TOPICAL FIRE REPORT SERIES Volume 14, Issue 6 / July 2013

Multiple-fatality Fires in Residential Buildings (2009–2011)

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

- Each year, an estimated 200 fires in residential buildings reported to United States fire departments resulted in multiple fatalities. These fires annually caused an estimated 740 deaths, 175 injuries and $34 million in property loss.
- Multiple-fatality fires in residential buildings tended to be larger, caused more damage, and had higher injury rates than both single-fatality fires and nonfatal fires in residential buildings.
- One- and two-family dwellings accounted for 81 percent of multiple-fatality fires in residential buildings.
- The leading areas of fire origin in multiple-fatality fires in residential buildings were bedrooms (23 percent) and common areas such as living and family rooms (23 percent).
- "Other unintentional, careless" action was the leading cause of multiple-fatality fires in residential buildings (16 percent).
- The leading human factor contributing to the ignition of multiple-fatality fires in residential buildings was being "asleep" (53 percent).
- Multiple-fatality fires in residential buildings were more prevalent in the cooler months, spiking in January at 17 percent.
- Multiple-fatality fires in residential buildings occurred most frequently from 1 to 5 a.m. This four-hour time period accounted for 38 percent of the multiple-fatality residential building fires.
- In 91 percent of multiple-fatality fires in residential buildings, the fire extended beyond the room of origin.
- When smoke alarms were reported to be present in multiple-fatality fires in residential buildings, they operated in 33 percent of the incidents and failed to operate in 23 percent.

Historically, the fire death rate in the U.S. has been higher than most of the industrialized world. While the U.S. still has one of the highest fire death rates (9.6 deaths per million population) in the industrialized world today, its standing has greatly improved.[1,2] Falling from among the top three nations in terms of the fire death rate two decades ago, the U.S. now has the 13th highest fire death rate per million people.[3] Nevertheless, civilian fire fatalities are still high. From 2009 to 2011, an estimated 3,045 civilian fire deaths were reported to fire departments across the country each year.[4]

Fires in residential buildings that resulted in two or more civilian fire deaths were rare occurrences. In fact, less than 0.1 percent of all fires in residential buildings involved multiple fatalities. However, these multiple fatalities accounted for 30 percent of all fatalities that resulted from residential building fires. In addition, and most importantly, these events are inherently tragic.

An estimated 200 multiple-fatality fires in residential buildings occurred annually in recent years (2009 to 2011).[5,6] These fires resulted in an annual average of approximately 740 deaths, 175 injuries and $34 million in property loss.

This report is one of a continuing series of topical reports issued by the U.S. Fire Administration's National Fire Data Center, and it addresses the characteristics of multiple-fatality fires in residential buildings reported to the National Fire Incident Reporting System from 2009 to 2011, the most recent data available at the time of the analysis. The information in this report about multiple-fatality fires in residential buildings 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. Additional information on the fatal fire problem can be found in USFA's topical report, "Fatal Fires in Residential Buildings (2009-2011)" (Volume 14, Issue 3).

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For the purpose of this report, the terms "residential fires" and "residential multiple-fatality fires" or "multiple-fatality fires" are synonymous with "residential building fires" and "multiple-fatality fires in residential buildings," respectively. "Residential multiple-fatality fires" or "multiple-fatality fires" is used throughout the body of this report; the findings, tables, charts, headings and endnotes reflect the full category, "multiple-fatality fires in residential buildings."

Loss Measures

Although residential multiple-fatality fires accounted for less than one-tenth of a percent of the overall residential fire profile and only 13 percent of all fatal fires in residential buildings, they had tremendous and devastating outcomes. Table 1 presents losses, averaged over the three-year period, for residential multiple-fatality, single-fatality and nonfatal fires.[7] In addition to resulting in multiple fatalities, residential multiple-fatality fires reported to NFIRS had over twice as many deaths per fire than that of single-fatality residential building fires. Residential multiple-fatality fires also had 19 times as many injuries per fire and more than seven times the dollar loss per fire than that of nonfatal residential building fires. These statistics reflect the destructive nature of residential multiple-fatality fires.

