 winter residential fires was notably higher than the same loss measures for residential building fires that occurred during all other seasons of the year. In addition, all of the average loss measures associated with nonconfined winter residential fires were substantially higher than the same loss measures for confined winter residential fires. This can be expected, however, as nonconfined fires are generally larger fires that often result in serious injuries and higher dollar losses.

**Table 2. Loss measures for winter and nonwinter residential building fires (three-year average, 2014-2016)**

Measure	Winter residential building fires	Confined winter residential building fires	Nonconfined winter residential building fires	Nonwinter residential building fires
<b>Average loss</b>				
Fatalities/1,000 fires	7.2	0.0	14.7	5.2
Injuries/1,000 fires	27.6	5.9	50.1	24.8
Dollar loss/fire	\$17,350	\$220	\$35,050	\$17,550

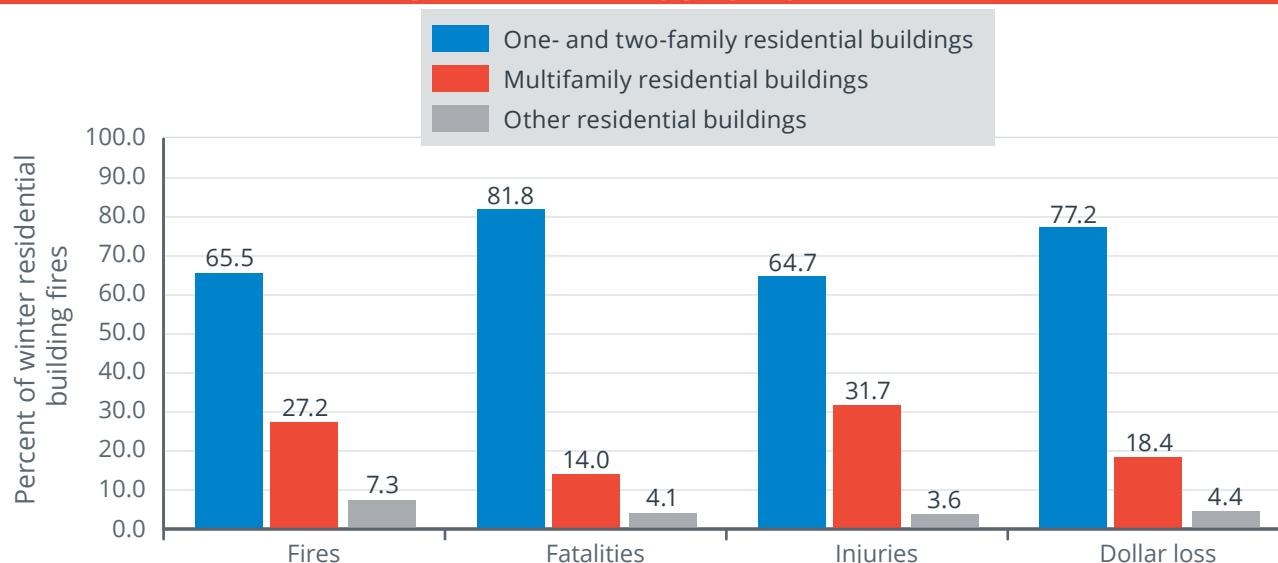
Source: NFIRS 5.0.

Notes: 1. Average loss for fatalities and injuries is computed per 1,000 fires. Average dollar loss is computed **per fire** and is rounded to the nearest \$10.  
 2. The 2014 and 2015 dollar-loss values were adjusted to 2016 dollars.

## Property use

Figure 1 presents the percentage distribution of winter residential fire losses by property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings).<sup>9</sup> Consistent with the fact that the majority of winter residential fires took place in one- and two-family residential buildings (66 percent), the percentages of fatalities (82 percent), injuries (65 percent) and dollar loss (77 percent) were also highest in these types of residences.

One explanation for the higher percentage of fires and subsequent losses in one- and two-family dwellings may be that more stringent building and fire codes, which require detection and suppression systems as well as regular fire inspections, are imposed on multifamily dwellings and other residential buildings. In addition, multifamily dwellings and other residential buildings may more often be professionally maintained.

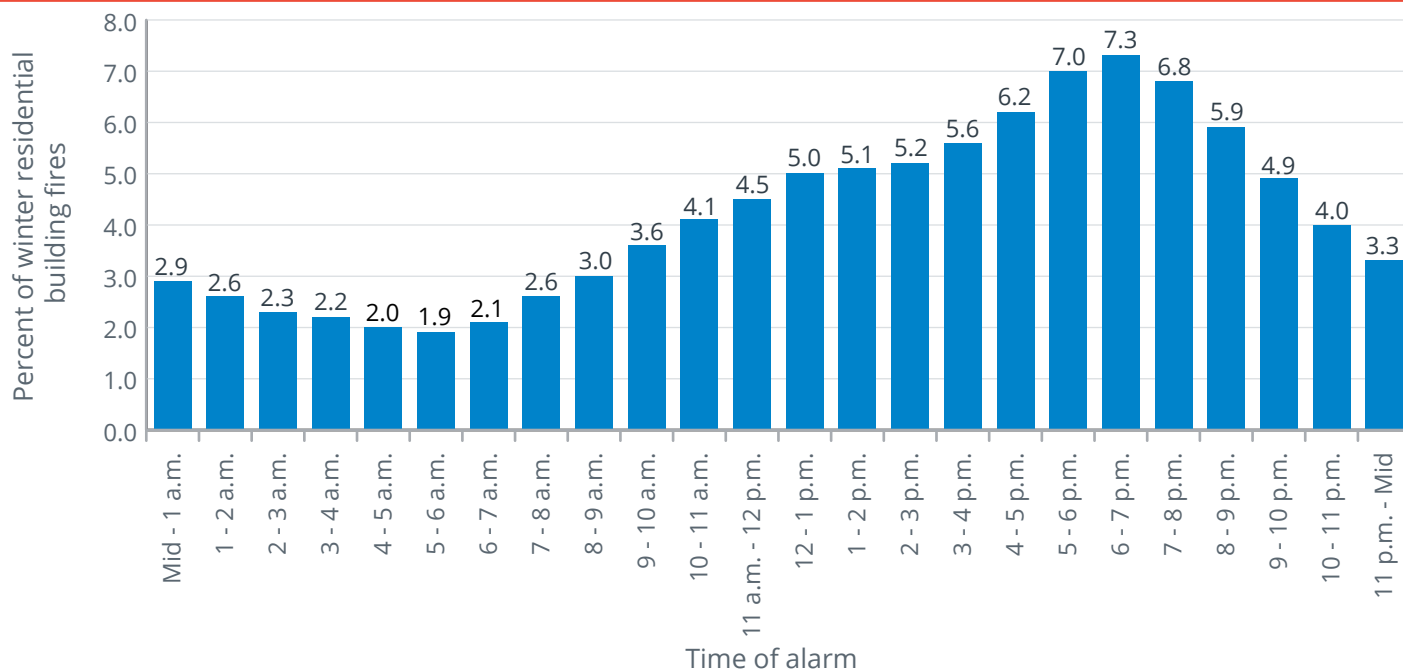
**Figure 1. Winter residential building fires and losses by property use (2014-2016)**

Source: NFIRS 5.0.

Notes: 1. Total percent of fatalities does not add up to 100 percent due to rounding.  
 2. The 2014 and 2015 dollar-loss values were adjusted to 2016 dollars.

