# Fatal Fires in Residential Buildings

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

- An estimated 1,800 fatal residential building fires are reported to U.S. fire departments each year and cause an estimated 2,635 deaths, 725 injuries, and $196 million in property loss.
- Fatal residential building fires tend to be larger, cause more damage, and have higher injury rates than nonfatal residential fires.
- Smoking is the leading cause of fatal residential building fires (19 percent).
- The leading areas of fire origin in fatal residential building fires are bedrooms (27 percent) and common areas such as living and family rooms (23 percent).
- Fatal residential building fires are more prevalent in the cooler months, peaking in January (13 percent).
- Fatal residential building fires occur most frequently in the late evening and early morning hours, peaking from midnight to 5 a.m. One-third (33 percent) of fatal residential fires occur during these 5 hours.
- About two-thirds (66 percent) of fatal residential building fires are confined to the building of origin or extend beyond the building of origin.

The U.S. fire death rate has gone down dramatically over the past three decades since the creation of the U.S. Fire Administration (USFA), from over 30 deaths per million population to 11 deaths per million population. The United States, however, continues to have one of the highest fire death rates per capita among Western Nations.[1,2] The original goal for USFA was to help lead a reduction in fire deaths by 50 percent in a generation. With annual fire deaths dropping from over 9,000 to less than 3,500 in that period of time, USFA's goal has been achieved. Nevertheless, fire deaths are still high.

Approximately 1,800 fatal residential building fires occurred annually in recent years (2006 to 2008).[3,4] These fires resulted in an annual average of approximately 2,635 deaths, 725 injuries, and $196 million in property loss.

This report is one of a continuing series of topical reports issued by the USFA's National Fire Data Center and addresses the characteristics of fatal residential building fires reported to the National Fire Incident Reporting System (NFIRS) from 2006 to 2008, the most recent data available at the time of the analysis. Because 79 percent of fire deaths occur in residential buildings, they are the focus of this report. The information in this report about fatal residential fires can be used not only to assess progress but also to understand the nature of the fatal fire problem and its implications for targeting of prevention programs.

For the purpose of this report, the terms "residential fires" and "fatal residential fires" are synonymous with "residential building fires" and "fatal residential building fires," respectively. "Fatal residential fires" is used throughout the body of this report; the findings, tables, charts, headings, and footnotes reflect the full category, "fatal residential building fires."

## Loss Measures

Fatal residential fires do not account for many fires in the overall residential fire profile, but they have tremendous and devastating outcomes. Table 1 presents losses, averaged over the 3-year-period, for fatal and nonfatal residential fires.[5] Fatal residential fires reported to NFIRS have 6 times the dollar loss per fire and 13 times the injury rate of nonfatal residential fires. These statistics reflect the destructive nature of the fires that result in fatalities.

## Table 1. Loss Measures for Fatal and Nonfatal Residential Building Fires (3-year average, 2006–2008)

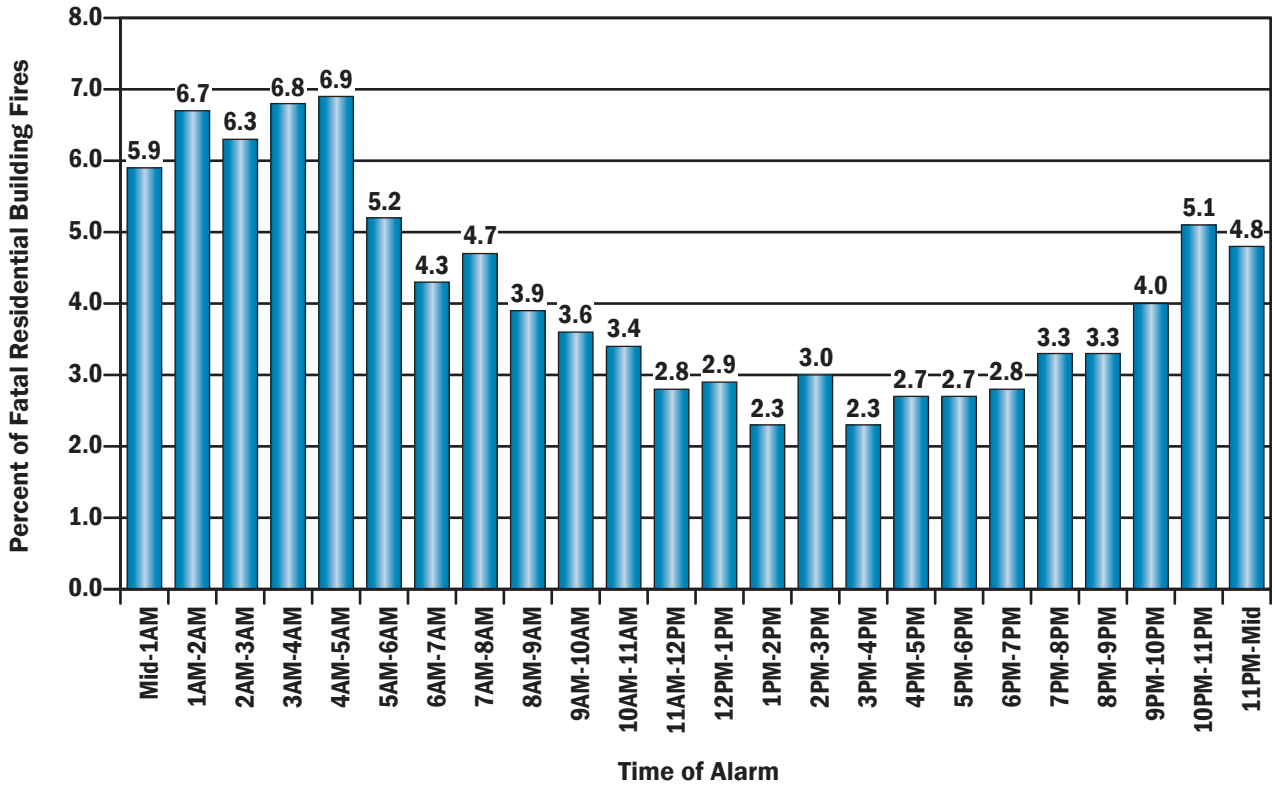
| Measure | Fatal Residential Building Fires | Nonfatal Residential Building Fires |
|---|---|---|
| Average Loss: | | |
| Fatalities/1,000 fires | 1,199.5 | 0.0 |
| Injuries/1,000 fires | 344.2 | 26.7 |
| Dollar loss/fire | $95,080 | $15,710 |