Table 1. Loss Measures for Multiple-fatality, Single-fatality and Nonfatal Fires in Residential Buildings (three-year average, 2009-2011)

Measure	Multiple-fatality Fires in Residential Buildings	Single-fatality Fires in Residential Buildings	Nonfatal Fires in Residential Buildings
Average Loss:			
Fatalities per fire	2.47	1.0	0.0
Injuries per fire	0.57	0.27	0.03
Dollar loss per fire	$115,300	$87,770	$15,080

Source: NFIRS 5.0.
Notes: 1. Average loss is computed per fire; average dollar loss is rounded to the nearest $10.
2. When calculating the average dollar loss per fire for 2009-2011, the 2009 and 2010 dollar-loss values were adjusted to their equivalent 2011 dollar-loss values to account for inflation.

As Table 2 shows, 89 percent of residential multiple-fatality fires involved two or three fatalities (72 percent involved two fatalities while 17 percent involved three fatalities). Residential multiple-fatality fires that resulted in five or more fatalities were rare and represented 5 percent of all multiple-fatality fires.

Table 2. Fatalities per Fire in Multiple-fatality Fires in Residential Buildings (2009-2011)

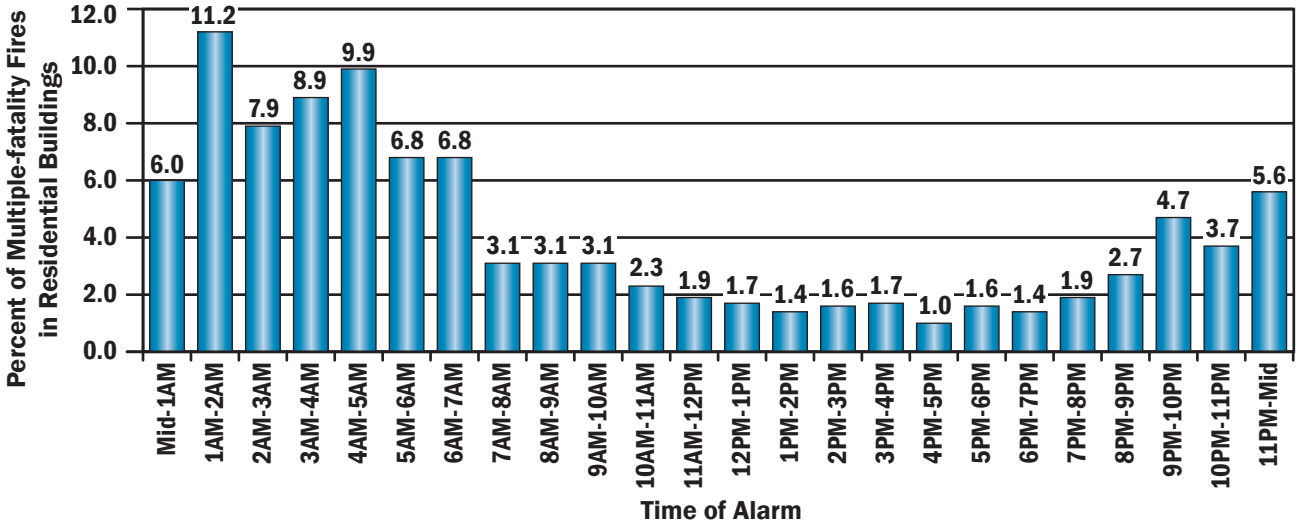
Fatalities per Fire	Percent of Multiple-fatality Fires in Residential Buildings
2	71.7
3	17.4
4	5.6
5 or more	5.2
Total	100.0

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

When Multiple-fatality Fires in Residential Buildings Occur

As shown in Figure 1, residential multiple-fatality fires occurred most frequently in the early morning hours.[8] From 2009 to 2011, residential multiple-fatality fires were highest from 1 to 5 a.m., peaking from 1 to 2 a.m. (11 percent). Over one-third (38 percent) of multiple-fatality fires occurred during these four hours. Multiple-fatality fires then declined throughout the day, reaching the lowest point during the late afternoon from 4 to 5 p.m.