## When winter residential building fires occur

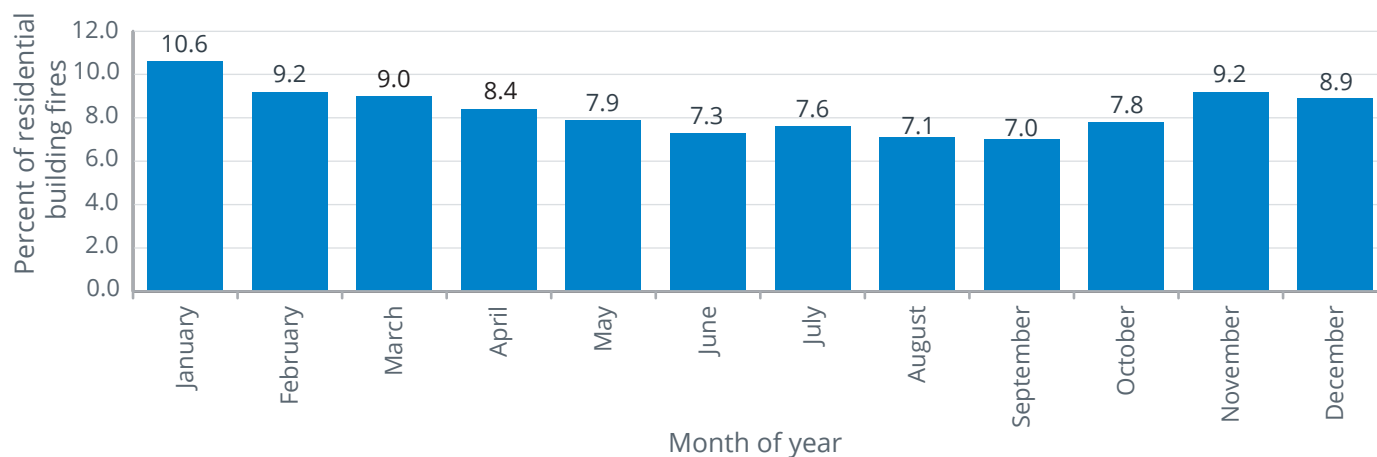
As shown in Figure 2, winter residential fires occurred most frequently in the early evening, peaking during the dinner hours from 5 to 8 p.m., when cooking fire incidence is high.<sup>10</sup> Cooking fires, discussed later in the “Causes of winter residential building fires” section, accounted for 43 percent of winter residential fires. Fires then declined throughout the night, reaching the lowest point during the early to midmorning hours (2 to 7 a.m.).

**Figure 2. Winter residential building fires by time of alarm (2014-2016)**

Source: NFIRS 5.0.

Note: Total does not add up to 100 percent due to rounding.

Figure 3 illustrates that residential fire incidence was collectively higher in the winter months of January, February and March, peaking in January at 11 percent.<sup>11</sup> Overall, the winter months accounted for 29 percent of residential fires, while spring, summer and fall constituted 24, 22 and 26 percent of the total, respectively.<sup>12</sup> The increase in fires in the cooler months may be explained by the increase in heating fires. In addition, the increase may also be due to more indoor activities in general, as well as more indoor seasonal and holiday-related activities. During the spring and summer months, fire incidence declined steadily, reaching a low in September.

**Figure 3. Residential building fires by month (2014-2016)**

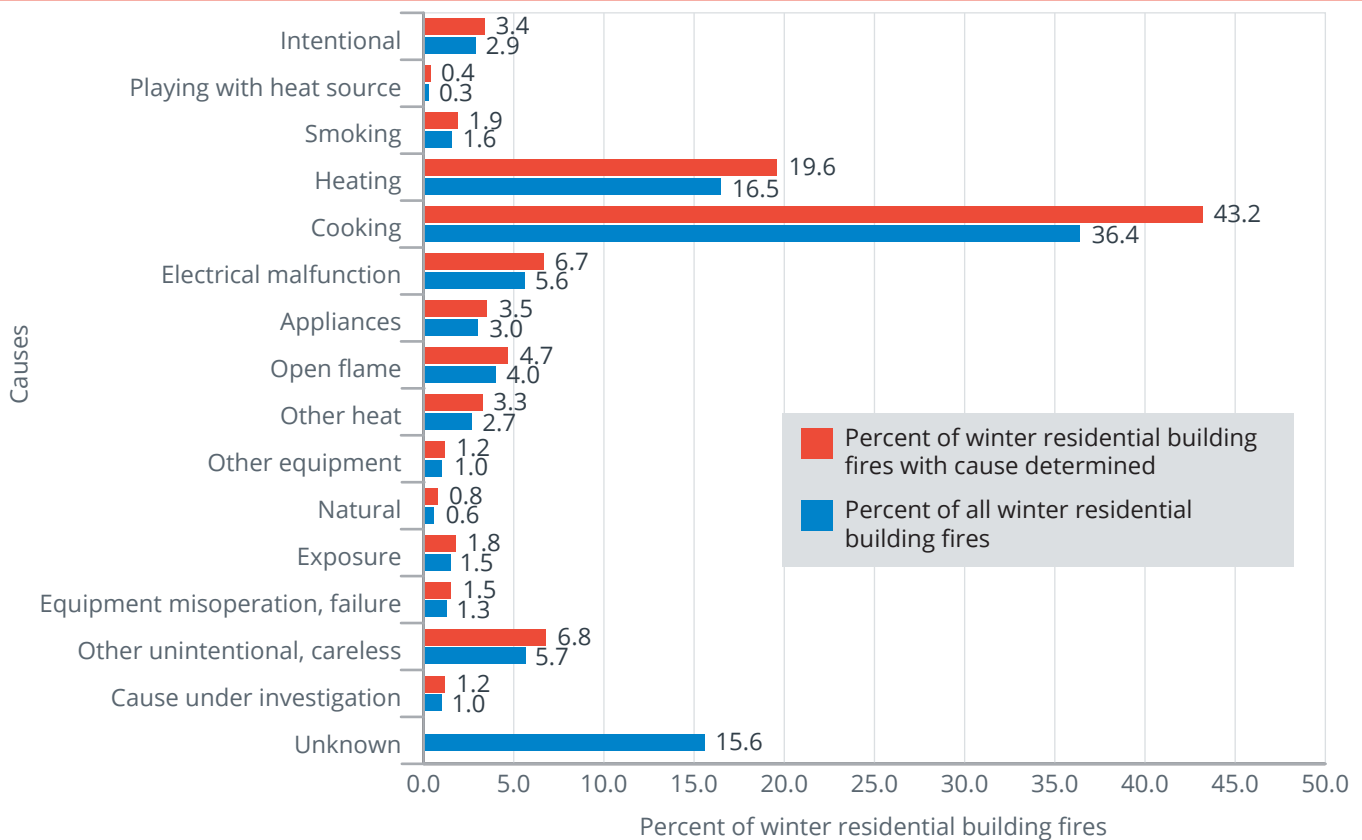
Source: NFIRS 5.0.

## Causes of winter residential building fires

Cooking was the leading cause and accounted for 43 percent of all winter residential fires, as shown in Figure 4.<sup>13</sup> Small, confined fires with limited damage accounted for 90 percent of these cooking fires.

The next three causes combined accounted for one-third of winter residential fires: heating (20 percent); other unintentional or careless actions, a miscellaneous group (7 percent); and electrical malfunctions, such as short circuits and wiring problems (7 percent).