Source: NFIRS 5.0.
Note: Average loss for fatalities and injuries is computed per 1,000 fires; average dollar loss is computed ***per fire*** and is rounded to the nearest $10.

## When Fatal Residential Building Fires Occur

As shown in Figure 1, fatal residential fires occur most frequently in the late evening and early morning hours, peaking from midnight to 5 a.m. One-third (33 percent) of fatal residential fires occur during these 5 hours. They then decline throughout the day, reaching the lowest point during the early afternoon hours.[6] There are a few possible reasons for this. First, many people are sleeping and less on guard in the middle of the night. If smoke alarms are not present, these individuals may die before waking up to a fire. Second, and related, cigarette and other smoldering fires started by careless actions before people retire for the night may go unnoticed and grow to rapidly progressing fires while they are sleeping.

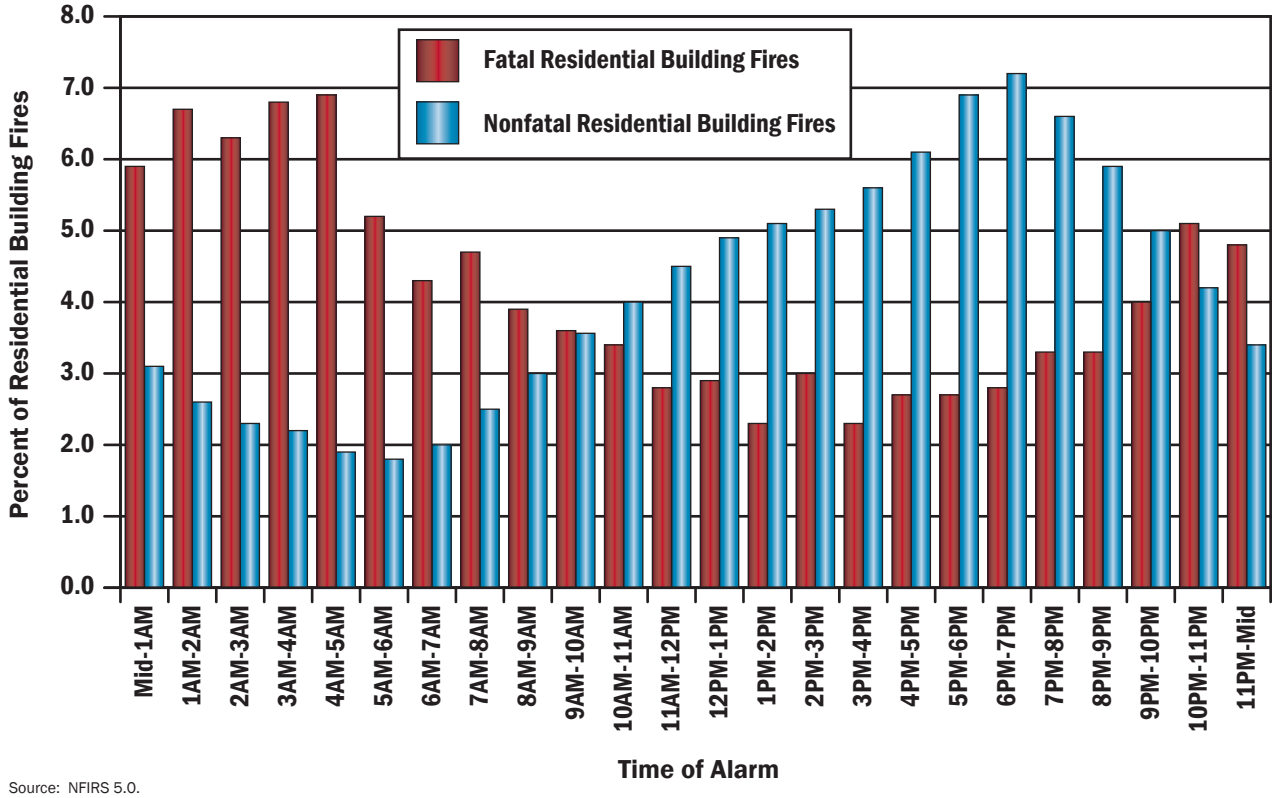
## Figure 1. Fatal Residential Building Fires by Time of Alarm (2006–2008)




Source: NFIRS 5.0.

