Residential Building Fires (2010–2012)

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

- An estimated 366,900 residential building fires were reported to fire departments within the United States each year and caused an estimated 2,465 deaths, 13,400 injuries and $7 billion in property loss.
- Cooking, at 47 percent, was the leading reported cause of residential building fires. Nearly all residential building cooking fires were small, confined fires (92 percent).
- Residential building fire incidence was higher in the cooler months, peaking in January at 11 percent.
- Residential building fires occurred most frequently in the early evening hours, peaking during the dinner hours from 5 to 8 p.m., when cooking fire incidence is high.
- Nonconfined residential building fires most often started in cooking areas and kitchens (21 percent).
- In 48 percent of nonconfined residential building fires, the fire extended beyond the room of origin. The leading reported causes of these larger fires were unintentional or careless actions (16 percent), electrical malfunctions (14 percent), intentional actions (12 percent), and open flames (11 percent).
- The leading reported factor contributing to the ignition category was misuse of material or product (38 percent).
- Smoke alarms were not present in 22 percent of the larger nonconfined fires in occupied residential buildings. This is a high percentage when compared to the 3 percent of households lacking smoke alarms nationally. Additionally, automatic extinguishing systems (AESs) were present in only 4 percent of nonconfined fires in occupied residential buildings.

From 2010 to 2012, fire departments responded to an estimated 366,900 fires in residential buildings each year across the nation.[1, 2] These fires resulted in an annual average of 2,465 deaths, 13,400 injuries and $7 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. National estimates for 2010-2012 show that 82 percent of all fire deaths and 78 percent of all fire injuries occurred in residential buildings. In addition, residential building fires accounted for over half (57 percent) of the total dollar loss from all fires.[3]

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 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.

As part of a series of topical reports that address fires in types of residential buildings, this report addresses the characteristics of all residential building fires, as reported to the National Fire Incident Reporting System (NFIRS). The focus is on fires reported from 2010 to 2012, the most recent data available at the time of the analysis.[4] NFIRS data is used for the analyses throughout this report.

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

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Type of Fire

Building fires are divided into two classes of severity in NFIRS: "confined fires," which are fires confined to certain types of equipment or objects, and "nonconfined fires," which are not confined. Confined building fires are small fire incidents that are limited in extent, staying within pots, fireplaces or certain other noncombustible containers.[5]

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

Table 1. Residential Building Fires by Type of Incident (2010–2012)

Incident Type	Percent
Nonconfined fires	50.9
Confined fires	49.1
Cooking fire, confined to container	35.6
Chimney or flue fire, confined to chimney or flue	5.7
Incinerator overload or malfunction, fire confined	0.2
Fuel burner/boiler malfunction, fire confined	2.9
Commercial compactor fire, confined to rubbish	0.2
Trash or rubbish fire, contained	4.4
Total	100.0

Source: NFIRS 5.0.
Note: Confined fire incident type percentages do not add up to the total confined fires percentage due to rounding.

Loss Measures

Table 2 presents losses, averaged over the three-year period from 2010-2012, of reported residential and nonresidential building fires.[7] The average number of fatalities and injuries per 1,000 residential fires was notably higher than the same loss measures for nonresidential building fires.

Table 2. Loss Measures for Residential and Nonresidential Building Fires (Three-Year Average, 2010–2012)

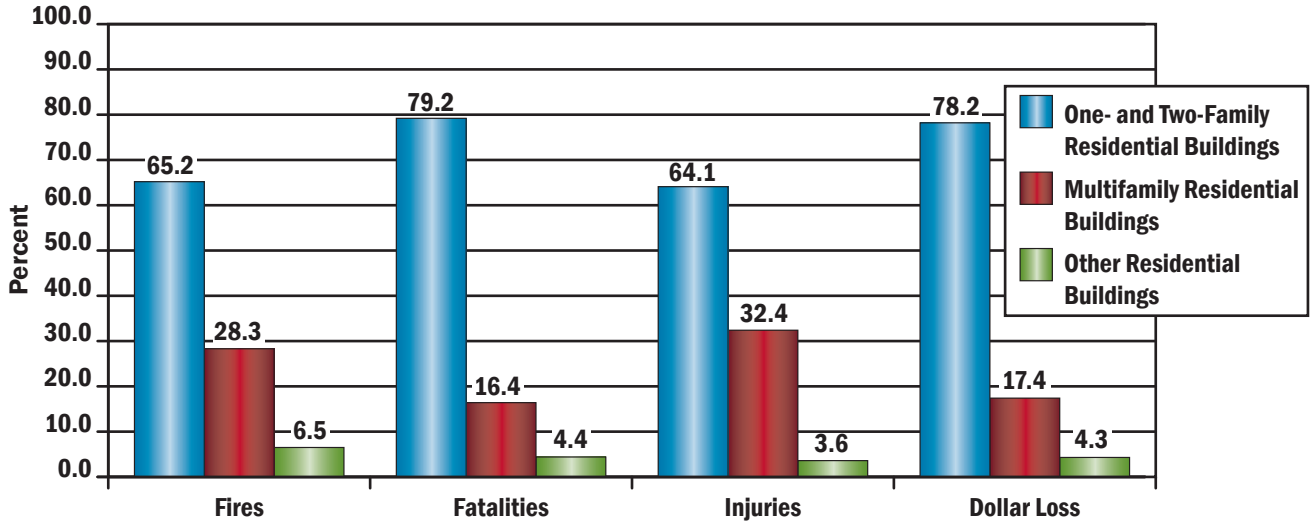
Measure	Residential Building Fires	**Confined** Residential Building Fires	**Nonconfined** Residential Building Fires	Nonresidential Building Fires
Average Loss				
Fatalities/1,000 fires	5.5	0.0	10.7	1.1
Injuries/1,000 fires	29.2	8.2	49.5	9.9
Dollar loss/fire	$15,300	$170	$29,870	$27,350

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 rounded to the nearest $10.
2. The 2010 and 2011 dollar-loss values were adjusted to 2012 dollars.