**Figure 4. Causes of winter residential building fires (2014-2016)**

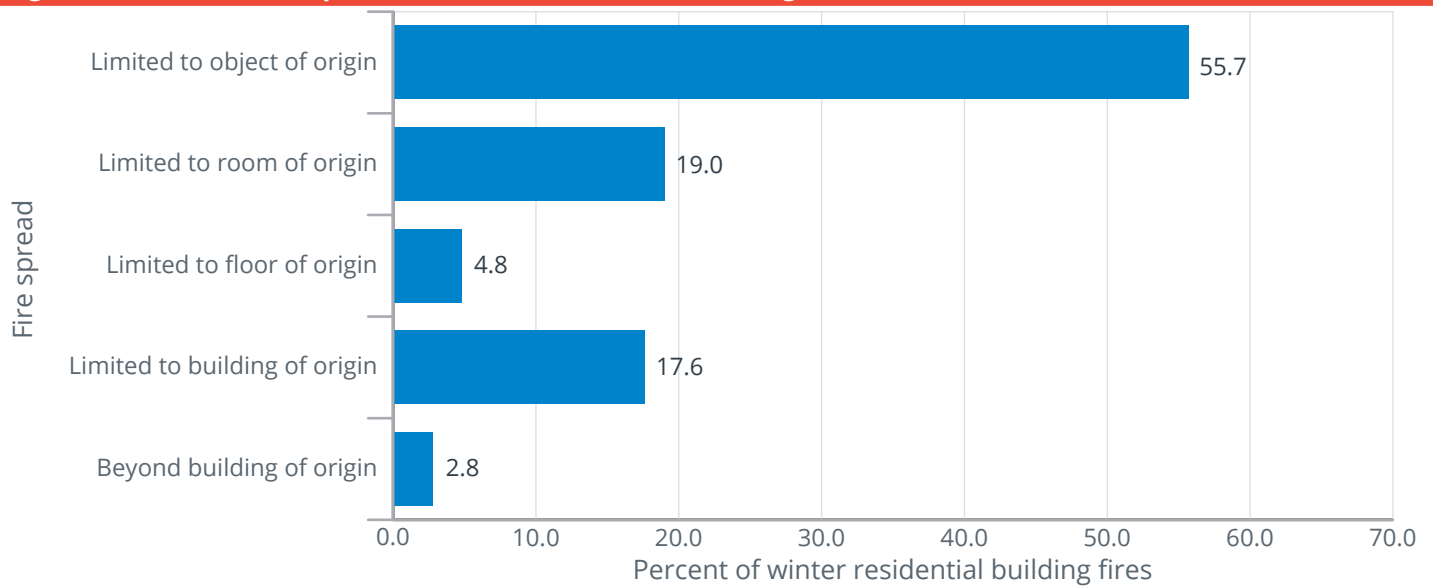


Source: NFIRS 5.0.

Notes: 1. Causes are listed in order of the U.S. Fire Administration (USFA) Structure Fire Cause Hierarchy for ease of comparison of fire causes across different aspects of the fire problem. Fires are assigned to one of 16 cause groupings using a hierarchy of definitions, as shown in the figure. A fire is included in the highest category into which it fits. If it does not fit the top category, then the second one is considered, and if not that one, the third and so on. 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 in the hierarchy. 2. Total percent of all winter residential building fires does not add up to 100 percent due to rounding.

## Fire spread in winter residential building fires

As shown in Figure 5, 56 percent of winter residential fires were limited to the object of origin. Included in these fires were those coded as “confined fires” in the NFIRS. In addition, 25 percent of fires extended beyond the room of origin.

**Figure 5. Extent of fire spread in winter residential building fires (2014-2016)**

Source: NFIRS 5.0.

Note: Total does not add up to 100 percent due to rounding.

## Confined fires

The NFIRS allows abbreviated reporting for confined fires, and many reporting details of these fires are not required nor are they reported. (Not all fires confined to the object of origin are counted as confined fires).<sup>14</sup> As previously discussed, however, it is known that confined fires accounted for 51 percent of all winter residential fires. Confined cooking fires — those cooking fires confined to a pot or the oven, for example — accounted for 65 percent of these confined fires (Table 1).

In addition, the number of confined winter residential fires was greatest from 5 to 7 p.m. These fires accounted for 63 percent of all winter residential fires occurring in this time period. Moreover, confined cooking fires accounted for 68 percent of the confined fires and 43 percent of all fires in residential buildings that occurred between 5 and 7 p.m. during the winter months.

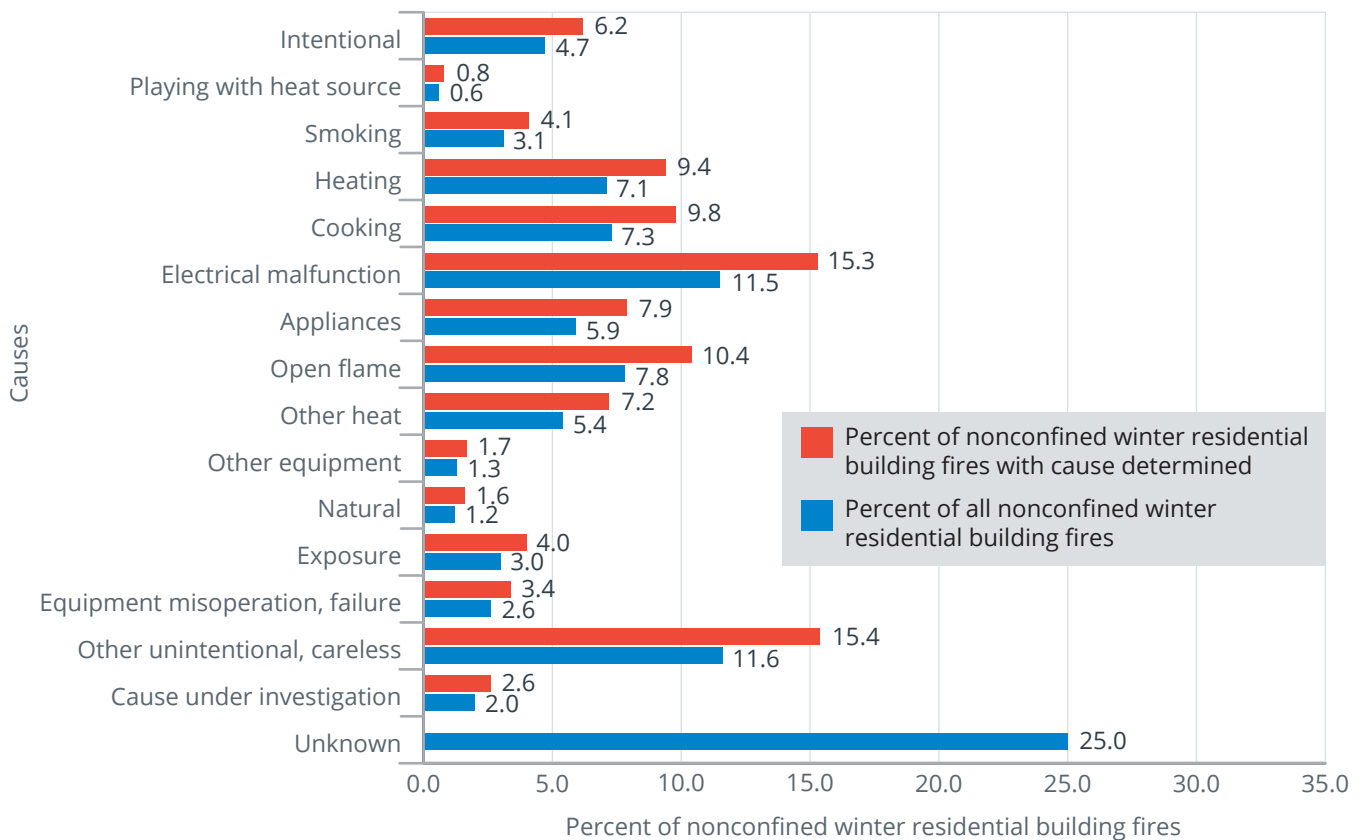
Of the three winter months, January, February and March, confined residential fires peaked in January at 37 percent, while February and March accounted for 32 percent and 31 percent of the fires, respectively.