The time of alarm profile for fatal residential fires is in contrast to the alarm time profile for nonfatal residential fires as shown in Figure 2. Nonfatal residential fires have the reverse daily cycle, with fires, predominately cooking fires, occurring during the late afternoon and evening.

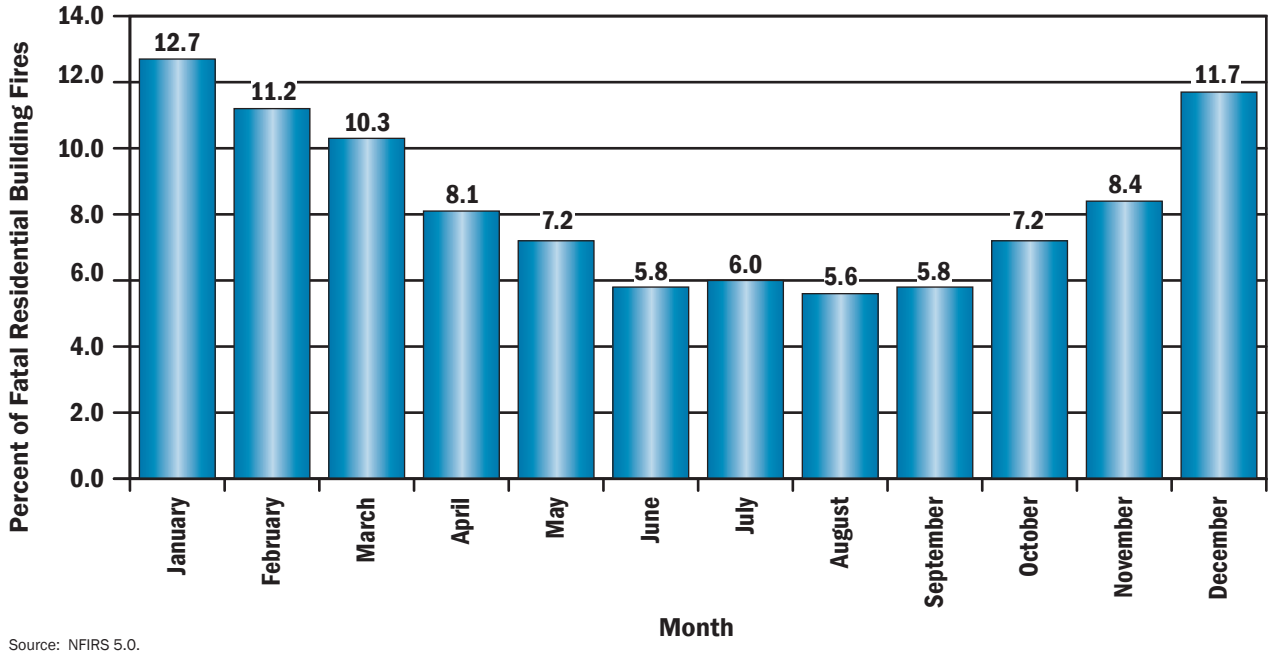
## Figure 2. Time of Alarm for Fatal and Nonfatal Residential Building Fires (2006–2008)




Source: NFIRS 5.0.

Fatal residential fires have much higher incidence in the cooler months—twice that of the summer months, perhaps as a result of increased activities indoors. Fatal residential fires peak in January at 13 percent (Figure 3). Fire incidence declines steadily after January, reaching the lowest incidence during the summer months.

## Figure 3. Fatal Residential Building Fires by Month (2006–2008)




Source: NFIRS 5.0.

## *Causes of Fatal Residential Building Fires*

The causes of fires are often a complex chain of events. To determine the cause of a fire, analysts rely on the data collected. Heat source, equipment involved, factors (human or otherwise) contributing to the ignition, incident type, and the cause of ignition are the primary data elements used. A large percentage of fatal residential fire incidents reported to NFIRS (43 percent) do not have sufficient information to

