Topical Fire Report Series

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Multifamily Residential Building Fires (2017-2019)

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 (USFA's) National Fire Incident Reporting System (NFIRS). Each topical report briefly addresses the nature of the specific fire or fire-related topic, highlights important findings from the data, and may suggest other resources to consider for further information. 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 as reported to the NFIRS

- Each year, from 2017 to 2019, an estimated average of 106,700 multifamily residential building fires were reported to fire departments within the United States. These fires caused an estimated annual average of 400 deaths, 3,875 injuries and $1.7 billion in property loss.
- Multifamily residential building fires accounted for 29% of all residential building fires.
- Small, confined fires accounted for 71% of multifamily residential building fires.
- Multifamily residential building fire incidence was slightly higher in the cooler months, peaking in January at 10%.
- Cooking, at 74%, was the leading cause of multifamily residential building fires. Of these cooking fires, 95% were small, confined fires with limited damage.
- Cooking areas and kitchens (33%) were the primary areas of origin for nonconfined multifamily residential building fires.
- In 31% of nonconfined multifamily residential building fires, the fire extended beyond the room of origin. The leading cause of these larger fires was other unintentional, careless actions (14%). In contrast, 54% of all other nonconfined residential building fires (excluding multifamily buildings) extended beyond the room of origin.
- Smoke alarms were present in 64% of nonconfined multifamily residential building fires.
- Full or partial automatic extinguishing systems (AESs), including residential sprinklers, were present in 15% of nonconfined multifamily residential buildings.

From 2017 to 2019, multifamily residential building fires accounted for an annual estimated average of 106,700 reported fires. These fires resulted in an annual estimated average of 400 deaths, 3,875 injuries and $1.7 billion in property loss.[1, 2] In addition, multifamily residential building fires accounted for 29% of all residential building fires responded to by fire departments across the nation.[3]

Multifamily residential buildings include structures such as apartments, town houses, row houses, condominiums and other tenement properties. Multifamily residential buildings tend to have stricter building codes than one- and two-family buildings.[4] Many multifamily residential buildings are rental properties, and they are usually required to comply with more stringent fire prevention statutes and regulations involving smoke alarms and sprinkler systems. As a result of the type of building, the more stringent building and code requirements, and the fact that more people live in the building itself than in the predominant one- and two-family residences, fires in multifamily residential buildings tend to have a different profile than fires in other types of residences.

A major difference in the multifamily residential building fire profile is seen in cooking fires. Cooking was the leading cause of 74% of multifamily residential building fires, almost twice that of all other types of residential buildings. Multifamily residential buildings also tend to have central heating systems that are maintained by professionals instead of homeowners, thus there are typically fewer heating fires from poor maintenance or misuse than in one- and two-family dwellings. Also, fire problems related to fireplaces, chimneys and fireplace-

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related equipment tend to occur less often in multifamily heating fires since multifamily residential buildings generally lack these features. Finally, multifamily residential buildings usually have fewer fires caused by electrical problems due to construction materials, building codes and professional maintenance.

This topical report is an update to the "Multifamily Residential Building Fires (2013-2015)" (Volume 18, Issue 3) report, released in June 2017. As part of a series of topical reports that address fires in the major residential building types, the remainder of this report addresses the characteristics of multifamily residential building fires as reported to the NFIRS. Comparisons to one- and two-family residential building fires are noted based on analyses from the "One- and Two-Family Residential Building Fires (2017-2019)" (Volume 21, Issue 6) topical report.

The focus is on fires reported from 2017 to 2019, the most current data available at the time of the analysis.[5] Complete or full years of data are required for statistical analyses presented in these topical reports. Although the NFIRS data for a calendar year are often reported to the USFA throughout the year, fire departments and or states have until the official cutoff date as set forth by the National Fire Data Center to submit their data to the USFA. Typically, this cutoff date is July 1 after the end of the previous calendar year. This provides states with ample time to perform data quality checks and correct questionable incidents before they are set to released status in the national production database and Enterprise Data Warehouse. Once the data are released to the USFA, additional data quality reviews are completed before the data are prepared for public release.

For this report, the terms "residential fires" and "multifamily fires" are synonymous with "residential building fires" and "multifamily residential building fires," respectively. "Multifamily fires" is used throughout the body of this report; the findings, tables, figures, headings and endnotes reflect the full category of "multifamily residential building fires."

Type of fire

Building fires are divided into 2 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.[6] 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.[7] Nonconfined fires extend beyond certain types of equipment or objects. They are generally larger fires resulting in more serious injury and larger losses of property and content.

The smaller, confined fires accounted for 71% of the multifamily fires, with cooking fires as the predominant type of confined fire (Table 1). Nonconfined fires made up the remaining 29% of multifamily fires. In contrast to one- and two-family residences, the relative proportions of confined and nonconfined fires were reversed; nonconfined fires accounted for the bulk of one- and two-family building fires (60%), and confined fires accounted for the remaining 40%.

Table 1. Multifamily residential building fires by type of incident (2017-2019)

Incident type	Percent
Nonconfined fires	28.7
Confined fires	71.3
Cooking fire, confined to container	63.3
Chimney or flue fire, confined to chimney or flue	0.4
Incinerator overload or malfunction, fire confined	0.1
Fuel burner/boiler malfunction, fire confined	2.0
Commercial compactor fire, confined to rubbish	0.7
Trash or rubbish fire, contained	4.8
Total	100.0

Source: NFIRS 5.0.