## Nonconfined fires

The next sections of this topical report address nonconfined winter residential fires — the larger and more serious fires — where more detailed fire data are available, as they are required to be reported in the NFIRS.

### Causes of nonconfined winter residential building fires

While cooking was the leading cause of winter residential fires overall, it only accounted for 10 percent of all nonconfined winter residential fires, as shown in Figure 6. Other unintentional or careless actions (15 percent) and electrical malfunctions (15 percent) were the primary causes of nonconfined winter residential fires. Secondary causes of nonconfined winter residential fires included open flames (10 percent), cooking (10 percent), and heating (9 percent).

**Figure 6. Causes of nonconfined winter residential building fires (2014-2016)**

Source: NFIRS 5.0.

- Notes:
1. Causes are listed in order of the USFA Structure Fire Cause Hierarchy for ease of comparison of fire causes across different aspects of the fire problem. Fires are assigned to one of 16 cause groupings using a hierarchy of definitions, as shown in the figure. A fire is included in the highest category into which it fits. If it does not fit the top category, then the second one is considered, and if not that one, the third and so on. 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 in the hierarchy.
  2. Total for each distribution does not add up to 100 percent due to rounding.

### Where nonconfined winter residential building fires start (area of fire origin)

Nonconfined winter residential fires most often started in cooking areas and kitchens (20 percent), as shown in Table 3. Bedrooms (13 percent) and common rooms, living rooms or lounge areas (7 percent) were the next most common areas of fire origin in the home. Smaller percentages of fires started in attics and vacant spaces (5 percent) and laundry areas (5 percent).

Note that these areas of origin do not include areas associated with confined fires. Cooking was the leading cause of all winter residential fires at 43 percent, and it is not surprising that kitchens were the leading area of fire origin. The percentages were not identical between cooking and kitchen fires because some cooking fires started outside the kitchen, some areas of origin for cooking fires were not reported (as is the case in most confined cooking fires), and some kitchen fires did not start due to cooking. In fact, only 47 percent of nonconfined winter residential fires that started in the kitchen were cooking fires. Other unintentional or careless actions (14 percent), appliances (8 percent), and other heat (8 percent) collectively accounted for an additional 30 percent of kitchen fires.

**Table 3. Leading areas of fire origin in nonconfined winter residential building fires (2014-2016)**

Areas of fire origin	Percent (unknowns apportioned)
Cooking area, kitchen	19.6
Bedrooms	12.7
Common room, den, family room, living room, lounge	7.1

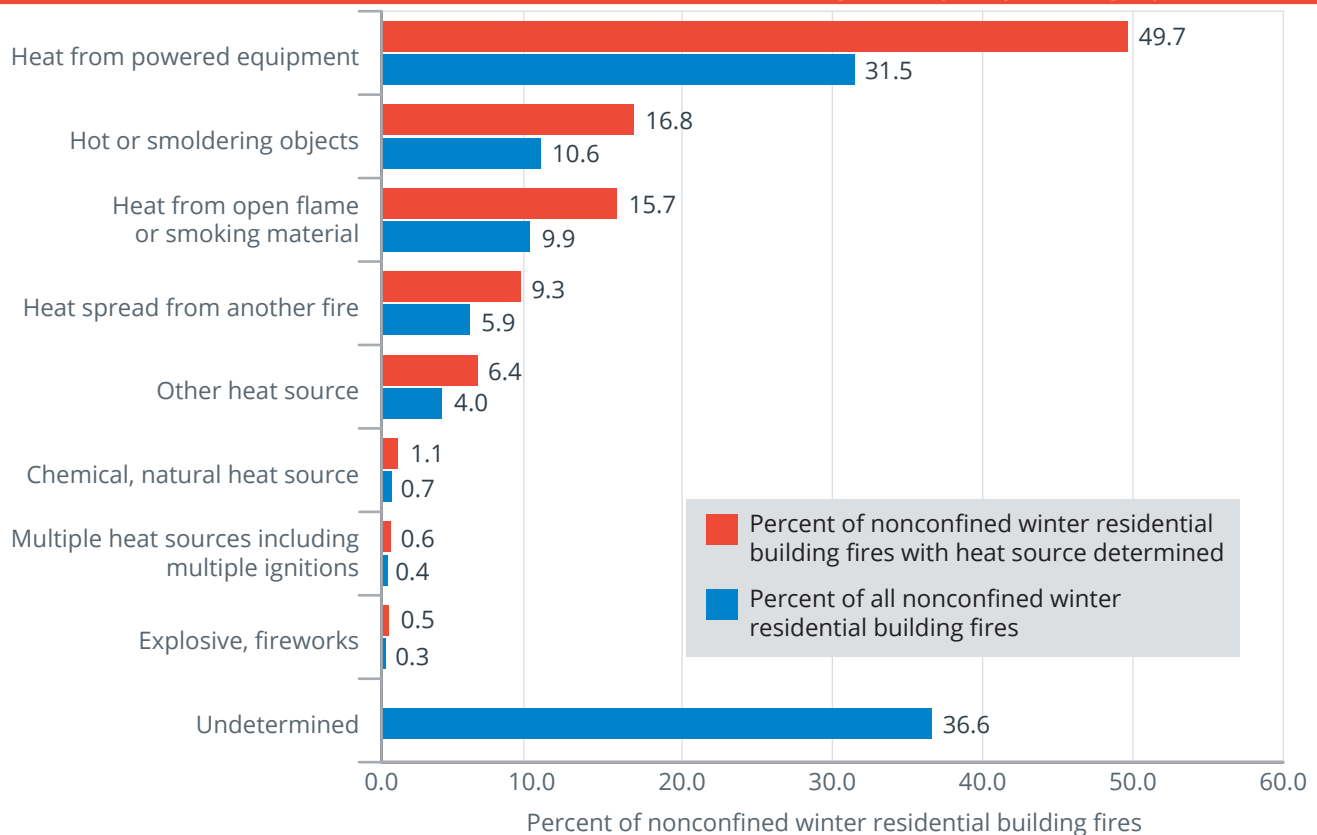
Source: NFIRS 5.0.

### How nonconfined winter residential building fires start (heat source)

Figure 7 shows sources of heat categories for nonconfined winter residential fires. Heat from powered equipment accounted for 50 percent of nonconfined winter residential fires. This category includes electrical arcing (16 percent); radiated or conducted heat from operating equipment (15 percent); heat from other powered equipment (14 percent); and spark, ember or flame from operating equipment (5 percent).

Hot or smoldering objects accounted for 17 percent of nonconfined winter residential fires. This category includes items such as hot embers or ashes (8 percent) and miscellaneous hot or smoldering objects (7 percent).

The third largest category pertains to heat from open flame or smoking materials (16 percent). This category includes items such as cigarettes (4 percent), other miscellaneous open flame or smoking materials (4 percent), lighters and matches (combined, 3 percent), and candles (3 percent).

**Figure 7. Sources of heat in nonconfined winter residential building fires by major category (2014-2016)**

Source: NFIRS 5.0.