Property Use

Figure 1 presents the percentage distribution of fire losses by property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings).[8] Consistent with the fact that the majority of residential fires took place in one- and two-family residential buildings (65 percent), the percentages of fatalities (79 percent), injuries (64 percent) and dollar loss (78 percent) were also highest in these types of residences. One explanation for the higher percentages 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. Fire Losses by Property Use (2010–2012)

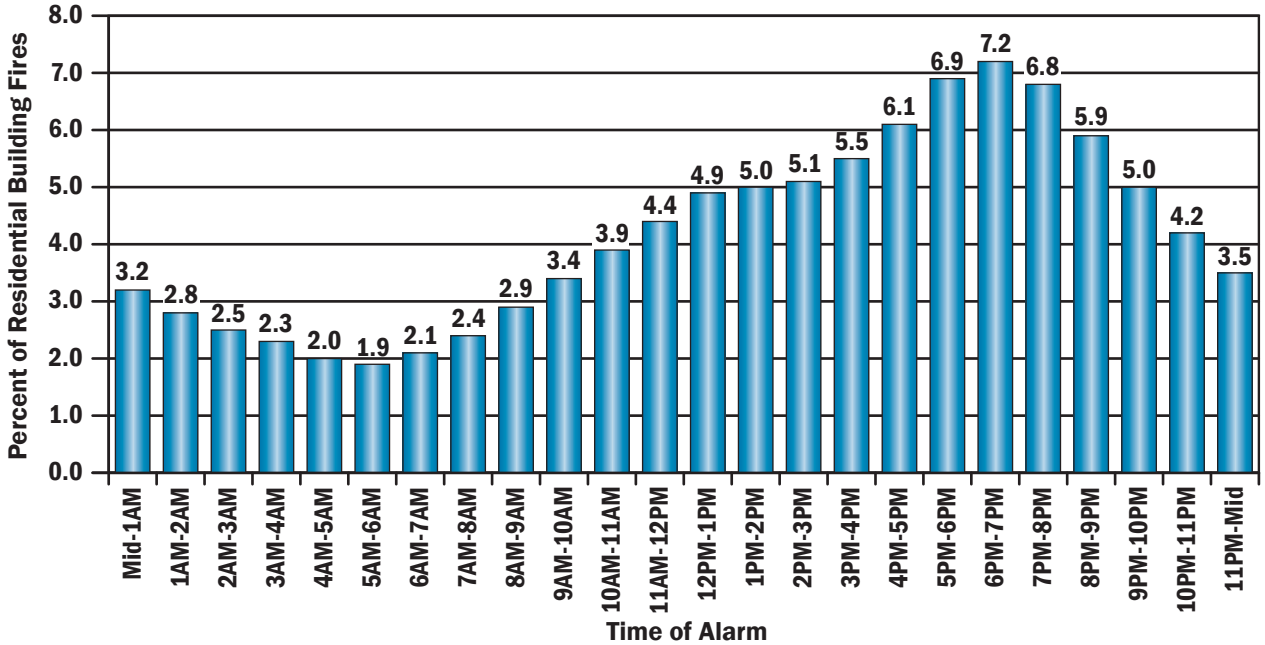


Source: NFIRS 5.0.
Notes: 1. Total percentages of injuries and dollar loss do not add up to 100 percent due to rounding.
2. The 2010 and 2011 dollar-loss values were adjusted to 2012 dollars.

When Residential Building Fires Occur

As shown in Figure 2, residential fires occurred most frequently in the early evening hours, peaking during the dinner hours from 5 to 8 p.m. when cooking fire incidence is high.[9, 10] Cooking fires, discussed later in the Causes of Residential Building Fires section, accounted for 47 percent of residential fires. Fires then declined throughout the night, reaching the lowest point during the early to mid-morning hours (4 to 7 a.m.).

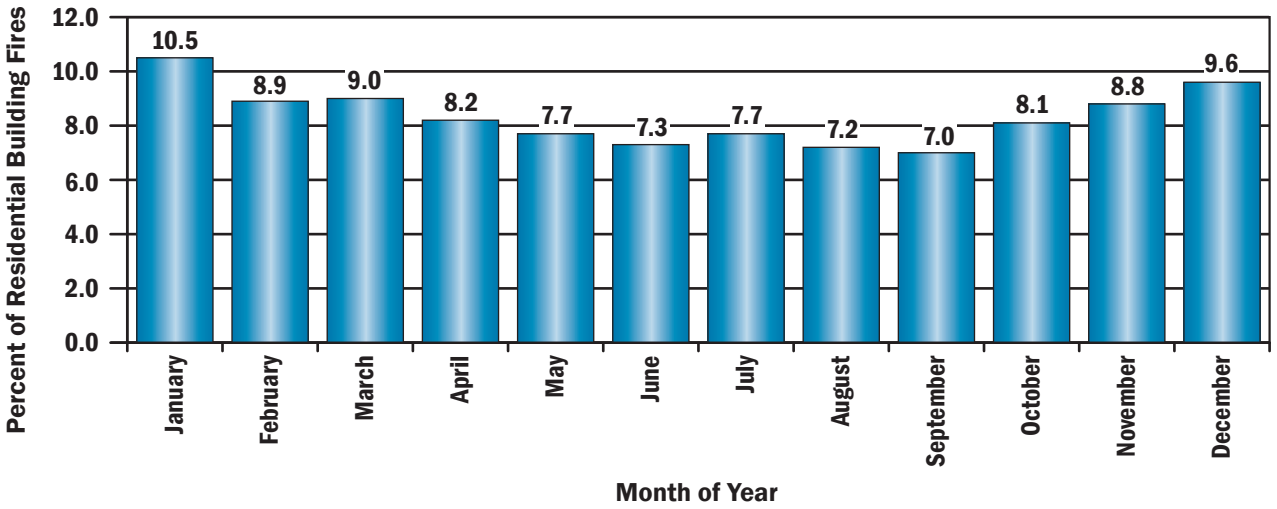
Figure 2. Residential Building Fires by Time of Alarm (2010–2012)