Loss measures

Table 2 presents losses, averaged over this 3-year period from 2017 to 2019, of reported multifamily fires and all other residential fires.[8] The average number of fatalities per 1,000 multifamily fires was less than half that of the same loss measure for all other residential building fires. The average dollar loss per fire for multifamily fires was more than half that of the same loss measure for all other residential building fires. In addition, the average loss measures for nonconfined multifamily fires were substantially higher than the same loss measures for confined multifamily fires; this is to be expected, however, since confined fires rarely result in serious injury or large content loss.

Table 2. Loss measures for multifamily residential building fires (3-year average, 2017-2019)

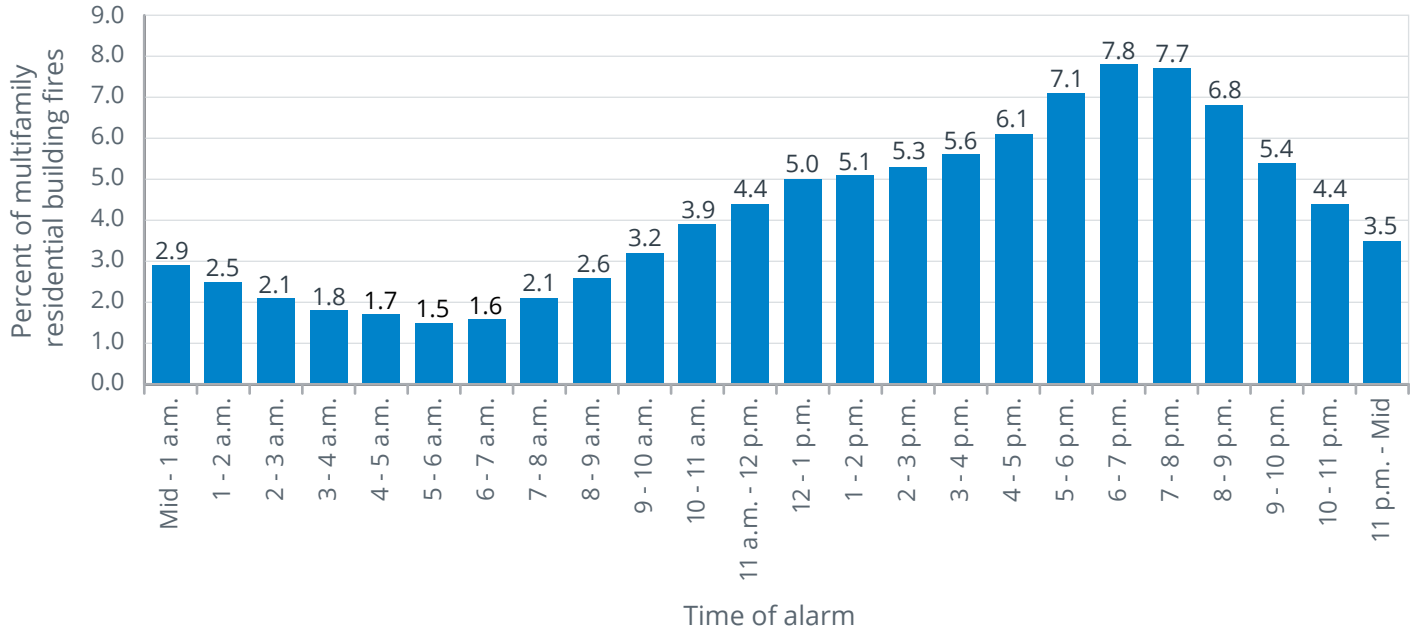
Measure	Multifamily residential building fires	Confined multifamily residential building fires	Nonconfined multifamily residential building fires	Residential building fires (excluding multifamily)
Average Loss				
Fatalities/1,000 fires	3.1	0.0	10.7	7.5
Injuries/1,000 fires	29.3	7.0	84.4	23.9
Dollar loss/fire	$13,730	$190	$47,300	$20,750

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 2017 and 2018 dollar-loss values were adjusted to 2019 dollars.

When multifamily residential building fires occur

As shown in Figure 1, multifamily fires occurred most frequently in the evening, peaking during dinner hours from 6 to 8 p.m.[9] This peak period was consistent with the major cause of fires, cooking (discussed in the next section, "Causes of Multifamily Residential Building Fires"), and accounted for 16% of multifamily fires. Fires then declined throughout the night, reaching the lowest point during the morning hours from 5 to 6 a.m.

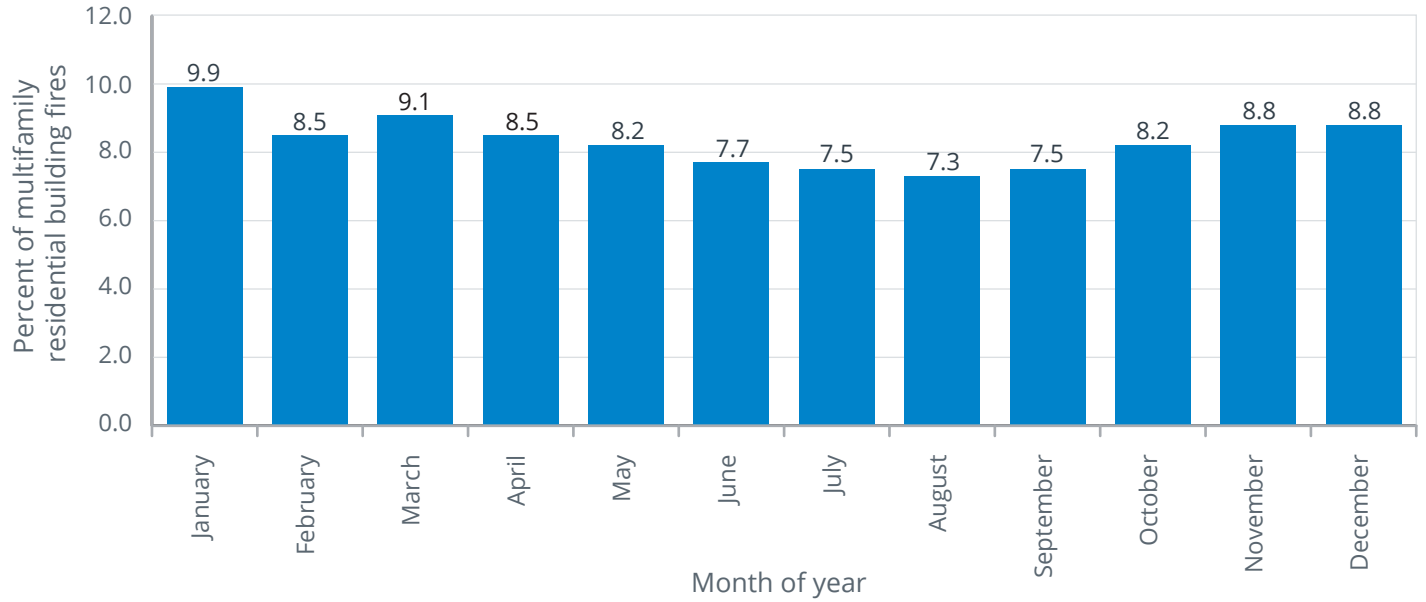
Figure 1. Multifamily residential building fires by time of alarm (2017-2019)