Note: Total for each distribution does not add up to 100 percent due to rounding.

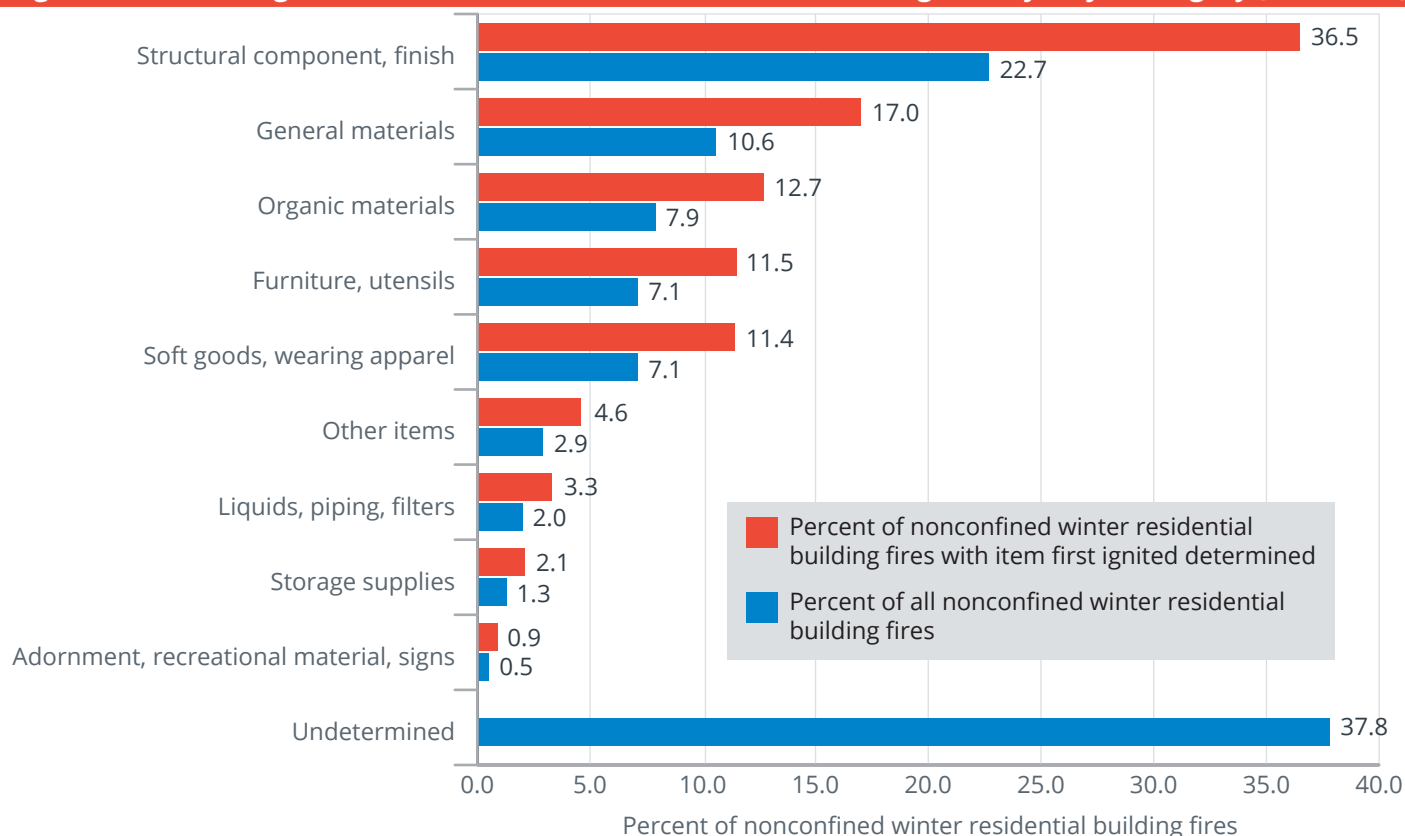


## What ignites first in nonconfined winter residential building fires

As shown in Figure 8, 37 percent of the items first ignited in nonconfined winter residential fires where the item is determined fell under the “structural component, finish” category. This category includes structural member or framing and exterior sidewall covering. The second leading category of items first ignited in nonconfined winter residential fires was “general materials,” which accounted for 17 percent of these fires. “General materials” include items such as electrical wire, cable insulation, and trash or rubbish. The next three leading categories of nonconfined winter residential fires were “organic materials” at 13 percent; “furniture, utensils” at 12 percent; and “soft goods, wearing apparel” at 11 percent. These categories include items such as cooking materials, cabinetry, upholstered sofas and chairs, clothing, bedding, linens and curtains.

Structural member or framing (12 percent), cooking materials (10 percent), electrical wire, cable insulation (8 percent), and exterior sidewall covering (7 percent) were the specific items most often first ignited in nonconfined winter residential fires.

**Figure 8. Item first ignited in nonconfined winter residential building fires by major category (2014-2016)**



Source: NFIRS 5.0.

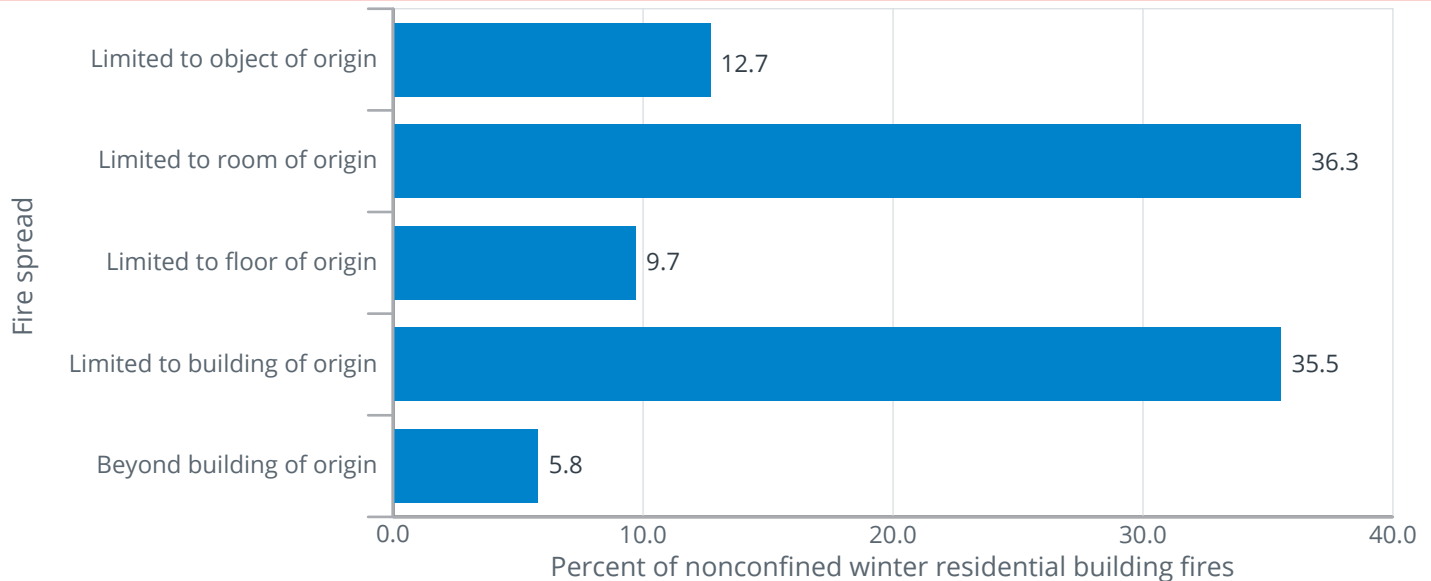
Note: Total percent of all nonconfined winter residential building fires does not add up to 100 percent due to rounding.