Source: NFIRS 5.0.
Note: Total does not add up to 100 percent due to rounding.

Figure 3 illustrates that residential fire incidence was higher in the cooler months, peaking in January at 11 percent. 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 activities. During the spring and summer months, fire incidence declined steadily, reaching a low in September.

Figure 3. Residential Building Fires by Month (2010–2012)



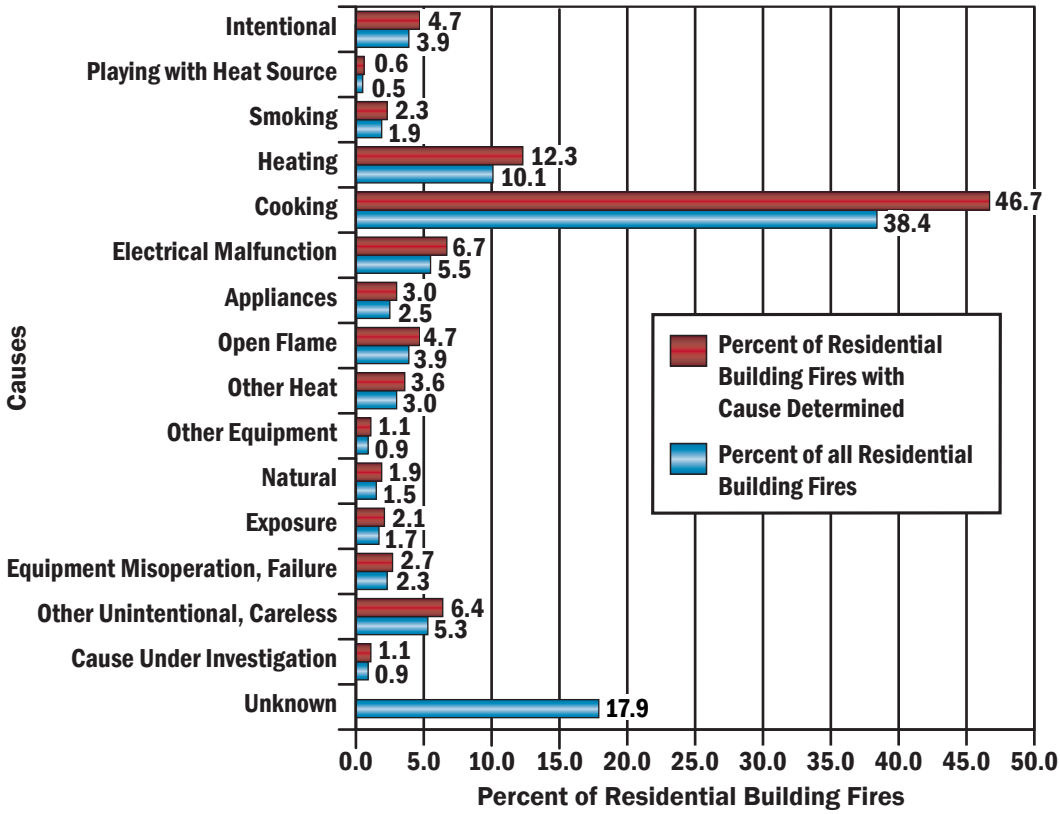
Source: NFIRS 5.0.

Causes of Residential Building Fires

Cooking was the leading reported cause and accounted for 47 percent of all residential fires, as shown in Figure 4.[11] Nearly all of these cooking fires (92 percent) were small, confined fires with limited damage.

The next five reported causes combined accounted for 35 percent of residential fires: fires caused by heating (12 percent); electrical malfunctions, such as short circuits and wiring problems (7 percent); other unintentional or careless actions, a miscellaneous group (6 percent); intentional actions (5 percent);[12] and open flames that resulted from candles, matches and the like (5 percent).

Figure 4. Causes of Residential Building Fires (2010–2012)



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, approximately as shown in the chart above. 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. Totals do not add up to 100 percent due to rounding.