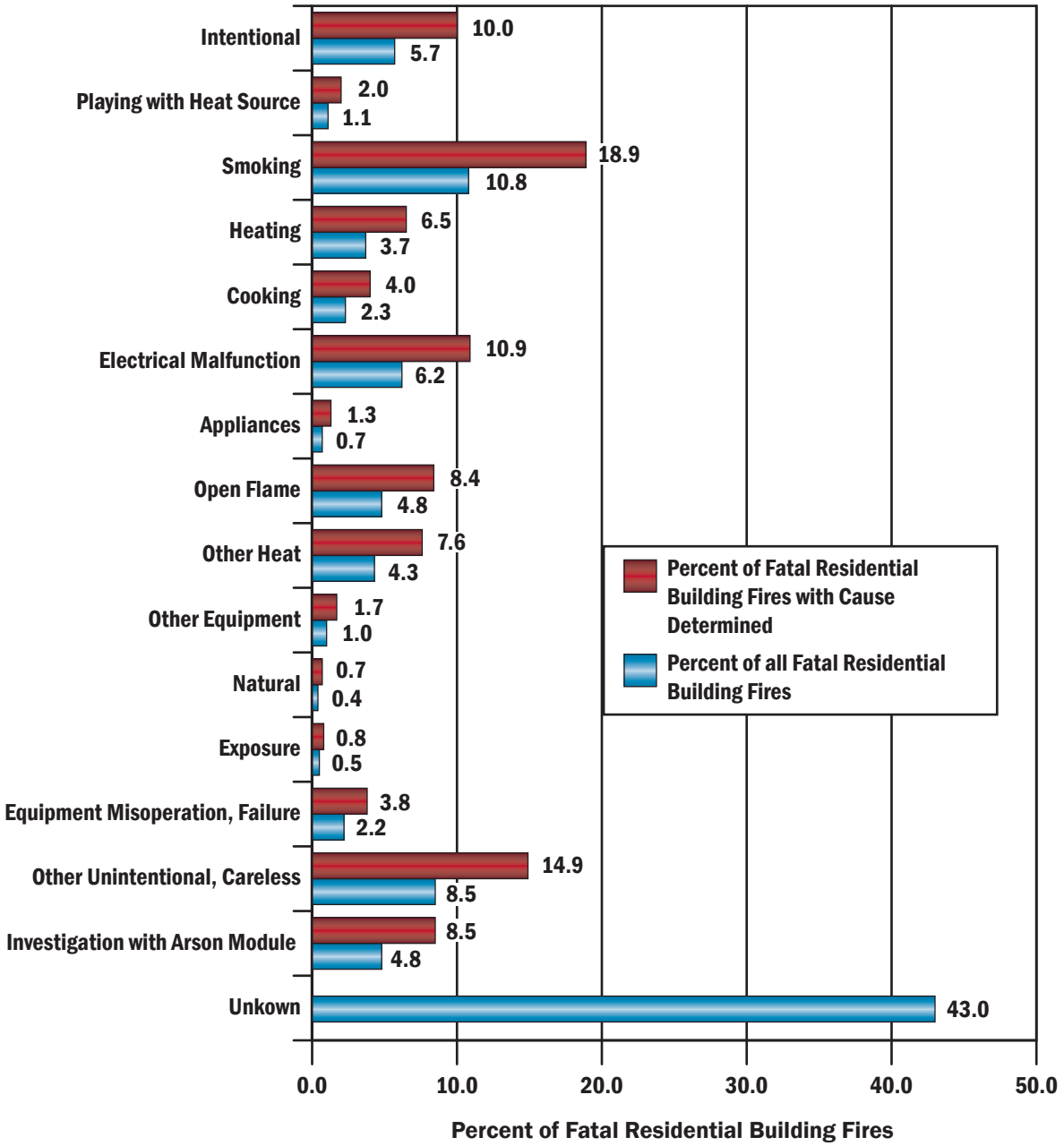
determine the cause of the fire. The cause analyses that follow reflect only the 57 percent of incidents where enough information and enough detail were reported to determine the cause of the fatal fire.[7]

Nineteen percent of all fatal residential fires are smoking-related[8] as shown in Figure 4. Although not as prominent as it once was, smoking (with rare exceptions) has been the leading cause of fatal residential fires since NFIRS's inception. Fires caused by electrical malfunctions (11 percent) and intentionally set fires (10 percent) are the next leading specific causes.

Multiple fatality fires, those fires resulting in two or more deaths, in residential buildings were most often caused by electrical malfunctions (16 percent) followed by intentionally set fires (14 percent). In contrast, smoking is the leading cause of single fatality fires (20 percent).

Fires caused by other unintentional or careless actions play a larger role in fatal residential fires (15 percent) than in nonfatal residential fires (6 percent).

## Figure 4. Causes of Fatal Residential Building Fires (2006–2008)




Source: NFIRS 5.0.

Note: Causes are listed in order of the USFA 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, 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.

## Winter and Summer Fatal Residential Fire Causes

As shown in Figure 3, fatal residential fires have much higher incidence in the cooler months. While the addition of heating helps account for the increase in overall residential fires in the cooler winter months, heating is not a primary cause of these winter fatal residential fires. Nearly half of all fatal residential fires in December through March are the result of three causes: smoking (20 percent); other unintentional or careless actions (17 percent); or electrical malfunctions (12 percent). Heating, the fourth leading cause, is the cause of 9 percent of these fatal winter fires (Table 2).

Half as many fatal fires occur in the warmer months, June through September (also Figure 3). As shown in Table 2, with the exception of intentionally caused fires, the causes of these summer fires are not remarkably different from fatal winter fires. Three of the four leading causes remain the same: smoking (18 percent); electrical malfunctions (12 percent); and other unintentional or careless actions (11 percent). The increase in fatal fires in the winter months is more likely to be related to the increase in indoor activities, as noted earlier, rather than the type of fire.