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

Figure 2 illustrates that multifamily fire incidence was slightly higher in the cooler months, peaking in January at 10%. This peak was partially the result of an increase in heating fires. Multifamily fire incidence was lowest during the months of June through September reaching a low in August at 7%.

Figure 2. Multifamily residential building fires by month (2017-2019)



Source: NFIRS 5.0.

Causes of multifamily residential building fires

As shown in Table 3, cooking was by far the leading cause of multifamily fires, accounting for 74% of all multifamily fires.[10] The majority of all cooking fires (95%) in multifamily residences were small, confined fires with limited damage. The next 7 causes combined accounted for 19% of multifamily fires: heating (4%); other unintentional, careless actions (4%); electrical malfunctions (3%); open flames (2%); other heat sources (2%); appliances (2%); and intentional actions (2%).[11]

Table 3. Leading and secondary causes of multifamily residential building fires (2017-2019)

Cause	Percent (unknowns apportioned)
Cooking	74.4
Heating	3.9
Other unintentional, careless	3.5
Electrical malfunction	2.5
Open flame	2.4
Other heat	2.2
Appliances	2.1
Intentional	2.1

Source: NFIRS 5.0.

The fire cause profile for multifamily buildings was different from the fire cause profile for one- and two-family buildings. While the 2 leading causes, cooking and heating, were the same, cooking was a substantially more prevalent cause of multifamily fires (74%) than of one- and two-family fires (37%). Heating was a much smaller cause of multifamily fires (4%) than of one- and two-family fires (12%).

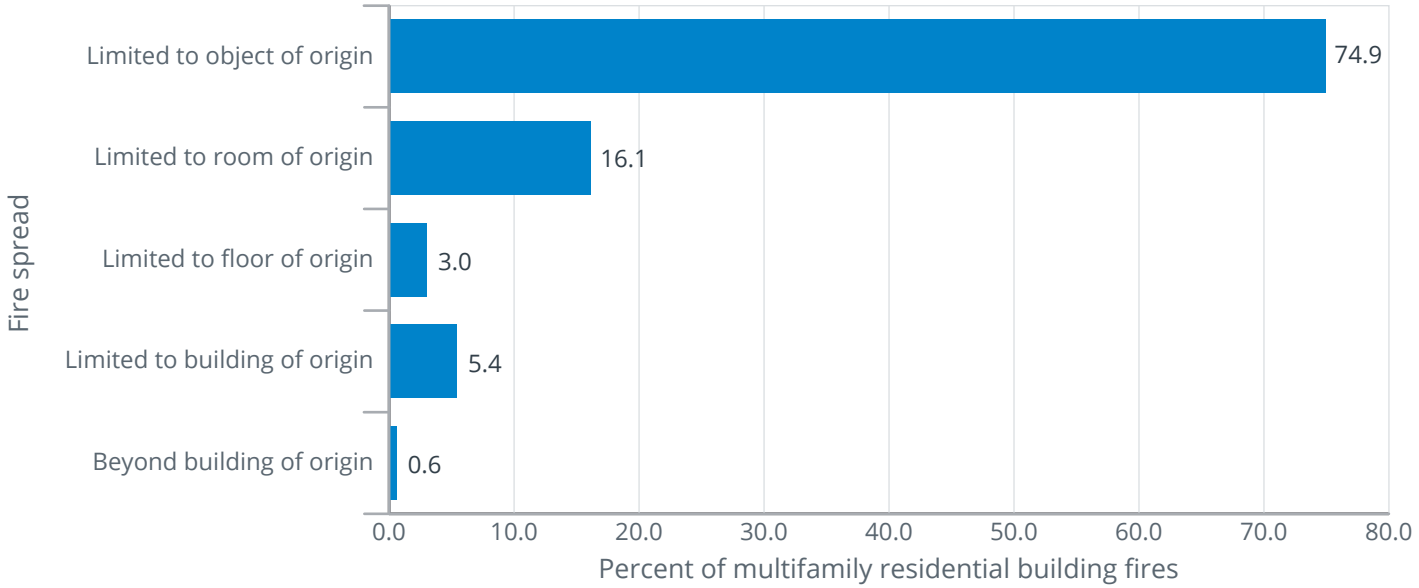
One explanation for the importance of cooking as a cause of multifamily fires may lie in the construction materials, building codes and professional maintenance of the buildings. For example, many multifamily residential buildings tend to have systems — heating and electrical systems, for instance — that are regularly maintained by professionals. As a result, there are fewer fires from lack of maintenance or misuse than in one- and two-family housing. Multifamily buildings also have fewer fire problems related to fireplaces, chimneys and fireplace-related equipment than one- and two-family residential buildings, since multifamily buildings generally lack this equipment.[12]