## Fire spread in nonconfined winter residential building fires

Figure 9 shows the extent of fire spread in nonconfined winter residential fires. In 49 percent of these nonconfined fires, the fire was limited to the object or room of fire origin — in 36 percent of these nonconfined fires, the fire was limited to the room of origin; in another 13 percent of fires, the fire was limited to the object of origin. (Note that a fire limited to a sofa or bed is not defined as a “confined fire” because of the greater potential for spread. Unlike fires in pots or chimneys, there is no container to stop the fire even though the fire did not spread beyond the object of origin.)

In 51 percent of nonconfined winter residential fires, the fire extended beyond the room of origin. The leading causes of these larger fires were unintentional or careless actions (19 percent), electrical malfunctions (14 percent), open flames (12 percent), and heating (9 percent).

**Figure 9. Extent of fire spread in nonconfined winter residential building fires (2014-2016)**



Source: NFIRS 5.0.

### Factors contributing to ignition in nonconfined winter residential building fires

Table 4 shows the categories of factors contributing to ignition in nonconfined winter residential fires. The leading category was the misuse of material or product (38 percent). In this category, the leading specific factors contributing to ignition were a heat source too close to combustible materials (16 percent) and abandoned or discarded materials, such as matches or cigarettes (10 percent).

Electrical failures and malfunctions contributed to 23 percent of nonconfined winter residential fires. Operational deficiency was the third leading category at 15 percent. Unattended equipment was the leading factor in the operational deficiency category and accounted for 7 percent of all nonconfined winter residential fires.

**Table 4. Factors contributing to ignition for nonconfined winter residential building fires by major category (where factors contributing to ignition are specified, 2014-2016)**

Factors contributing to ignition category	Percent of nonconfined winter residential building fires (unknowns apportioned)
Misuse of material or product	38.1
Electrical failure, malfunction	23.3
Operational deficiency	14.9
Fire spread or control	10.6
Mechanical failure, malfunction	7.8
Other factors contributing to ignition	5.7
Design, manufacture, installation deficiency	2.7
Natural condition	2.2

Source: NFIRS 5.0.

- Notes: 1. Includes only incidents where factors that contributed to the ignition of the fire were specified.  
2. Multiple factors contributing to fire ignition may be noted for each incident; the total will exceed 100 percent.

## Alerting/Suppression systems in winter residential building fires

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

Smoke alarm data is available for both confined and nonconfined fires, although for confined fires, the data is very limited in scope. Since different levels of data are reported on smoke alarms in confined and nonconfined fires, the analyses are performed separately. Note that the data presented in Tables 5, 6 and 7 are the raw counts from the NFIRS dataset and are not scaled to national estimates of smoke alarms in winter residential fires. In addition, the NFIRS does not allow for the determination of the type of smoke alarm (i.e., photoelectric or ionization) or the location of the smoke alarm with respect to the area of fire origin.

### Smoke alarms in nonconfined winter fires

Overall, smoke alarms were reported as present in 43 percent of nonconfined winter residential fires (Table 5). In 26 percent of nonconfined winter residential fires, there were no smoke alarms present. In another 31 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Thus, smoke alarms were missing in 26 percent to potentially 57 percent of fires with the ability to spread and possibly result in fatalities.

**Table 5. Presence of smoke alarms in nonconfined winter residential building fires (2014-2016)**

Presence of smoke alarms	Percent
Present	43.2
None present	26.1
Undetermined	30.7
Total incidents	100.0

Source: NFIRS 5.0.

While 14 percent of all nonconfined winter residential fires occurred in residential buildings that are **not** currently or routinely occupied, these buildings — which are under construction, undergoing major renovations, or vacant and the like — are unlikely to have alerting and suppression systems that are in place and, if in place, that are operational. In fact, only 7 percent of all nonconfined winter fires in unoccupied residential buildings were reported as having smoke alarms that operated. As a result, the detailed smoke alarm analyses in the next section focus on nonconfined winter fires in occupied residential buildings only.

### Smoke alarms in nonconfined winter fires in occupied residential buildings

Smoke alarms were reported as present in 48 percent of nonconfined winter fires in occupied residential buildings (Table 6). In 22 percent of nonconfined winter fires in occupied residential buildings, there were no smoke alarms present. In another 30 percent of these fires, firefighters were unable to determine if a smoke alarm was present; unfortunately, in 52 percent of the fires where the presence of a smoke alarm was undetermined, either the flames involved the building of origin or spread beyond it. The fires were so large and destructive that it is unlikely the presence of a smoke alarm could be determined.

When smoke alarms were present (48 percent) and the alarm operational status is considered, the percentage of smoke alarms reported as present consisted of:

- ➊ Present and operated — 28 percent.
- ➋ Present but did not operate — 12 percent (alarm did not operate, 6 percent; fire too small, 6 percent).
- ➌ Present but operational status unknown — 8 percent.

When the subset of incidents where smoke alarms were reported as present was analyzed separately as a whole, smoke alarms were reported to have operated in 59 percent of the incidents and failed to operate in 12 percent. In another 13 percent of this subset, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 16 percent of these incidents.

At least 22 percent of nonconfined winter fires in occupied residential buildings had no smoke alarms present — and perhaps more if fires without information on smoke alarms could be factored in.<sup>15</sup> A large proportion of reported fires without smoke alarms may reflect the effectiveness of the alarms themselves: Smoke alarms do not prevent fires, but they may prevent a fire from being reported if it is detected at an early stage and extinguished before the fire department becomes involved. Alternatively, fires in homes without smoke alarms may **not** be detected at an early stage, causing them to grow large, require fire department intervention, and thus be reported.<sup>16</sup>

If a fire occurs, properly installed and maintained smoke alarms provide an early warning signal to everyone in a home. Smoke alarms help save lives and property. The USFA continues to partner with other government agencies and fire service organizations to improve and develop new smoke alarm technologies. More information on smoke alarm technologies, performance, disposal and storage, training bulletins, and public education and outreach materials can be found at [https://www.usfa.fema.gov/prevention/technology/smoke\\_fire\\_alarms.html](https://www.usfa.fema.gov/prevention/technology/smoke_fire_alarms.html). Additionally, the USFA's position statement on smoke alarms is available at [https://www.usfa.fema.gov/about/smoke\\_alarms\\_position.html](https://www.usfa.fema.gov/about/smoke_alarms_position.html).

**Table 6. NFIRS smoke alarm data for nonconfined winter fires in occupied residential buildings (2014-2016)**

Presence of smoke alarms	Smoke alarm operational status	Smoke alarm effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		5,905	6.1
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	20,434	21.0
		Smoke alarm alerted occupants, occupants failed to respond	885	0.9
		No occupants	2,852	2.9
		Smoke alarm failed to alert occupants	633	0.7
		Undetermined	2,801	2.9
	Smoke alarm failed to operate		5,484	5.6
	Undetermined		7,695	7.9
None present			21,179	21.8
Undetermined			29,289	30.1
Total incidents			97,157	100.0

Source: NFIRS 5.0.

Notes: 1. The data presented in this table are raw data counts from the NFIRS dataset summed (not averaged) from 2014 to 2016. They do not represent national estimates of smoke alarms in nonconfined winter fires in occupied residential buildings. They are presented for informational purposes.