**Table 2. Relative Proportion of Leading Causes of Fatal Residential Building Fires: Winter and Summer (3-year average, 2006–2008)**

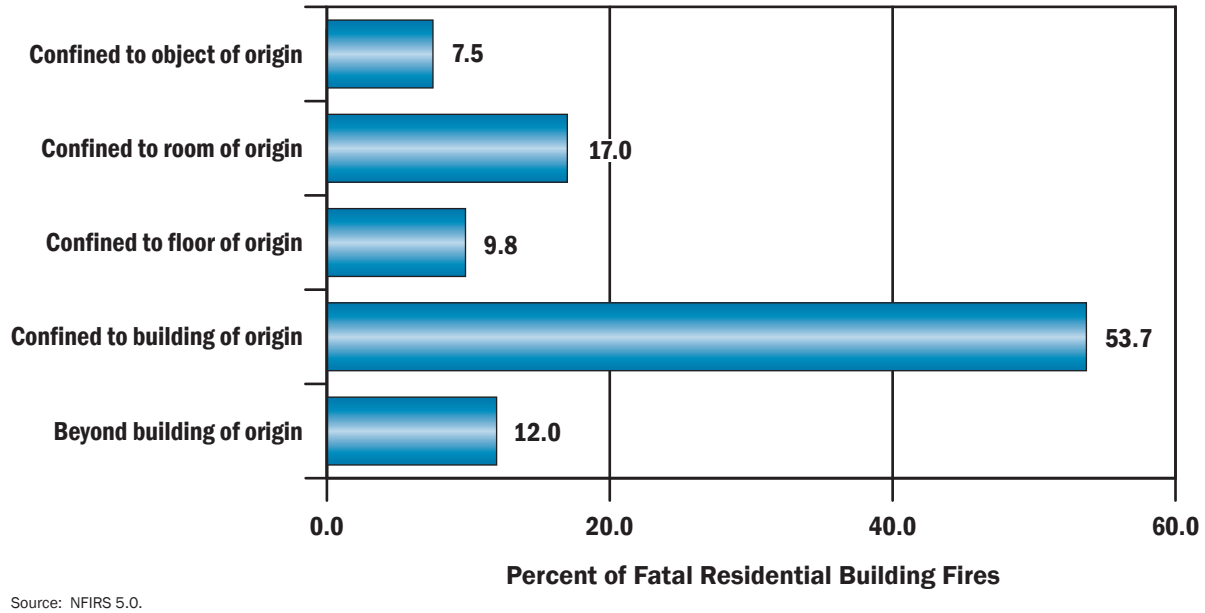
| Leading Cause of Fire | Percent (Unknowns Apportioned) | |
|---|---|---|
| | December–March | June–September |
| Smoking | 19.5 | 17.7 |
| Intentional | | 14.7 |
| Other Unintentional, Careless | 17.1 | 11.4 |
| Electrical Malfunction | 11.5 | 12.1 |
| Heating | 8.5 | |

Source: NFIRS 5.0.

## Fire Spread in Fatal Residential Building Fires

Seventy-six percent of fatal residential fires extend beyond the room of origin. These fires often occur in the middle of the night when residents are generally asleep and unaware of the fire. In addition, a quarter of fatal residential building fires are confined to the room or object of origin (Figure 5). Many people do not realize that a fire does not have to be large to be deadly.

**Figure 5. Extent of Fire Spread in Fatal Residential Building Fires (2006–2008)**




Source: NFIRS 5.0.

## Where Fatal Residential Building Fires Start

Table 3 shows the leading areas of fire origin in fatal residential building fires. These fires start most frequently in bedrooms (27 percent) and common rooms including dens, family rooms, living rooms, and lounges (23 percent). Fires starting in cooking areas or kitchens account for 15 percent of fires.

### Table 3. Leading Areas of Origin for Fatal Residential Building Fires (2006–2008)

| Area of Origin | Percent (Unknowns Apportioned) |
|---|---|
| Bedrooms | 27.4 |
| Common room, den, family room, living room, lounge | 22.5 |
| Cooking area, kitchen | 15.3 |

Source: NFIRS 5.0.

Eighty percent of fatal residential fires occur in one- and two-family houses as seen in Table 4. This is not surprising since the majority of the population lives in these types of residences.[9] Multifamily houses account for 16 percent of all fatal residential fires. Other residential occupancies, including boarding and rooming houses, and hotels and motels, are a very small portion, accounting for only 4 percent of fatal residential fires.

### Table 4. Property Use for Fatal Residential Building Fires (2006–2008)

| Property Use | Percent (Unknowns Apportioned) |
|---|---|
| One- and two-family houses | 80.2 |
| Multifamily houses | 16.1 |
| Other residential buildings | 2.8 |
| Boarding, rooming houses | 0.4 |
| Hotels and motels | 0.4 |
| Total | 100.0 |

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

## Factors Contributing to Ignition

Table 5 shows the categories of factors contributing to ignition for fatal residential fires. The "misuse of material or product" is the leading category contributing (59 percent) to the ignition of fatal residential fires. Factors in the "electrical failure or malfunction" category contribute to the ignition of the fire in 15 percent of fatal residential fires. The "other (unspecified) factors" and "operational deficiency" categories account for 13 percent and 12 percent, respectively, of fatal residential fires. These four categories play a role in nearly all fatal residential fires where a contributing factor is reported.