It may also be that confined cooking fires are reported to the fire department more often in multifamily residences. While these fires are small and contained, and they do not cause much damage, someone may hear the alarm in the complex (if the fire is large enough to activate it) or may smell smoke and notify the building manager or the fire department. If it is a newer complex, the alarms are often connected to the building alarm system, and the fire department is automatically called. These same small cooking fires in one- and two-family residences may occur as frequently but may not be reported as often. As little damage occurs and only the residents hear the smoke alarm or smell the smoke, the residents may elect not to call the fire department.

Fire spread in multifamily residential building fires

Three-quarters of multifamily fires (75%) were limited to the object of origin (Figure 3). These fires were primarily coded as confined fires in the NFIRS (small, low-loss fires that were confined to noncombustible containers); 93% of multifamily fires limited to the object of origin were reported as confined fires. Only 9% of multifamily fires extended beyond the room of origin, far fewer than in one- and two-family residences (33%).

Figure 3. Extent of fire spread in multifamily residential building fires (2017-2019)



Source: NFIRS 5.0.

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 limited to the object of origin are counted as confined fires.[13]) For example, a fire contained to a chair or clothes dryer is not defined as a confined fire in the NFIRS 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.

Because 71% of multifamily fires are confined, the profiles of when multifamily confined fires occurred and their causes dominated the overall multifamily fire profile. As shown in Table 1, confined cooking fires accounted for 63% of multifamily fire incidents and dominated the cause of multifamily fires.

The occurrence of confined multifamily fires was greatest during the hours from 5 to 8 p.m., when they accounted for 77% of all multifamily fires that occurred during this period. Moreover, confined cooking fires accounted for 91% of the confined fires and 70% of all fires in multifamily buildings that occurred during this time period.

Confined multifamily fires also peaked in January and declined throughout the spring, reaching the lowest incidence during the month of July.

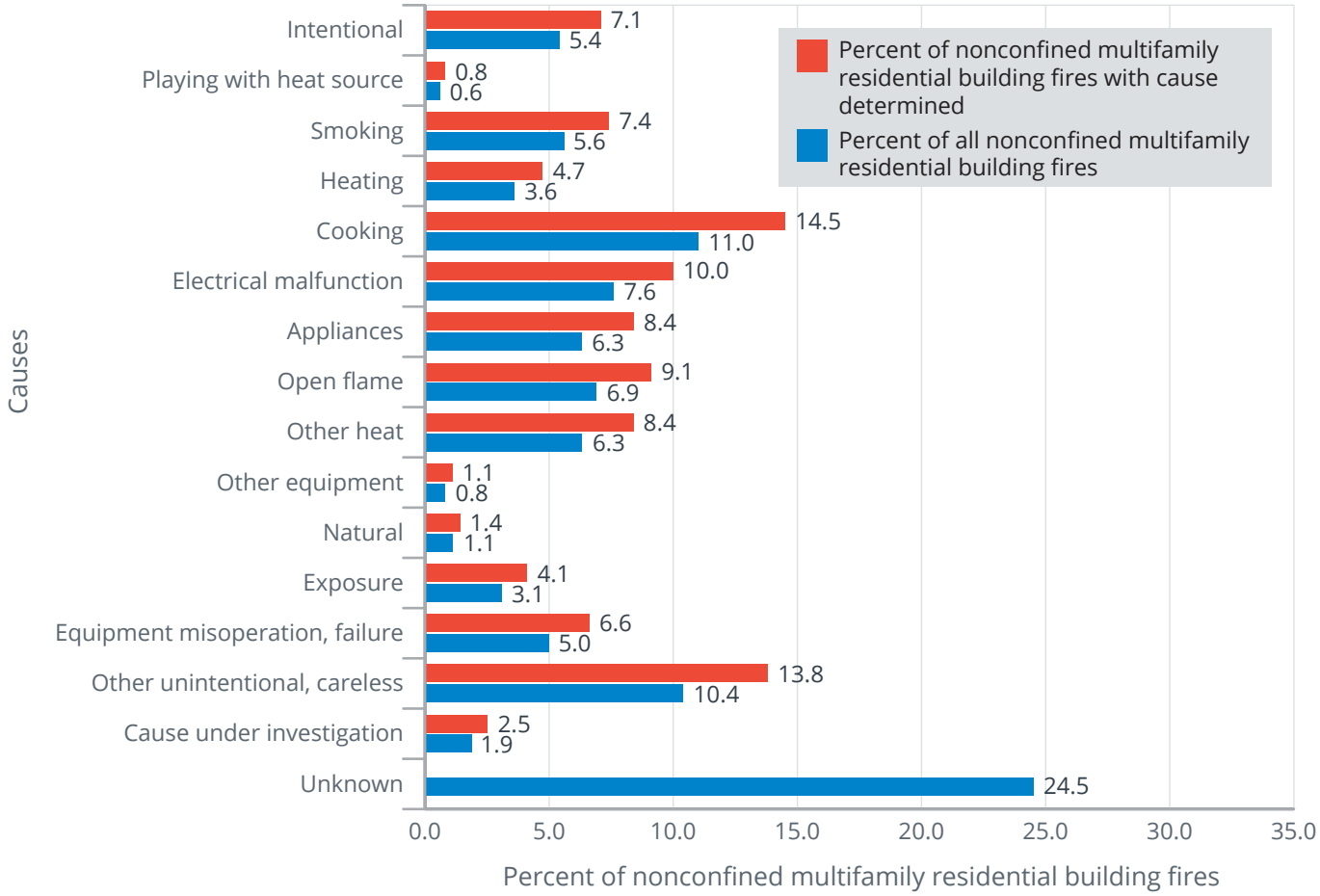
Nonconfined fires

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 the NFIRS.