2. Total does not add up to 100 percent due to rounding.

## Smoke alarms in confined winter fires

Less information about smoke alarm status is collected for confined fires, but the data still give important insights about the effectiveness of alerting occupants in these types of fires. The analyses presented here do not differentiate between occupied and unoccupied residential buildings, as this data detail is not required when reporting confined fires in the NFIRS. However, an assumption may be made that confined fires are fires in occupied housing, as these types of fires are unlikely to be reported in residential buildings that are not occupied.

Smoke alarms alerted occupants in 42 percent of the reported confined winter residential fires (Table 7). In other words, residents received a warning from a smoke alarm in about two-fifths of these fires. The data suggest that smoke alarms may alert residents to confined fires, as the early alerting allowed the occupants to extinguish the fires, or the fires self-extinguished. If this is the case, it is an example of the contribution to overall safety and the ability to rapidly respond to fires in early stages that smoke alarms afford. Details on smoke alarm effectiveness for confined fires are needed to pursue this analysis further.

Occupants were not alerted by smoke alarms in 18 percent of confined winter residential fires.<sup>17</sup> In 40 percent of these confined fires, the smoke alarm effectiveness was unknown.

**Table 7. NFIRS smoke alarm data for confined winter residential building fires (2014-2016)**

Smoke alarm effectiveness	Count	Percent
Smoke alarm alerted occupants	48,887	41.9
Smoke alarm did not alert occupants	20,771	17.8
Unknown	47,109	40.3
Total incidents	116,767	100.0

Source: NFIRS 5.0.

Note: The data presented in this table are raw data counts from the NFIRS dataset summed (not averaged) from 2014 to 2016. They do not represent national estimates of smoke alarms in confined winter residential building fires. They are presented for informational purposes.

### Automatic extinguishing systems in nonconfined winter fires in occupied residential buildings

AES data are available for both confined and nonconfined fires, although for confined fires the data are very limited in scope. In confined winter residential building fires, an AES was present in less than 1 percent of reported incidents.<sup>18</sup> In addition, the following AES analyses focus on nonconfined winter fires in occupied residential buildings only, as even fewer AESs are present in unoccupied housing.

Residential sprinklers are the primary AES in residences but are not yet widely installed. In fact, AESs were reported as present in only 4 percent of nonconfined winter fires in occupied residential buildings (Table 8).

Residential sprinkler systems help to reduce the risk of deaths and injuries, homeowner insurance premiums, and uninsured property losses. Yet many homes do not have AESs, although they are often found in hotels and businesses. Sprinklers are required by code in hotels and many multifamily residences. There are major movements in the U.S. fire service to require sprinklers in all new homes. At present, however, they are largely absent in residences nationwide.<sup>19</sup>

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

**Table 8. NFIRS automatic extinguishing system data for nonconfined winter fires in occupied residential buildings (2014-2016)**

Automatic extinguishing system presence	Count	Percent
AES present	3,820	3.9
Partial system present	191	0.2
AES not present	85,249	87.7
Unknown	7,897	8.1
Total incidents	97,157	100.0

Source: NFIRS 5.0.

Notes: 1. The data presented in this table are raw data counts from the NFIRS dataset summed (not averaged) from 2014 to 2016. They do not represent national estimates of AESs in nonconfined winter fires in occupied residential buildings. They are presented for informational purposes.

2. Total does not add up to 100 percent due to rounding.

## Examples

The following are recent examples of winter residential fires reported by the media:

- ❶ March 2018: One person was seriously injured when a fire broke out in a single family home in Maywood, Illinois. According to fire officials, the fire started in a first-floor bedroom around 7:30 a.m. and spread throughout the house. A male occupant of the home sustained first- and second-degree burns on his arm. He was taken to Loyola University Medical Center for treatment of his injuries. No other injuries were reported, but the home was uninhabitable. The cause of the fire is under investigation.<sup>20</sup>
- ❷ February 2018: Fire crews were dispatched to a chimney fire in a two-story house in Perrysburg, Ohio. The fire broke out just before midnight, and it quickly spread to the second floor and roof of the home. A woman and her dog escaped the fire unharmed, and no other injuries were reported.<sup>21</sup>
- ❸ January 2018: According to the State Fire Marshal's Office, an unattended pot of grease on a kitchen stove was the source of a midafternoon fire that injured one man and damaged the rear of a town house in Taneytown, Maryland. The man received second and third degree burns while attempting to remove the burning pot from the stove, and the fire quickly spread forcing the occupants of the home to escape. The man was transported to Johns Hopkins Bayview Medical Center, but was expected to make a full recovery. No other injuries were reported as a result of the blaze. Structural damage to the home was estimated at \$100,000 with an additional estimated \$25,000 in contents loss.<sup>22</sup>
- ❹ January 2018: An early morning house fire in Addison, Illinois, resulted in the deaths of an elderly couple in their 70s. Fire crews believed the fire started in the kitchen area of the home shortly after 2:30 a.m. and spread to the attic. The couple was found in the bedroom of their home. According to the fire department, there were no working smoke alarms in the home. The cause of the blaze is unknown; however, fire officials determined it was not suspicious.<sup>23</sup>

## NFIRS data specifications for winter residential building fires

Data for this report were extracted from the NFIRS annual Public Data Release files for 2014, 2015 and 2016. Only Version 5.0 data were extracted.

Winter residential building fires were defined using the following criteria:

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid counting a single incident more than once.
- Incident Types 111 to 123 (excluding Incident Type 112):

Incident Type	Description
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

Note: Incident Types 113 to 118 do not specify if the structure is a building.

- Property Use Series 400, which consists of the following:

Property Use	Description
400	Residential, other
419	One- or two-family dwelling, detached, manufactured home, mobile home not in transit, duplex
429	Multifamily dwelling
439	Boarding/Rooming house, residential hotels
449	Hotel/Motel, commercial
459	Residential board and care
460	Dormitory-type residence, other
462	Sorority house, fraternity house
464	Barracks, dormitory

- 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.

- Residential building fires that occurred in the three months of January, February and March.



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.

Information regarding the USFA's national estimates for nonresidential building fires, as well as the data sources used to derive the estimates, can be found in the document "Data Sources and National Estimates Methodology Overview for the U.S. Fire Administration's Topical Fire Report Series (Volume 19)," [https://www.usfa.fema.gov/downloads/pdf/statistics/data\\_sources\\_and\\_national\\_estimates\\_methodology\\_vol19.pdf](https://www.usfa.fema.gov/downloads/pdf/statistics/data_sources_and_national_estimates_methodology_vol19.pdf). This document also addresses the specific NFIRS data elements analyzed in the topical reports, as well as "unknown" data entries and missing data.

To help prevent winter weather-related home fires, the USFA provides safety tips, social media messages, public service announcements, and publications regarding winter fires available at: <https://www.usfa.fema.gov/prevention/outreach/winter.html>.

To request additional information, visit <https://www.usfa.fema.gov/contact.html>. [Provide feedback on this report.](#)

## Notes:

<sup>1</sup>National estimates are based on 2014 to 2016 native Version 5.0 data from the National Fire Incident Reporting System (NFIRS), residential structure fire loss estimates from the National Fire Protection Association's (NFPA's) annual surveys of fire loss, and the U.S. Fire Administration's (USFA's) residential building fire loss estimates: [https://www.usfa.fema.gov/data/statistics/order\\_download\\_data.html](https://www.usfa.fema.gov/data/statistics/order_download_data.html). Further information on the USFA's residential building fire loss estimates can be found in the "National Estimates Methodology for Building Fires and Losses," August 2012, [https://www.usfa.fema.gov/downloads/pdf/statistics/national\\_estimate\\_methodology.pdf](https://www.usfa.fema.gov/downloads/pdf/statistics/national_estimate_methodology.pdf). For information on the NFPA's survey methodology, see the NFPA's report "Fire Loss in the United States During 2016," September 2017, <https://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>. In this topical report, fires are rounded to the nearest 100, deaths to the nearest five, injuries to the nearest 25, and dollar loss to the nearest \$100 million.