Placing a heat source too close to combustible objects, part of the "misuse of material or product" category, is the leading specific contributing factor (21 percent). Also a part of the "misuse of material or product" category, abandoned or discarded materials, primarily cigarettes, is the second leading specific contributing factor in 17 percent of fatal residential fires.

### Table 5. Factors Contributing to Ignition for Fatal Residential Building Fires by Major Category (Where Factor Contributing Specified, 2006–2008)

| Factor Contributing to Ignition Category | Percent of Fatal Residential Fires (Unknowns Apportioned) |
|---|---|
| Misuse of material or product | 59.3 |
| Electrical failure, malfunction | 15.1 |
| Other factors contributing to ignition | 13.2 |
| Operational deficiency | 12.0 |
| Mechanical failure, malfunction | 4.8 |
| Fire spread or control | 2.7 |
| Design, manufacture, installation deficiency | 1.4 |
| Natural condition | 1.1 |

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; total will exceed 100 percent.

## Human Factors Contributing to Ignition

Human factors—the human condition or situation that allowed the heat source and combustible material to combine to ignite the fire—play an important role in fatal residential fires. The leading human factor contributing to the ignition of the fire is being asleep. This finding is not unexpected as 48 percent of fatal fires occur during the 8-hour period, 10 p.m. to 6 a.m. (Figure 1). When being asleep was reported as a contributing factor to the fire, it was most often reported as a factor in smoking-related and other unintentional or careless caused fires.

Possibly impaired by alcohol or drugs is the second leading human factor contributing to the ignition of the fire (24 percent). When possible alcohol or drug impairment was reported as a factor, it was most often reported as a factor in smoking-related and intentionally set fires.

Surprisingly, age as a factor (16 percent) was more often cited with smoking-related fires than fires caused by playing with the heat source. Typically, playing with a heat source is associated with children playing-caused fires.

It is not unexpected that smoking-related fires is the first or second associated fire cause with six of the seven human factors as smoking is the leading cause of fatal fires.

**Table 6. Human Factors Contributing to Ignition for Fatal Residential Building Fires (Where Human Factor Contributing Specified, 2006–2008)**

| Human Factors Contributing to Ignition | Percent of Fatal Residential Fires (Unknowns Apportioned) | Primary Associated Fire Causes | |
|---|---|---|---|
| Asleep | 47.3 | Smoking | (28.5%) |
| | | Other Unintentional, Careless | (17.1%) |
| Possibly impaired by alcohol or drugs | 23.5 | Smoking | (33.2%) |
| | | Intentional | (12.8%) |
| Age was a factor | 16.1 | Smoking | (24.3%) |
| | | Playing with Heat Source | (14.9%) |
| Physically disabled | 14.8 | Smoking | (41.0%) |
| | | Other Unintentional, Careless | (16.5%) |
| Unattended or unsupervised person | 10.2 | Playing with Heat Source | (17.3%) |
| | | Smoking | (13.6%) |
| Possibly mentally disabled | 7.6 | Intentional | (50.0%) |
| | | Smoking | (16.7%) |
| Multiple persons involved | 5.8 | Intentional | (20.0%) |
| | | Heating | (15.6%) |

Source: NFIRS 5.0.
Notes: 1) Includes only incidents where human factors that contributed to the ignition of the fire were specified.
2) Multiple human factors contributing to fire ignition may be noted for each incident; total will exceed 100 percent.

## *Alerting/Suppression Systems in Fatal Residential Building Fires*

Smoke alarms were reported as present in 38 percent of fatal residential fires. By comparison, smoke alarms were present in 44 percent of nonfatal residential fires. In 23 percent of fatal residential fires, there were no smoke alarms present.[10] Nationally, only 3 percent of households do not have a smoke alarm installed.[11] This lack of early warning is a considerable factor in fatal residential fires. Lastly, in 40 percent of these fatal residential fires, firefighters were unable to determine if a smoke alarm was present (Table 7).[12]

**Table 7. Presence of Smoke Alarms in Fatal Residential Building Fires (2006–2008)**

| Presence of Smoke Alarms | Percent |
|---|---|
| Present | 37.7 |
| None present | 22.5 |
| Undetermined | 39.7 |
| Null/Blank | <0.1 |

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

Where the existence of a smoke alarm was not determined, 79 percent of the fires spread beyond the floor of fire origin. Because these fires were so expansive, it may be impossible to determine the presence of smoke alarms.

Fires in one- and two-family housing accounted for 89 percent of fatal residential fires in which no smoke alarm was present. Multifamily housing accounted for just 8 percent of these fires, perhaps because they are subject to more stringent codes and often require the landlord or manager to maintain the detection systems.

Of concern are fatal fires in residential buildings that are not currently or routinely occupied. While these fires are a small portion of all fatal residential fires (4 percent), these occupancies—buildings under construction, undergoing major renovation, vacant, and the like—are also unlikely to have alerting and suppression systems that are in place and, if in place, that operate. Only 4 percent of fatal fires in residential buildings that are not routinely occupied were reported as having smoke alarms that operated. No automatic suppression systems were reported as operating in fatal fires in residential buildings that are not routinely occupied.