Causes of nonconfined multifamily residential building fires

While cooking was the leading cause for multifamily fires overall (74%), it only accounted for 15% of all nonconfined multifamily fires (Figure 4). The next leading causes were other unintentional, careless actions (14%); electrical malfunctions (10%); open flames, such as candles or matches (9%); other heat sources (8%); and appliances (8%). These 5 causes accounted for 50% of the fires.[14]

Figure 4. Causes of nonconfined multifamily residential building fires (2017-2019)



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 1 of 16 cause groupings using a hierarchy of definitions, as shown in this 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 percentages do not add up to 100% due to rounding.

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

Nonconfined multifamily fires most often started in cooking areas and kitchens (33%), as shown in Table 4. The next leading area of fire origin was bedrooms (13%). Additional fires started in family rooms or living rooms (6%), exterior balconies or unenclosed porches (6%), bathrooms (5%), and laundry areas (5%). These areas of origin do not include areas associated with confined fires, as that information generally is not reported for confined fires. Cooking fires were a substantial percentage of all multifamily fires. Therefore, it is likely that the kitchen was the leading area of fire origin for all multifamily fires.

Nonetheless, nonconfined multifamily fires that started in the kitchen were not exclusively cooking fires — only 40% of fires that started in the kitchen were cooking fires. Other unintentional, careless actions (18%) and equipment misoperation or failure (12%) accounted for another 30% of these kitchen fires. Additional nonconfined multifamily fires that started in the kitchen were caused by other heat sources (9%) and appliances (6%).

Table 4. Leading areas of fire origin in nonconfined multifamily residential building fires (2017-2019)

Areas of fire origin	Percent (unknowns apportioned)
Cooking area, kitchen	33.4
Bedrooms	12.6
Common room, den, family room, living room, lounge	6.2
Exterior balcony, unenclosed porch	5.8
Bathrooms	4.8
Laundry area	4.8

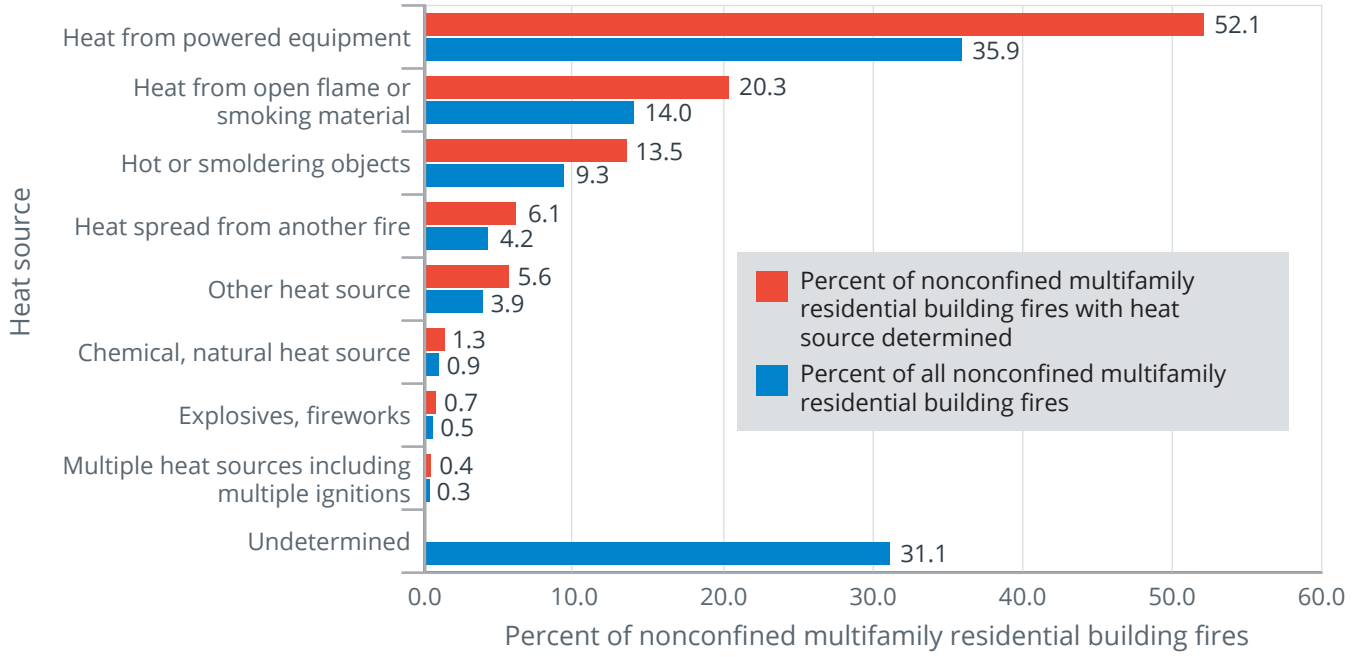
Source: NFIRS 5.0.

How nonconfined multifamily residential building fires start (heat source)

Figure 5 shows sources of heat categories in nonconfined multifamily fires. The heat from powered equipment category accounted for 52% of nonconfined multifamily fires. This category includes radiated or conducted heat from operating equipment (19%), heat from other powered equipment (17%), and electrical arcing (11%).