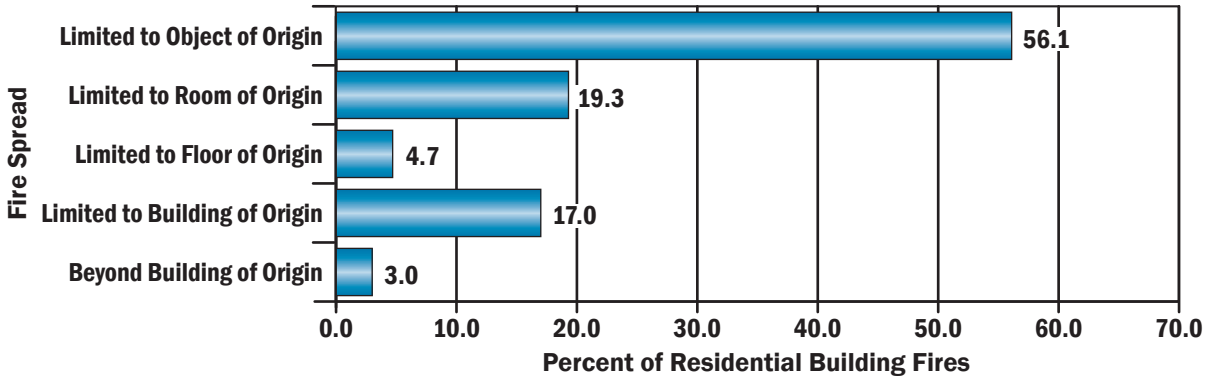
However, when looking at the different types of property use (i.e., one- and two-family residential buildings, multifamily residential buildings, and other residential buildings), there are striking differences in the prevalence of cooking as a reported fire cause. Cooking accounted for 70 percent of multifamily residential building fires and 59 percent of other residential building fires but only 34 percent of one- and two-family building fires. The most persuasive explanation for this difference may be that the smaller confined fires in one- and two-family dwellings are not reported as often to fire departments. They are small and contained, and they do not cause much damage. In addition, only the residents hear the smoke alarm if it is activated. However, these same confined fires in multifamily residences may be reported — if someone else in the complex hears the alarm or smells the fire. Alternatively, if it is a newer complex, the alarms are connected to the building alarm system, and the fire department may automatically be called.

Heating and electrical malfunctions played a larger role in one- and two-family fires than in multifamily fires. One reason for this may be that many one- and two-family residential buildings have fireplaces, chimneys and fireplace-related equipment that most other types of residential properties do not have.[13] This heating equipment difference may also be the explanation for the increase in confined chimney and flue fires (a component of heating fires) seen in one- and two-family fires (8 percent) as compared to multifamily fires (less than 1 percent).

Fire Spread in Residential Building Fires

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

Figure 5. Extent of Fire Spread in Residential Building Fires (2010-2012)



Source: NFIRS 5.0.
Note: Total does not add up to 100 percent due to rounding.

Confined Fires

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).[14] As previously discussed, however, it is known that confined fires accounted for 49 percent of all residential fires. Confined cooking fires — those cooking fires confined to a pot or the oven, for example — accounted for the majority of these confined fires (Table 1).

In addition, the number of confined residential fires was greatest from 5 to 8 p.m. These fires accounted for 60 percent of all residential fires occurring in this time period. Moreover, confined cooking fires accounted for 75 percent of the confined fires and 45 percent of all fires in residential buildings that occurred between 5 and 8 p.m.

Confined residential fires peaked in January, then steadily declined until reaching the lowest incidence in July.

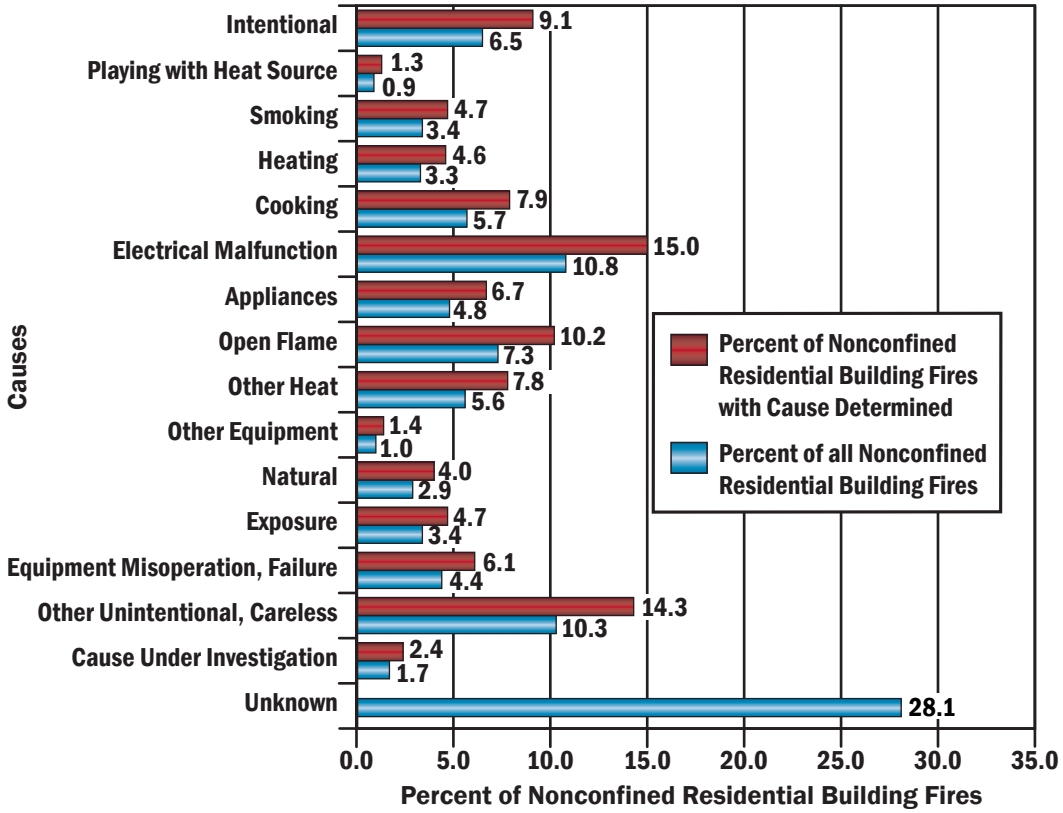
Nonconfined Fires

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

Causes of Nonconfined Residential Building Fires

While cooking was the leading reported cause of residential fires overall, it only accounted for 8 percent of all nonconfined residential fires. At 15 percent, electrical malfunction was the leading reported cause of nonconfined residential fires. Other leading reported causes of nonconfined residential fires were carelessness or other unintentional actions (14 percent), open flames (10 percent), and intentional actions (9 percent) (Figure 6).