<sup>2</sup>In NFIRS Version 5.0, a structure is a constructed item of which a building is one type. In previous versions of the NFIRS, the term "residential structure" commonly referred to buildings where people live. To coincide with this concept, the definition of a residential structure fire for the NFIRS 5.0 includes only those fires where the NFIRS 5.0 structure type is 1 or 2 (enclosed building and fixed portable or mobile structure) with a residential property use. Such structures are referred to as "residential buildings" to distinguish these buildings from other structures on residential properties that may include fences, sheds and other uninhabitable structures. In addition, confined fire incidents that have a residential property use but do not have a structure type specified are presumed to occur in buildings. Nonconfined fire incidents that have a residential property use without a structure type specified are considered to be invalid incidents (Structure Type is a required field) and are not included.

<sup>3</sup>Each year, from 2014 to 2016, there were an estimated 374,900 residential building fires. These fires caused an estimated 2,700 deaths, 11,525 injuries, and \$6.6 billion in property loss (USFA's residential building fire loss estimates).

<sup>4</sup>The percentages shown here are derived from the national estimates of residential building fires as explained in Endnote 1 and the summary data resulting from NFPA's annual fire loss surveys (Haynes, Hylton J.G., "Fire Loss in the United States During 2014," NFPA, September 2015; "Fire Loss in the United States During 2015," NFPA, September 2016; "Fire Loss in the United States During 2016," NFPA, September 2017).

<sup>5</sup>Fire department participation in the NFIRS is voluntary; however, some states do require their departments to participate in the state system. Additionally, if a fire department is a recipient of a Fire Act Grant, participation is required. From 2014 to 2016, 68 percent of the NFPA's annual average estimated 1,328,500 fires to which fire departments responded were captured in the NFIRS. Thus, the NFIRS is not representative of all fire incidents in the U.S. and is not a "complete" census of fire incidents. Although the NFIRS does not represent 100 percent of the incidents reported to fire departments each year, the enormous dataset exhibits stability from one year to the next without radical changes. Results based on the full dataset are generally similar to those based on part of the data.

<sup>6</sup>In the NFIRS, confined fires are defined by Incident Type codes 113 to 118.

<sup>7</sup>The NFIRS distinguishes between "content" and "property" loss. 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. Total loss is the sum of the content loss and the property loss. For confined fires, the expectation is that the fire did not spread beyond the container (or rubbish for Incident Type code 118), and hence, 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.

<sup>8</sup>The average fire death and fire injury loss rates computed from the national estimates do not agree with average fire death and fire injury loss rates computed from NFIRS data alone. The fire death rate computed from national estimates is  $(1,000 \times (980/108,200)) = 9.1$  deaths per 1,000 winter residential building fires, and the fire injury rate is  $(1,000 \times (3,575/108,200)) = 33.0$  injuries per 1,000 winter residential building fires.



<sup>9</sup>“One- and two-family residential buildings” include detached dwellings, manufactured homes, mobile homes not in transit, and duplexes. “Multifamily residential buildings” include apartments, town houses, row houses, condominiums, and other tenement properties. “Other residential buildings” include boarding/rooming houses, hotel/motels, residential board and care facilities, dormitory-type residences, sorority/ fraternity houses, and barracks.

<sup>10</sup>For the purposes of this report, the time of the fire alarm is used as an approximation for the general time at which the fire started. However, in the NFIRS, it is the time at which the fire was reported to the fire department.

<sup>11</sup>Each year, from 2014 to 2016, there were an estimated 374,900 residential building fires.

<sup>12</sup>Total does not add up to 100 percent due to rounding.

<sup>13</sup>The USFA Structure Fire Cause Methodology was used to determine the cause of winter residential building fires. The cause methodology and definitions can be found in the document “National Fire Incident Reporting System Version 5.0 Fire Data Analysis Guidelines and Issues,” July 2011, [https://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs\\_data\\_analysis\\_guidelines\\_issues.pdf](https://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs_data_analysis_guidelines_issues.pdf). Based on the cause definition, 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 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>.

<sup>14</sup>As noted previously, confined building fires are small fire incidents that are limited in scope, are confined to noncombustible containers, rarely result in serious injury or large content loss, and are expected to have no significant accompanying property loss due to flame damage. In the NFIRS, confined fires are defined by Incident Type codes 113 to 118.

<sup>15</sup>Here, **at least** 22 percent of nonconfined winter fires in occupied residential buildings had no smoke alarms present — the 22 percent that were known to not have smoke alarms and some portion (or as many as all) of the fires where the smoke alarm presence was undetermined.

<sup>16</sup>The “2004-2005 National Sample Survey of Unreported Residential Fires,” however, suggests that this may not be the case. It is observed that “if this conjecture is true, it would suggest that the percentage decrease in fire department-attended fires would have been greater than unattended fires in the 20 year period between the surveys.”

<sup>17</sup>In confined fires, the entry “smoke alarm did not alert occupants” can mean no smoke alarm was present; the smoke alarm was present but did not operate; the smoke alarm was present and operated, but the occupant(s) was already aware of the fire; or there were no occupants present at the time of the fire.

<sup>18</sup>As confined fires codes are designed to capture fires contained to noncombustible containers, it is not recommended to code a fire incident as a small-, low- or no-loss confined fire incident if the automatic extinguishing system (AES) operated and contained the fire as a result. The preferred method is to code the fire as a standard fire incident with fire spread confined to the object of origin and provide the relevant information on AES presence and operation.

<sup>19</sup>U.S. Department of Housing and Urban Development and U.S. Census Bureau, American Housing Survey for the United States: 2011, September 2013, “Health and Safety Characteristics-All Occupied Units (National),” Table S-01-AO, <https://www.census.gov/content/dam/Census/programs-surveys/ahs/data/2011/h150-11.pdf> (accessed July 26, 2018).

<sup>20</sup>Romain, Michael, “Family Displaced, One Seriously Injured In March 18 Maywood House Fire,” <https://thevillagefreepress.org>, March 18, 2018, <https://thevillagefreepress.org/2018/03/18/family-displaced-one-seriously-injured-in-march-18-maywood-house-fire/> (accessed July 30, 2018).

<sup>21</sup>“Multiple Crews Respond to Perrysburg House Fire Friday Night,” [www.wtol.com](http://www.wtol.com), Feb. 3, 2018, <http://www.wtol.com/story/37419153/multiple-crews-respond-to-perrysburg-house-fire-friday-night> (accessed July 30, 2018).

<sup>22</sup>Kelvey, Jon, “Cooking Fire The Source Of Taneytown Blaze That Sent One To Hospital,” [www.carrollcountytimes.com](http://www.carrollcountytimes.com), Jan. 30, 2018, <http://www.carrollcountytimes.com/news/local/cc-taneytown-house-fire-20180130-story.html> (accessed July 30, 2018).

<sup>23</sup>“2 Killed In House Fire In Addison,” [cltv.com](http://cltv.com), Jan. 22, 2018, <https://cltv.com/2018/01/22/2-killed-in-house-fire-in-addison/> (accessed July 30, 2018).