Heat from open flame or smoking materials accounted for 20% of nonconfined multifamily fires. This category includes cigarettes (7%), heat from miscellaneous open flames or smoking materials (4%), lighters and matches (combined, 4%), and candles (4%). The third largest heat source category pertains to hot or smoldering objects (14%). This category includes miscellaneous hot or smoldering objects (7%) and hot embers or ashes (5%).

Figure 5. Sources of heat in nonconfined multifamily residential building fires by major category (2017-2019)

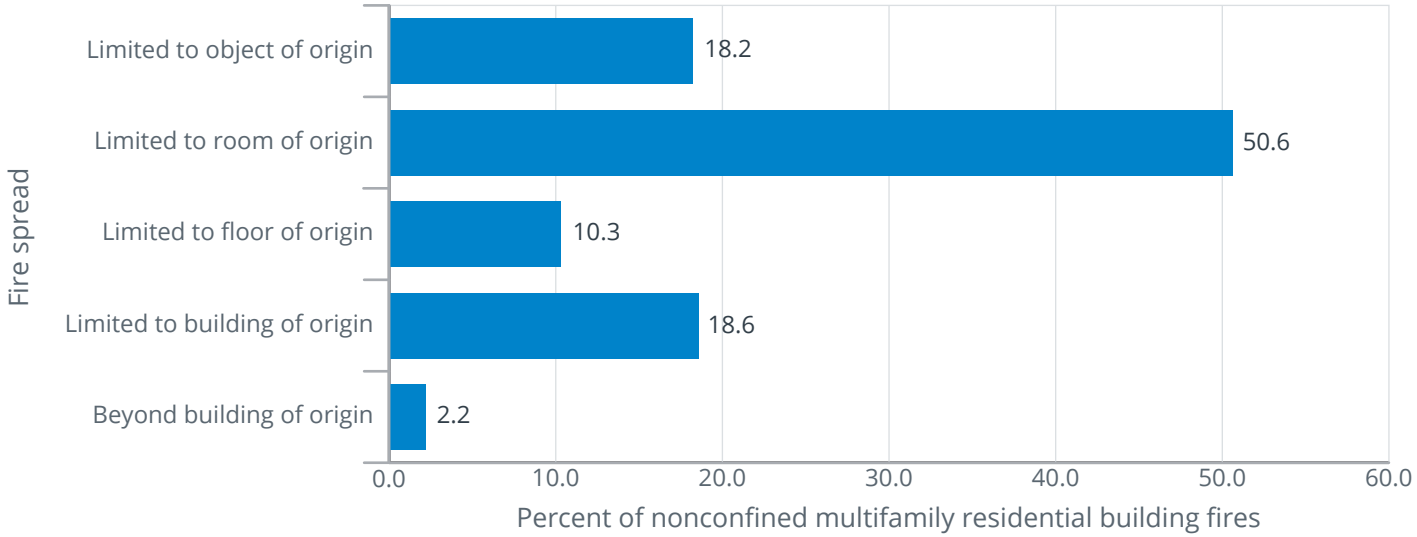


Source: NFIRS 5.0.
Note: Total percentage of all nonconfined multifamily residential building fires does not add up to 100% due to rounding.

Fire spread in nonconfined multifamily fires

Figure 6 shows the extent of fire spread in nonconfined multifamily fires. The majority of nonconfined fires, 69%, were limited to the object or room of fire origin. In 51% of nonconfined fires, the fire was limited to the room of origin; in another 18% of fires, the fire was limited to the object of origin. In 31% of nonconfined multifamily fires, the fire extended beyond the room of origin. The leading causes of these larger fires were unintentional, careless actions (14%); exposures (13%); electrical malfunctions (11%); open flames (10%); smoking (9%); and intentional actions (9%). In contrast, 54% of all other nonconfined residential building fires (excluding multifamily building) extended beyond the room of origin. AESs, such as sprinklers, can aid in containing multifamily fires, as discussed in a later section.

Figure 6. Extent of fire spread in nonconfined multifamily residential building fires (2017-2019)



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

Factors contributing to ignition in nonconfined multifamily residential building fires

Table 5 shows the categories of factors contributing to ignition for nonconfined multifamily fires. By far, the leading category contributing to the ignition of nonconfined multifamily fires was the misuse of material or product (45%). Abandoned or discarded materials (16%) and a heat source too close to combustible materials (15%) were the leading specific factors contributing to ignition in this category.

Operational deficiency, the second leading category, contributed to 21% of nonconfined multifamily fires. Unattended equipment was the leading factor in the operational deficiency category, and it accounted for 12% of all nonconfined multifamily fires. Electrical failures and malfunctions was the third leading category of factors contributing to ignition at 16%.

Table 5. Factors contributing to ignition for nonconfined multifamily residential building fires by major category (where factors contributing to ignition were specified, 2017-2019)

Factors contributing to ignition category	Percent of nonconfined multifamily residential building fires (unknowns apportioned)
Misuse of material or product	45.3
Operational deficiency	21.1
Electrical failure, malfunction	15.9
Fire spread or control	7.3
Mechanical failure, malfunction	6.2
Other factors contributing to ignition	6.2
Natural condition	1.5
Design, manufacture, installation deficiency	0.8

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%.

Alerting/suppression systems in multifamily residential building fires

Fire fatalities and injuries have declined over the last 40 years, partly due to new technologies to detect and extinguish fires. In addition, residential sprinklers have gained support from the fire service and many residential communities.