Figure 6. Causes of Nonconfined Residential Building Fires (2010–2012)



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, approximately as shown in the chart above. 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. Totals do not add up to 100 percent due to rounding.

Where Nonconfined Residential Building Fires Start (Area of Fire Origin)

Nonconfined residential fires most often started in cooking areas and kitchens (21 percent), as shown in Table 3. Bedrooms (13 percent) and common rooms, living rooms or lounge areas (6 percent) were the next most common areas of fire origin in the home. Smaller but not minor percentages of fires started in laundry areas (5 percent), vacant spaces and attics (5 percent), and exterior wall surfaces (5 percent). Also of interest, 4 percent of nonconfined residential fires started in garages and carports.

Note that these areas of origin do not include areas associated with confined fires. Cooking was the leading reported cause of all residential fires at 47 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 35 percent of nonconfined residential fires that started in the kitchen were cooking fires. Other unintentional or careless actions accounted for 17 percent of kitchen fires, and nonheat-producing equipment that malfunctions or fails accounted for an additional 14 percent of kitchen fires.

Table 3. Leading Areas of Fire Origin in Nonconfined Residential Building Fires (2010–2012)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	21.0
Bedrooms	13.0
Common room, den, family room, living room, lounge	6.4

Source: NFIRS 5.0.

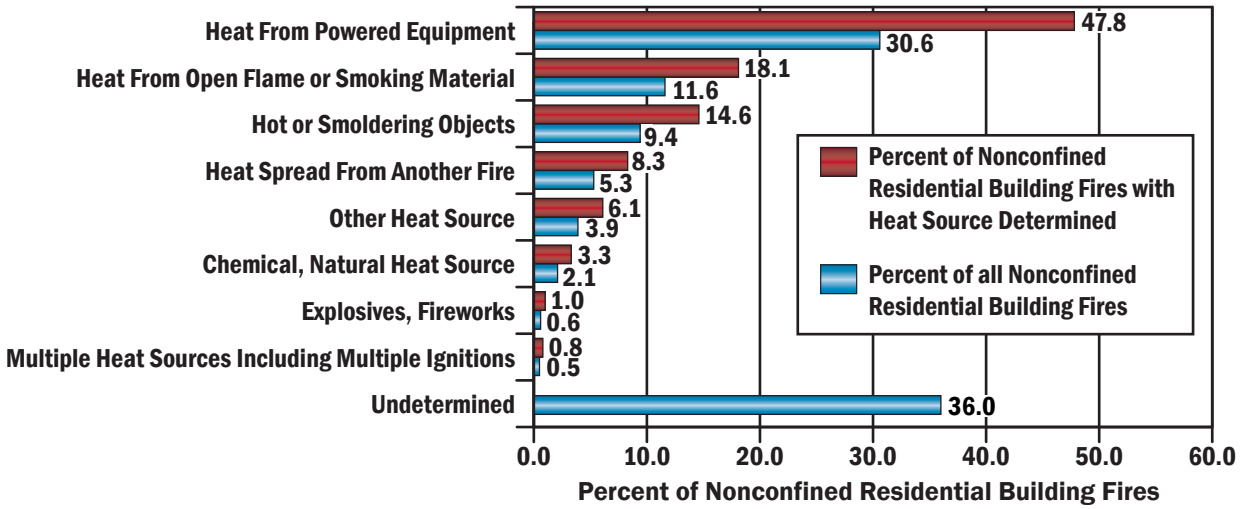
How Nonconfined Residential Building Fires Start (Heat Source)

Figure 7 shows sources of heat categories for nonconfined residential fires. Heat from powered equipment accounted for 48 percent of nonconfined residential fires. This category includes electrical arcing (15 percent); radiated or conducted heat from operating equipment (14 percent); heat from other powered equipment (13 percent); and spark, ember or flame from operating equipment (5 percent).[15]

Heat from open flame or smoking materials accounted for 18 percent of nonconfined residential fires. This category includes such items as cigarettes (5 percent), other miscellaneous open flame or smoking materials (4 percent), lighters and matches (combined, 4 percent), and candles (3 percent).

The third largest category pertains to hot or smoldering objects (15 percent). This category includes miscellaneous hot or smoldering objects (7 percent) and hot embers or ashes (6 percent).