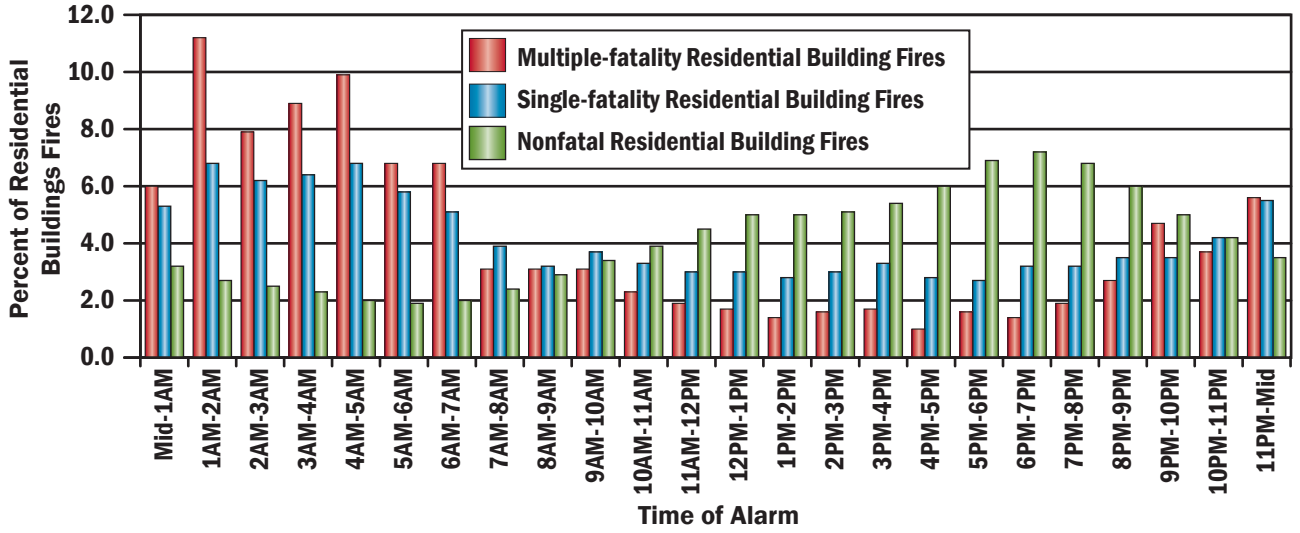
Figure 1. Multiple-fatality Fires in Residential Buildings by Time of Alarm (2009-2011)



Source: NFIRS 5.0.

The time of alarm profile for residential multiple-fatality fires was in contrast to the alarm time profile for nonfatal residential building fires as shown in Figure 2. Nonfatal fires had the reverse daily cycle, with fires, predominantly caused by cooking, occurring during the late afternoon and evening.[9] There are several 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, 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. While residential multiple-fatality fires had a similar time profile to single-fatality residential fires by occurring more often in the late night and early morning hours, the multiple-fatality fire profile was much more pronounced.