Smoke alarm data are available for both confined and nonconfined fires, although for confined fires, the data are very limited in scope. Since different levels of data are reported on smoke alarms in confined and nonconfined fires, the analyses are performed separately. The data presented in Tables 6 through 8 show the raw counts from the NFIRS dataset and are not scaled to national estimates of smoke alarms in multifamily fires. In addition, the NFIRS does not allow for the determination of the type of smoke alarm — that is, if the smoke alarm was photoelectric or ionization — or the location of the smoke alarm with respect to the area of fire origin.

Smoke alarms in nonconfined fires

Because of various avenues of fire notification in multifamily buildings, the detailed smoke alarm analyses in the next section focus on all nonconfined fires in multifamily buildings.[15]

Smoke alarms were reported as present in 64% of nonconfined multifamily fires. In 18% of nonconfined multifamily fires, no smoke alarms were present. In another 18% of these fires, firefighters were unable to determine if a smoke alarm was present (Table 6).

When operational status is considered, the percentage of smoke alarms reported as present (64%) consisted of:

- Present and operated — 42%.
- Present, but did not operate — 14% (fire too small, 8%; alarm failed to operate, 6%).
- Present, but operational status unknown — 9%.[16]

When only the subset of incidents where smoke alarms were reported as present was analyzed, smoke alarms were reported to have operated in 64% of these incidents. The alarms failed to operate in 9% of the incidents, and the fire was too small to activate the alarm in another 12%. Additionally, the operational status of the alarm was undetermined in 15% of these incidents.

At least 18% of nonconfined fires in multifamily buildings had no smoke alarms present — and perhaps more if fires without information on smoke alarms were also considered.[17] 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.[18]

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

Table 6. NFIRS smoke alarm data for nonconfined multifamily residential building fires (2017-2019)

Presence of smoke alarms	Smoke alarm operational status	Smoke alarm effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		5,133	8.0
	Smoke alarm operated	Smoke alarm alerted occupants; occupants responded	20,118	31.2
		Smoke alarm alerted occupants; occupants failed to respond	1,135	1.8
		No occupants	2,626	4.1
		Smoke alarm failed to alert occupants	378	0.6
		Undetermined	2,477	3.8
	Smoke alarm failed to operate		3,569	5.5
	Undetermined		6,046	9.4
None present			11,469	17.8
Undetermined			11,430	17.8
Total reported incidents			64,381	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 2017 to 2019. They do not represent national estimates of smoke alarms in nonconfined fires in multifamily residential buildings. They are presented for informational purposes.

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. Smoke alarms operated and alerted occupants in 53% of confined multifamily fires (Table 7). In 13% of confined multifamily fires, the occupants were not alerted by the smoke alarm.[19] In 34% of the confined fires, the smoke alarm effectiveness was unknown.

Table 7. NFIRS smoke alarm data for confined multifamily residential building fires (2017-2019)

Smoke alarm effectiveness	Count	Percent
Smoke alarm alerted occupants	84,920	53.2
Smoke alarm did not alert occupants	20,170	12.6
Unknown	54,569	34.2
Total reported incidents	159,659	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 2017 to 2019. They do not represent national estimates of smoke alarms in confined multifamily residential building fires. They are presented for informational purposes.

Automatic extinguishing systems in nonconfined multifamily residential building fires

AES data are available for both confined and nonconfined fires, although for confined fires, the data are also very limited in scope. In confined multifamily residential building fires, an AES was present in 1% of reported incidents.[20] Full or partial AESs were present in 15% of nonconfined multifamily fires (Table 8). The presence of suppression systems (most likely sprinkler systems) was greater in nonconfined multifamily fires than in nonconfined fires in all other residential buildings (2%), possibly because of code requirements.

Residential sprinkler systems help to reduce the risk of deaths and injuries, homeowners insurance premiums, and uninsured property losses. Despite these advantages, 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. Unfortunately, at present, they are largely absent in residences nationwide.[21]

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 http://www.usfa.fema.gov/prevention/technology/home_fire_sprinklers.html. Additionally, the USFA's position statement on residential sprinklers is available at http://www.usfa.fema.gov/about/sprinklers_position.html.

Table 8. NFIRS automatic extinguishing system data for nonconfined multifamily residential building fires (2017-2019)

Automatic extinguishing system presence	Count	Percent
Automatic extinguishing system present	9,173	14.2
Partial system present	425	0.7
Automatic extinguishing system not present	50,786	78.9
Unknown	3,997	6.2
Total reported incidents	64,381	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 2017 to 2019. They do not represent national estimates of AESs in nonconfined fires in multifamily residential buildings. They are presented for informational purposes.

Examples

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

- June 2021: A second-floor apartment was gutted, and neighboring apartments were damaged, in a 2-alarm, midafternoon fire in downtown Hanover, Pennsylvania. The fire started in the bedroom, spreading throughout the unit and extending through the ceiling. The resident of the apartment, who was sleeping when the fire started, woke to find smoke and fire around him. That resident, as well as others in the building, were able to escape without injury. Although firefighters extinguished the fire in about 15 minutes, 7 apartments sustained damage and approximately 15 residents were displaced. The cause of the fire was under investigation.[22]
- June 2021: A midday townhouse fire in West Springfield, Virginia, started when cooking oil ignited after it was left unattended in a pot on the kitchen stove. Upon arrival, firefighters located and rapidly extinguished the fire. Damages were estimated at $62,500 and 6 occupants were displaced. Working smoke alarms were present in the home, and there were no reported civilian or firefighter injuries.[23]
- February 2021: A Lafayette, Louisiana, condominium sustained heavy fire damage to the attic and roof areas when a central heating system malfunctioned and ignited. The owner of the condo smelled smoke and discovered the late-night fire in the attic after checking the access door. Upon arrival, firefighters found smoke and flames coming from the roof and spent 3 hours battling the blaze. The interior of the home sustained water damage from the fire suppression efforts. In addition, a neighboring condo sustained light water damage. No injuries were reported.[24]

NFIRS data specifications for multifamily residential building fires

Data for this report were extracted from the NFIRS annual Public Data Release files for 2017, 2018 and 2019. Only Version 5.0 data were extracted.