Figure 7. Sources of Heat in Nonconfined Residential Building Fires by Major Category (2010–2012)



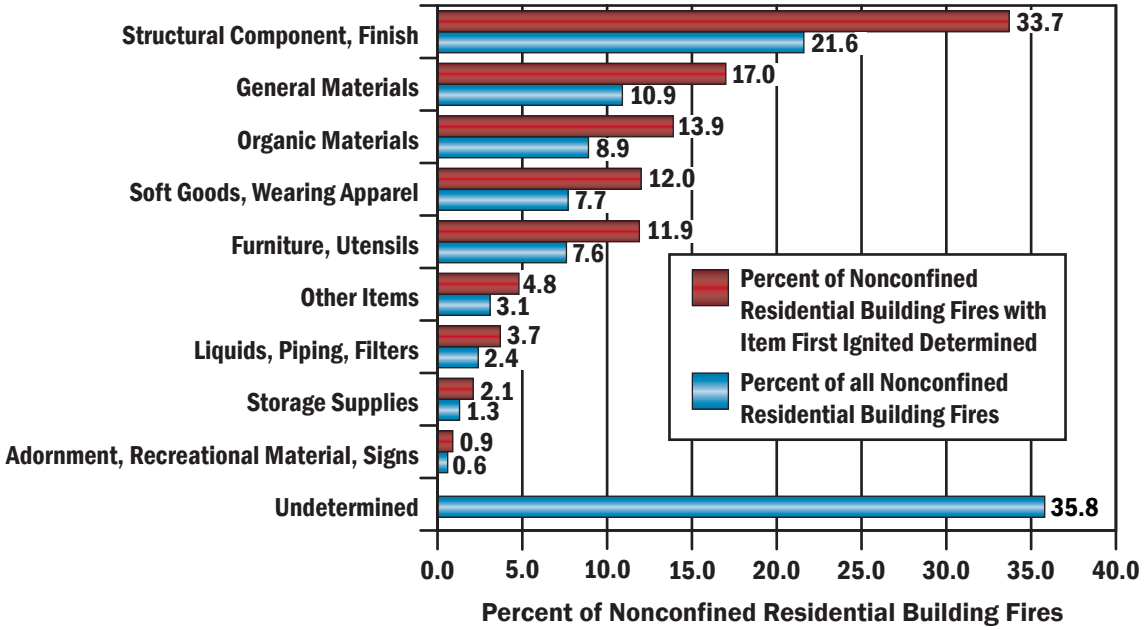
Source: NFIRS 5.0.

What Ignites First in Nonconfined Residential Building Fires

As shown in Figure 8, 34 percent of the items first ignited in nonconfined residential fires where the item is determined fell under the "structural component, finish" category. This category includes structural members or framing and exterior sidewall coverings. The second leading category of items first ignited in nonconfined residential fires was "general materials," which accounted for 17 percent of these fires. "General materials" includes items such as electrical wire, cable insulation, and trash or rubbish. The next three leading categories of nonconfined residential fires were "organic materials" at 14 percent, plus "soft goods, wearing apparel" and "furniture, utensils," each at 12 percent. These categories include items such as cooking materials, clothing, bedding, and upholstered sofas and chairs.

Cooking materials (11 percent); structural member and framing (10 percent); electrical wire, cable insulation (8 percent); and exterior sidewall covering (7 percent) were the specific items most often first ignited in nonconfined residential fires.

Figure 8. Item First Ignited in Nonconfined Residential Building Fires by Major Category (2010–2012)



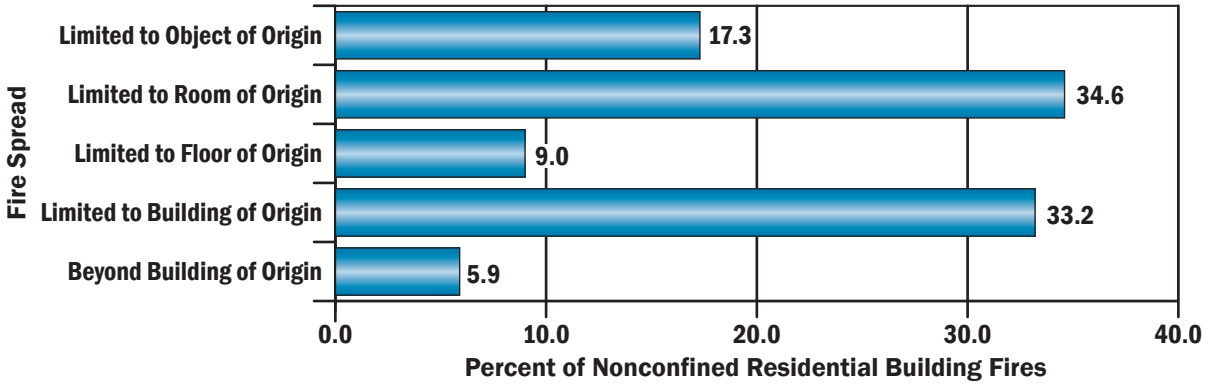
Source: NFIRS 5.0.
Note: Total percent of all nonconfined residential building fires does not add up to 100 percent due to rounding.

Fire Spread in Nonconfined Residential Building Fires

Figure 9 shows the extent of fire spread in nonconfined residential fires. In 52 percent of nonconfined fires, the fire was limited to the object or room of fire origin — in 35 percent of nonconfined fires, the fire was limited to the room of origin; in another 17 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 48 percent of nonconfined residential fires, the fire extended beyond the room of origin. The leading reported causes of these larger fires were unintentional or careless actions (16 percent), electrical malfunctions (14 percent), intentional actions (12 percent), and open flames (11 percent).

Figure 9. Extent of Fire Spread in Nonconfined Residential Building Fires (2010–2012)



Source: NFIRS 5.0.

Factors Contributing to Ignition in Nonconfined Residential Building Fires

Table 4 shows the categories of factors contributing to ignition in nonconfined 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 (13 percent) and abandoned or discarded materials, such as matches or cigarettes (11 percent).

Electrical failures and malfunctions contributed to 22 percent of nonconfined residential fires. Operational deficiency was the third leading category at 16 percent. Unattended equipment was the leading factor in the operational deficiency category and accounted for 8 percent of all nonconfined residential fires.