## Occupied Housing

A continuing trend of fatal residential fires in occupied housing is the high proportion with no smoke alarms or nonfunctioning smoke alarms. Households with fires (both fatal and nonfatal) are less likely to have had smoke alarms (93 percent) than nonfire households (97 percent).[13] In addition, households with fatal residential fires are less likely to have had smoke alarms (Table 8).

Smoke alarms were reported as present in 38 percent of fatal residential fires in occupied housing. In 22 percent of fatal residential fires in occupied housing, there were no smoke alarms present. Lastly, in 40 percent of fatal residential fires in occupied housing, firefighters were unable to determine if a smoke alarm was present (Table 8).

When operational status is considered, the percentage of smoke alarms reported as present (38 percent) consists of:[14]

- smoke alarms present and operated—15 percent;
- present but did not operate—9 percent (alarm did not operate, 8 percent; fire too small, less than 1 percent); and
- present but operational status unknown—15 percent.

When the subset of incidents where smoke alarms were reported as present is analyzed separately, smoke alarms were reported to have operated in 38 percent of the incidents and failed to operate in 22 percent. In less than 1 percent of this subset, the fire was too small to activate the alarm. The operational status of the alarm was undetermined in 39 percent of these incidents.

Note that the data presented in Table 8 are the raw counts from the NFIRS data set and are not scaled to national estimates of smoke alarms in fatal residential fires. In addition, 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.

**Table 8. NFIRS Smoke Alarm Data for Fatal Residential Building Fires in Occupied Housing (NFIRS, 2006–2008)**

| Presence of Smoke Alarms | Smoke Alarm Operational Status | Smoke Alarm Effectiveness | Count | Percent |
|---|---|---|---|---|
| Present | Fire too small to activate smoke alarm | | 9 | 0.3 |
| | Smoke alarm operated | Smoke alarm alerted occupants, occupants responded | 209 | 6.5 |
| | | Smoke alarm alerted occupants, occupants failed to respond | 83 | 2.6 |
| | | No occupants | 1 | 0.0 |
| | | Smoke alarm failed to alert occupants | 28 | 0.9 |
| | | Undetermined | 147 | 4.6 |
| | Smoke alarm failed to operate | | 266 | 8.3 |
| | Undetermined | | 474 | 14.8 |
| None present | | | 706 | 22.1 |
| Undetermined | | | 1,272 | 39.8 |
| Total Incidents | | | 3,195 | 100.0 |

Source: NFIRS 5.0.

Notes: The data presented in this table are raw data counts from the NFIRS data set. They do not represent national estimates of smoke alarms in fatal residential building fires in occupied housing. They are presented for informational purposes. Total may not add to 100 percent due to rounding.

Overall, full or partial automatic extinguishment systems (AESs), mainly sprinklers, were present in only 2 percent of fatal residential fires in occupied housing (Table 9). The presence of suppression systems in nonfatal occupied residential building fires is only 4 percent.

**Table 9. NFIRS Automatic Extinguishing System (AES) Data for Fatal Residential Building Fires in Occupied Housing (2006–2008)**

| AES Presence | Count | Percent |
|---|---|---|
| AES present | 44 | 1.4 |
| Partial system present | 7 | 0.2 |
| AES not present | 2,930 | 91.7 |
| Unknown | 214 | 6.7 |
| Total Incidents | 3,195 | 100.0 |

Source: NFIRS 5.0.
Notes: The data presented in this table are raw data counts from the NFIRS data set. They do not represent national estimates of AESs in fatal residential building fires in occupied housing. They are presented for informational purposes. Totals may not add to 100 percent due to rounding.

## Examples

The following are some recent examples of fatal residential building fires reported in local media:

- December 2009: A large apartment complex fire killed 9 people in Starkville, MS. While investigators do not know what started the fire, they do not believe it was intentionally set. There were no smoke alarms in the apartment complex.[15]
- December 2009: A house fire killed two people in Casper Mountain, WY. Fire investigators believe the fire was accidental but have been unable to specify a cause. The victims were taken to a local medical center but did not survive. Firefighters did not find smoke alarms in the home but stated that the alarms may have been consumed by the fire.[16]
- November 2009: A 46-year-old man was killed in a fire that was started by a lit cigarette. The man was smoking while mixing gasoline and oil in the living room of his apartment. His death was the result of respiratory failure and burns suffered in the flash fire. The apartment fire left eight people homeless in Mechanic Falls, ME.[17]
- October 2009: A rowhouse fire killed a 63-year-old man in South Philadelphia, PA. A neighbor attempted to rescue the man, but was unable to reach him in time. Fire officials noted that there was no working smoke alarm in the house. The cause of the fire is still undetermined.[18]

## NFIRS Data Specifications for Fatal Residential Building Fires

Data for this report were extracted from the NFIRS annual Public Data Release (PDR) files for 2006, 2007, and 2008. Only version 5.0 data were extracted.

Fatal Residential Building fires are defined as:

- Incident Types 111 to 123:

| Incident Type | Description |
|---|---|
| 111 | Building fire |
| 112 | Fires in structure other than in a building |
| 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 that Incident Types 113 to 118 do not specify if the structure is a building.

Incident Type 112 is included prior to 2008 as previous analyses have shown that Incident Types 111 and 112 were used interchangeably. As of 2008, Incident Type 112 is excluded.