Multifamily residential building fires were defined using the following criteria:

- Incidents with 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 429:

Property Use	Description
429	Multifamily dwelling. Includes apartments, condos, town houses, row houses, tenements.

- 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.

Although voluntary, the NFIRS is the world's largest national, annual database of fire incident information. By contributing to the NFIRS, the fire service is helping in making data-based decisions from local budget development to the identification of national preparedness initiatives. It is important that fire departments participate in the NFIRS and critical that the data they report is complete and accurate so that sound decisions can be made.

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 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 the U.S. Fire Administration's Topical Fire Report Series (Volume 21)," https://www.usfa.fema.gov/downloads/pdf/statistics/data-sources-and-national-estimates-methodology-vol21.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, visit: http://www.usfa.fema.gov/contact.html. Provide feedback on this report.

Notes:

[1]National estimates are based on 2017 to 2019 native Version 5.0 data from the NFIRS, residential structure fire loss estimates from the National Fire Protection Association's (NFPA's) annual surveys of fire loss, and the USFA's residential building fire loss estimates: http://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, http://www.usfa.fema.gov/downloads/pdf/statistics/national_estimate_methodology.pdf. For detailed information regarding the NFPA's survey methodology, see the NFPA's "Methodology used in calculating national estimates from the NFPA's fire experience survey," August 2020, https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics-and-reports/US-Fire-Problem/Methodsfirelossandothers.ashx. In this topical report, fires are rounded to the nearest 100, deaths to the nearest 5, 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 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.

[3]USFA, Topical Fire Report Series, "Residential Building Fires (2017-2019)," Volume 21, Issue 2, May 2021, https://www.usfa.fema.gov/downloads/pdf/statistics/v21i2.pdf.

[4]"One- and two-family residential buildings" include detached dwellings, manufactured homes, mobile homes not in transit, and duplexes.

[5]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 2017 to 2019, 68% of the NFPA's annual average estimated 1,309,800 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% 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.

[6]In the NFIRS, confined fires are defined by Incident Type Codes 113 to 118.

[7]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.

[8]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 the NFIRS data alone. The fire death rate computed from national estimates is 1,000 x (400/106,700) = 3.7 deaths per 1,000 multifamily residential building fires, and the fire injury rate is 1,000 x (3,875/106,700) = 36.3 injuries per 1,000 multifamily residential building fires.

[9]For 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.

[10]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, https://www.usfa.fema.gov/downloads/pdf/nfirs/nfirs_data_analysis_guidelines_issues.pdf.

[11]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 (accessed June 14, 2021).

[12]The American Housing Survey does not indicate the number of fireplaces, chimneys and fireplace-related equipment; however, 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, 2019 American Housing Survey – Table Creator, select "2019 (Year) National (Area) Housing Unit Characteristics (Table); Units by Structure Type (Variable 1)," https://www.census.gov/programs-surveys/ahs/data/interactive/ahstablecreator.html?s_areas=00000&s_year=2019&s_tablename=TABLE0&s_bygroup1=3&s_bygroup2=1&s_filtergroup1=1&s_filtergroup2=1 (accessed June 15, 2021).

[13]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.

[14]Total does not add up to 50% due to rounding.

[15]The discussion in the "Smoke Alarms in Nonconfined Fires" section of this report includes nonconfined fires that occurred in both **occupied** and **unoccupied** multifamily residential buildings. There are 2 principal reasons for including both states of occupancy in the analysis. First, requirements that smoke alarms be interconnected in multifamily units are being included in an increasing number of local building codes. As a result, interconnected alarms may be present in more recently constructed multifamily residential buildings in many jurisdictions. Second, in all multifamily residential buildings, the proximity or closeness of the dwelling units to one another heightens the possibility that an occupant would hear an alarm, smell smoke or see flames coming from a neighboring unit. Thus, even though a fire may start in an unoccupied unit, it is possible that a fire department will be notified either automatically or by an occupant in a neighboring unit, who may become alerted to the presence of a fire either by the sounding of an interconnected alarm or by other physical cues.

[16]Total does not add up to 64% due to rounding.

[17]Here, **at least** 18% of nonconfined fires in multifamily residential buildings had no smoke alarms present — the 18% 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.

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

[19]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.

[20]As confined fire 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.

[21]HUD 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/library/publications/2013/demo/h150-11.pdf (accessed June 14, 2021).

[22]Jones, Harrison, "2-alarm fire displaces more than a dozen residents in downtown Hanover apartment building," www.eveningsun.com, June 14, 2021, https://www.eveningsun.com/story/news/2021/06/14/15-displaced-7-apartments-damaged-hanover-borough-fire/7682074002/ (accessed June 15, 2021).

[23]Fairfax County Fire and Rescue Department, "Unattended Cooking Cause of West Springfield Townhouse Fire," ffxfirerescue.wordpress.com, June 10, 2021, https://ffxfirerescue.wordpress.com/2021/06/10/unattended-cooking-cause-of-west-springfield-townhouse-fire/ (accessed June 15, 2021).

[24]Gagliano, Katie, "Heating system malfunction causes fire and heavy damage to Lafayette condo," www.theadvocate.com, Feb. 17, 2021, https://www.theadvocate.com/acadiana/news/crime_police/article_8fe9bc2e-716f-11eb-bbad-9720ac1a35e4.html (accessed June 15, 2021).