Table 4. Factors Contributing to Ignition for Nonconfined Residential Building Fires by Major Category (Where Factors Contributing to Ignition Are Specified, 2010–2012)

Factors Contributing to Ignition Category	Percent of Nonconfined Residential Building Fires (Unknowns Apportioned)
Misuse of material or product	37.8
Electrical failure, malfunction	21.5
Operational deficiency	15.8
Fire spread or control	10.8
Mechanical failure, malfunction	6.9
Other factors contributing to ignition	6.3
Natural condition	4.0
Design, manufacture, installation deficiency	2.1

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 Residential Building Fires

Technologies to detect and extinguish fires have been major contributors to the drop in fire fatalities and injuries over the past 35 years. Smoke alarms are now present in the majority of residential buildings. 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 to 7 are the raw counts from the NFIRS dataset and are not scaled to national estimates of smoke alarms in residential fires. In addition, 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 Fires

Overall, smoke alarms were reported as present in 42 percent of nonconfined residential fires (Table 5). In 28 percent of nonconfined residential fires, there were no smoke alarms present. In another 30 percent of these fires, firefighters were unable to determine if a smoke alarm was present. Thus, smoke alarms were potentially missing in between 30 and 58 percent of fires with the ability to spread and possibly result in fatalities.

Table 5. Presence of Smoke Alarms in Nonconfined Residential Building Fires (2010–2012)

Presence of Smoke Alarms	Percent
Present	42.3
None present	27.5
Undetermined	30.2

Source: NFIRS 5.0.

While 17 percent of all nonconfined residential fires occurred in residential buildings that are **not** currently or routinely occupied, these buildings — which are under construction, undergoing major renovation, 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 6 percent of all nonconfined 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 fires in occupied residential buildings only.

Smoke Alarms in Nonconfined Fires in Occupied Residential Buildings

Smoke alarms were reported as present in 48 percent of nonconfined fires in occupied residential buildings (Table 6). In 22 percent of nonconfined 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 47 percent of 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:

- Present and operated — 28 percent.
- Present but did not operate — 12 percent (alarm did not operate, 6 percent; fire too small, 6 percent).
- 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 13 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.[16]

Nationally, only 3 percent of households lack smoke alarms.[17] At least 22 percent of nonconfined fires in occupied residential buildings had no smoke alarms present — and perhaps more if fires without information on smoke alarms could be factored in.[18] 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.[19]

Table 6. NFIRS Smoke Alarm Data for Nonconfined Fires in Occupied Residential Buildings (2010–2012)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		20,313	6.1
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	68,304	20.4
		Smoke alarm alerted occupants, occupants failed to respond	3,165	0.9
		No occupants	11,299	3.4
		Smoke alarm failed to alert occupants	2,430	0.7
		Undetermined	9,468	2.8
	Smoke alarm failed to operate		20,303	6.1
	Undetermined		26,436	7.9
None present			74,224	22.1
Undetermined			99,589	29.7
Total incidents			335,531	100.0

Source: NFIRS 5.0.

Notes: 1. The data presented in this table are raw data counts from the NFIRS dataset. They do not represent national estimates of smoke alarms in nonconfined 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 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 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 44 percent of the reported confined residential fires (Table 7). In other words, residents received a warning from a smoke alarm in over 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 residential fires.[20] In 38 percent of these confined fires, the smoke alarm effectiveness was unknown.

Table 7. NFIRS Smoke Alarm Data for Confined Residential Building Fires (2010–2012)

Smoke Alarm Effectiveness	Count	Percent
Smoke alarm alerted occupants	169,709	43.8
Smoke alarm did not alert occupants	69,681	18.0
Unknown	148,113	38.2
Null/Blank	1	0.0
Total incidents	387,504	100.0

Source: NFIRS 5.0.
Note: The data presented in this table are raw data counts from the NFIRS dataset. They do not represent national estimates of smoke alarms in confined residential building fires. They are presented for informational purposes.

Automatic Extinguishing Systems in Nonconfined Fires in Occupied Residential Buildings

AES data is available for both confined and nonconfined fires, although for confined fires, the data is also very limited in scope. In confined residential building fires, an AES was present in 1 percent of reported incidents.[21] In addition, the following AES analyses focus on nonconfined 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 fires in occupied residential buildings (Table 8). Sprinklers are required by code in hotels and many multifamily residences. 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. At present, however, they are largely absent in residences nationwide.[22]

Table 8. NFIRS Automatic Extinguishing System Data for Nonconfined Fires in Occupied Residential Building Fires (2010–2012)

Automatic Extinguishing System Presence	Count	Percent
Automatic extinguishing system present	12,530	3.7
Partial system present	517	0.2
Automatic extinguishing system not present	295,300	88.0
Unknown	27,184	8.1
Total incidents	335,531	100.0

Source: NFIRS 5.0.
Note: The data presented in this table are raw data counts from the NFIRS dataset. They do not represent national estimates of AESs in nonconfined fires in occupied residential buildings. They are presented for informational purposes.

Examples

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

- June 2014: A family of six people, including two children, was killed in an early morning house fire in Newark, New Jersey. Upon arrival, firefighters found the single-family, three-story house fully engulfed in flames. Firefighters battled the fire from inside for two hours but eventually had to retreat outside after being overwhelmed by flames. The fire also spread to the house next door, where residents escaped without injury. Both homes were destroyed, and the cause of the fire remains under investigation.[23]
- June 2014: The Delaware State Fire Marshal's Office determined a late evening house fire in Glasgow, Delaware, to be accidental and caused by an unattended stove that resulted in the ignition of cooking oil. Five adults and three children were displaced as a result of the fire but escaped without injury. Damages to the house were estimated at $65,000.[24]
- May 2014: Two people died in an accidental Dayton, Ohio, house fire that firefighters believe was caused by smoking. Firefighters found the home engulfed in flames when they arrived shortly after 1 a.m. and attempted to rescue the occupants of the home. Two of the three occupants, a 15-year-old and a 37-year-old, were found inside the home but could not be saved. The third occupant was able to escape and was transported to a local hospital. A dog and cat also died in the fire. Authorities reported that the two smoke alarms found in the house were not functional.[25]

NFIRS Data Specifications for Residential Building Fires

Data for this report were extracted from the NFIRS annual Public Data Release files for 2010, 2011 and 2012. Only Version 5.0 data were extracted.