- Aid Types 3 (mutual aid given) and 4 (automatic aid given) are excluded to avoid double counting of incidents.
- Property use 400 to 464:

| Property Use | Description |
|---|---|
| 400 | Residential, other |
| 419 | One- or two-family dwelling |
| 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 113–118:
    - 1—Enclosed building,
    - 2—Fixed portable or mobile structure, and
    - Structure Type not specified (null entry).
  - For Incident Types 111,112, and 120–123:
    - 1—Enclosed building, and
    - 2—Fixed portable or mobile structure.
- Civilian deaths greater than zero.

The analyses contained in this report reflect the current methodologies used by the USFA. The USFA is committed to providing the best information on the United States' 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.

To request additional information or to comment on this report, visit http://www.usfa.fema.gov/applications/feedback/index.jsp

## Notes:

[1] The U.S. fire death rate for 2008 shown here is based on the National Fire Protection Association's (NFPA's) estimate of fire deaths in 2008 and the U.S. Census Bureau's estimate of the 2008 U.S. resident population.

[2] The Geneva Association, "World Fire Statistics," *Geneva Association Information Newsletter*, Number 25, October 2009.

[3] National estimates here are based on 2006–2008 native version 5.0 data from the National Fire Incident Reporting System (NFIRS) and residential structure fire loss estimates from the NFPA's annual surveys of fire loss. Fires are rounded to the nearest 100, deaths to the nearest 5, injuries to the nearest 25, and loss to the nearest $million.

[4] 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 fires 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. Confined fire incidents that have a residential property use, but do not have a structure type specified are presumed to be buildings. Nonconfined fire incidents without a structure type specified are considered to be invalid incidents (structure type is a required field) and are not included.

[5] The average fire death and fire injury loss rates computed from the national estimates will not agree with average fire death and fire injury loss rates computed from NFIRS data alone. The national estimates are based on a sample of fire departments that report fatality totals. The NFIRS is based on a large set of fires, with the data at the individual fire incident level. The fire death rate computed from national estimates would be (1,000*(2,635/1,800)) = 1,463.9 deaths per 1,000 fatal residential building fires and the fire injury rate would be (1,000*(725/1,800)) = 402.8 injuries per 1,000 fatal residential building fires.

[6] For the purposes of this report, the time of the fire alarm is used as an approximation for the general time the fire started. However, in NFIRS, it is the time the fire was reported to the fire department.

[7] The U.S. Fire Administration (USFA) cause hierarchy was used to determine the cause of fatal residential building fire incidents: http://www.usfa.dhs.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm.

[8] USFA differentiates between smoking as a cause of fires and fires ignited by smoking materials. Smoking (or smoking-related fires) are considered a behavioral cause. Fires ignited by smoking materials are considered as a group of fires where smoking materials were the heat source. The two sets are similar but not identical. A deliberately set fire with smoking materials as the heat of ignition would be considered an "intentional" fire; a fire unintentionally set by someone smoking (cigarettes, cigars, or other smoking materials) would be considered a "smoking" fire.

[9] The U.S. Census Bureau shows that, in 2007, 76.3 percent (84.4 million) of occupied housing units were one-unit attached and detached structures or mobile homes (http://www.census.gov/hhes/www/housing/ahs/ahs07/tab1a-1.xls for occupied housing). Household size was estimated at 2.6 people per household (http://factfinder.census.gov/servlet/ACSSAFFFacts?_submenuId=factsheet_1&_sse=on). Thus, 84.4 million housing units x 2.6 people per household = 219.4 million people lived in one-unit attached and detached structures or mobile homes. With the 2007 U.S. population given as 301.3 million, (http://www.census.gov/popest/national/asrh/NC-EST2008/NC-EST2008-03.xls), approximately 72.8 percent of the population lived in what NFIRS defines as one- and two-family housing.

[10] Here, *at least* 23 percent of fatal residential building fires had no smoke alarms present—the 23 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.

[11] 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.

[12] The percentages cited for smoke alarms sum to more than 100 percent due to rounding errors.

[13] Greene, Michael, and Craig Andres. 2004–2005 *National Sample Survey of Unreported Residential Fire*. Division of Hazard Analysis, Directorate for Epidemiology, U.S. Consumer Product Safety Commission, Table 5-3, July 2009.

[14] The percentages cited for smoke alarms do not add to the percent of alarms present due to rounding errors.

[15] "9 dead, including 6 kids in Mississippi apartment fire," foxnews.com/news, December 28, 2009. http://www.foxnews.com/story/0,2933,581378,00.html (accessed January 7, 2010).

[16] Joshua Wolfson, "No cause found in fatal house fire," billingsgazette.com, December 4, 2009. http://www.billingsgazette.com/news/state-and-regional/wyoming/article_d99520fa-e091-11de-a0d4-001cc4c002e0.html (accessed December 14, 2009).

[17] "Fire officials release cause of fatal Mechanic Falls fire," wmtw.com, November 30, 2009. http://www.wmtw.com/news/21760881/detail.html (accessed December 10, 2009).

[18] "Man dies in S. Phila. rowhouse fire," philly.com, October 13, 2009. http://www.philly.com/philly/news/20091013_Man_dies_in_S__Phila_rowhouse_fire.html (accessed December 14, 2009).