Residential building fires were defined using the following criteria:

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) were excluded to avoid double counting of incidents.
- 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.
    - 2—Fixed portable or mobile structure, and structure type not specified (null entry).
  - For Incident Types 111 and 120 to 123:
    - 1—Enclosed building.
    - 2—Fixed portable or mobile structure.

The analyses contained in this report reflect the current methodologies used by USFA. USFA is committed to providing the best and most currently available 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 USFA's national estimates for residential 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 U.S. Fire Administration's Topical Fire Report Series (Volume 15)," http://www.usfa.fema.gov/downloads/pdf/statistics/data_sources_and_national _estimates_methodology.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 request additional information or to comment on this report, visit http://www.usfa.fema.gov/contact.html.

Notes:

[1]National estimates are based on 2010-2012 native Version 5.0 data from NFIRS, residential structure fire loss estimates from the National Fire Protection Association's (NFPA's) annual surveys of fire loss, and USFA's residential building fire loss estimates: http://www.usfa.fema.gov/data/statistics/order_download_data.html. Further information on USFA's residential building fire loss estimates can be found in the "National Estimates Methodology for Building Fires and Losses," August 2012, http://www.usfa.fema.gov/downloads/pdf/statistics/national_estimate_methodology.pdf. For information on NFPA's survey methodology, see NFPA's report on fire loss in the U.S.: http://www.nfpa.org/~/media/Files/Research/NFPA%20reports/Overall%20Fire%20Statistics/osfireloss.pdf. 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.

[2]In NFIRS Version 5.0, a structure is a constructed item of which a building is one type. In previous versions of 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 NFIRS 5.0 has, therefore, changed to include 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.

[3]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 (Karter, Jr., Michael, J., "Fire Loss in the United States During 2012," NFPA, September 2013; "Fire Loss in the United States During 2011," NFPA, September 2012; "Fire Loss in the United States During 2010," NFPA, September 2011).

[4]Fire department participation in 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 2010 to 2012, 70 percent of NFPA's annual average estimated 1,365,300 fires to which fire departments responded were captured in NFIRS. Thus, NFIRS is not representative of all fire incidents in the U.S. and is not a "complete" census of fire incidents. Although 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.

[5]In NFIRS, confined fires are defined by Incident Type codes 113-118.

[6]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.

[7]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*(2,465/366,900)) = 6.7 deaths per 1,000 residential building fires, and the fire injury rate is (1,000*(13,400/366,900)) = 36.5 injuries per 1,000 residential building fires.

[8] "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, hotels/motels, residential board and care facilities, dormitory-type residences, sorority/fraternity houses, and barracks.

[9] 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 NFIRS, it is the time at which the fire was reported to the fire department.

[10] U.S. Fire Administration, "Cooking Fires in Residential Buildings (2008-2010)," Volume 13, Issue 12, January 2013, http://www.usfa.fema.gov/downloads/pdf/statistics/v13i12.pdf.

[11] The USFA Structure Fire Cause Methodology was used to determine the cause of 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, http://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs_data_analysis_guidelines_issues.pdf.

[12] 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, http://www.fbi.gov/about-us/cjis/ucr/ucr.

[13] The American Housing Survey does not indicate the number of fireplaces, chimneys and fireplace-related equipment per se. It does collect data on fireplaces, etc., as the primary heating unit, which applies to this analysis. U.S. Department of Housing and Urban Development (HUD) and U.S. Census Bureau, 2011 American Housing Survey, "General Characteristics by Units in Structure-All Occupied Units (National)," Table C-12-AO, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=AHS_2011_C12AO&prodType=table.

[14] 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 NFIRS, confined fires are defined by Incident Type codes 113-118.

[15] Total does not add up to 48 percent due to rounding.

[16] Total does not add up to 100 percent due to rounding.

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

[18] Here, **at least** 22 percent of nonconfined 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.

[19] 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."

[20] 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.

[21] 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 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.

[22] HUD and U.S. Census Bureau, 2011 American Housing Survey, "Health and Safety Characteristics-All Occupied Units (National)," Table S-01-AO, http://factfinder2.census.gov/faces/tableservices/jsf/pages/productview.xhtml?pid=AHS_2011_S01AO&prodType=table.

[23] "Newark House Fire Kills 6 People, Including Two Children," http://newyork.cbslocal.com, June 15, 2014, http://newyork.cbslocal.com/2014/06/15/newark-house-fire-kills-6-people/ (accessed June 16, 2014).

[24] Ruth Bryna, "Glasgow House Fire Caused by Cooking Oil, Unattended Stove," www.wdel.com, June 15, 2014, http://www.wdel.com/story.php?id=60210 (accessed June 16, 2014).

[25] Beairshelle Edme, "Fatal Fire Ruled Accidental, Smoking Probable Cause," http://wdtn.com, May 1, 2014, http://wdtn.com/2014/05/01/two-dead-in-dayton-house-fire (accessed June 17, 2014).