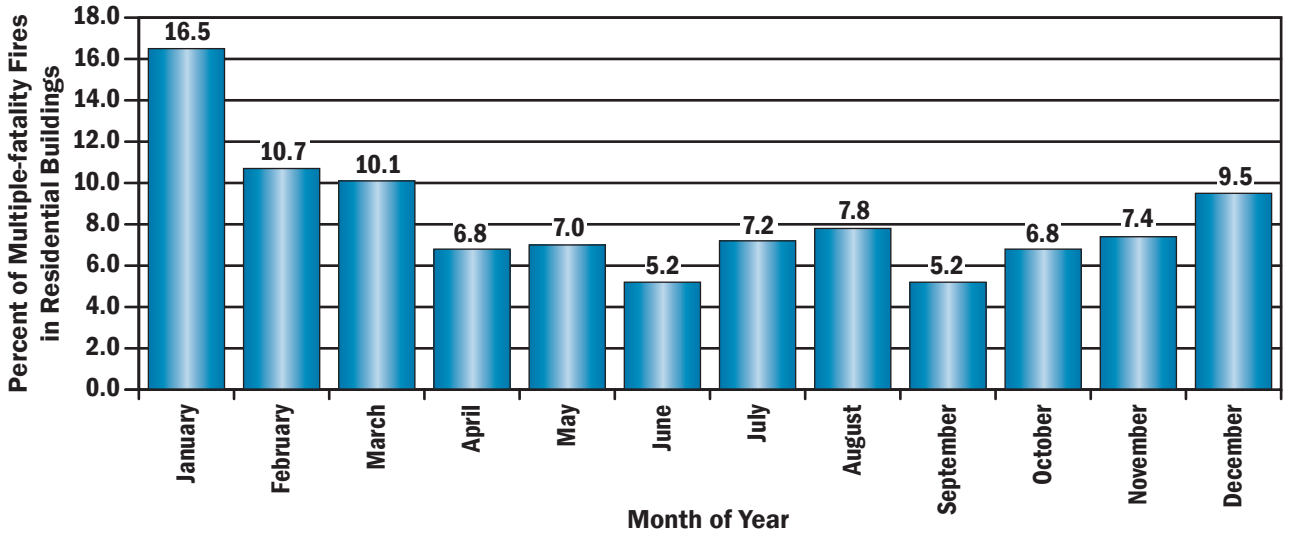
Figure 2. Time of Alarm for Multiple-fatality, Single-fatality and Nonfatal Fires in Residential Buildings (2009-2011)



Source: NFIRS 5.0.

There was a higher incidence of residential multiple-fatality fires in the cooler months, perhaps as a result of increased activities indoors. In fact, almost half (47 percent) of multiple-fatality fires occurred in the four months of December through March. Residential multiple-fatality fires spiked in January at 17 percent (Figure 3). Multiple-fatality fire incidence was lowest in June and September (both at 5 percent).

Figure 3. Multiple-fatality Fires in Residential Buildings by Month (2009-2011)



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

Where Multiple-fatality Fires in Residential Buildings Start

One- and two-family dwellings accounted for 81 percent of residential multiple-fatality fires as seen in Table 3. This is not surprising since almost three-quarters of the population lives in these types of residences.[10] Multifamily dwellings such as apartments, townhouses, condominiums and tenement properties accounted for 15 percent of all residential multiple-fatality fires. Other residential occupancies, including boarding and rooming houses as well as hotels and motels, were a very small portion, accounting for only 4 percent of residential multiple-fatality fires. The distribution of multiple-fatality fires was very similar to that of single-fatality residential fires.

Table 3. Property Use for Multiple- and Single-fatality Fires in Residential Buildings (2009-2011)

Property Use	Percent of Multiple-fatality Fires in Residential Buildings	Percent of Single-fatality Fires in Residential Buildings
One- and two-family dwellings	81.0	79.5
Multifamily dwellings	14.9	15.8
Other residential buildings	2.9	3.5
Boarding, rooming houses	1.0	0.7
Hotels and motels	0.2	0.6
Total	100.0	100.0

Source: NFIRS 5.0.
Note: Total of single-fatality fires in residential buildings does not add up to 100 percent due to rounding.

Table 4 shows the leading areas of fire origin in residential multiple-fatality fires. These fires started most frequently in bedrooms (23 percent) and common rooms including dens, family rooms, living rooms and lounges (also 23 percent). Fires starting in cooking areas or kitchens accounted for an additional 12 percent of residential multiple-fatality fires. These areas of fire origin were also the three leading areas of fire origin for single-fatality residential fires.

Table 4. Leading Areas of Origin for Multiple-fatality Fires in Residential Buildings (2009-2011)

Area of Origin	Percent (Unknowns Apportioned)
Bedrooms	23.4
Common room, den, family room, living room, lounge	22.9
Cooking area, kitchen	12.2

Source: NFIRS 5.0.

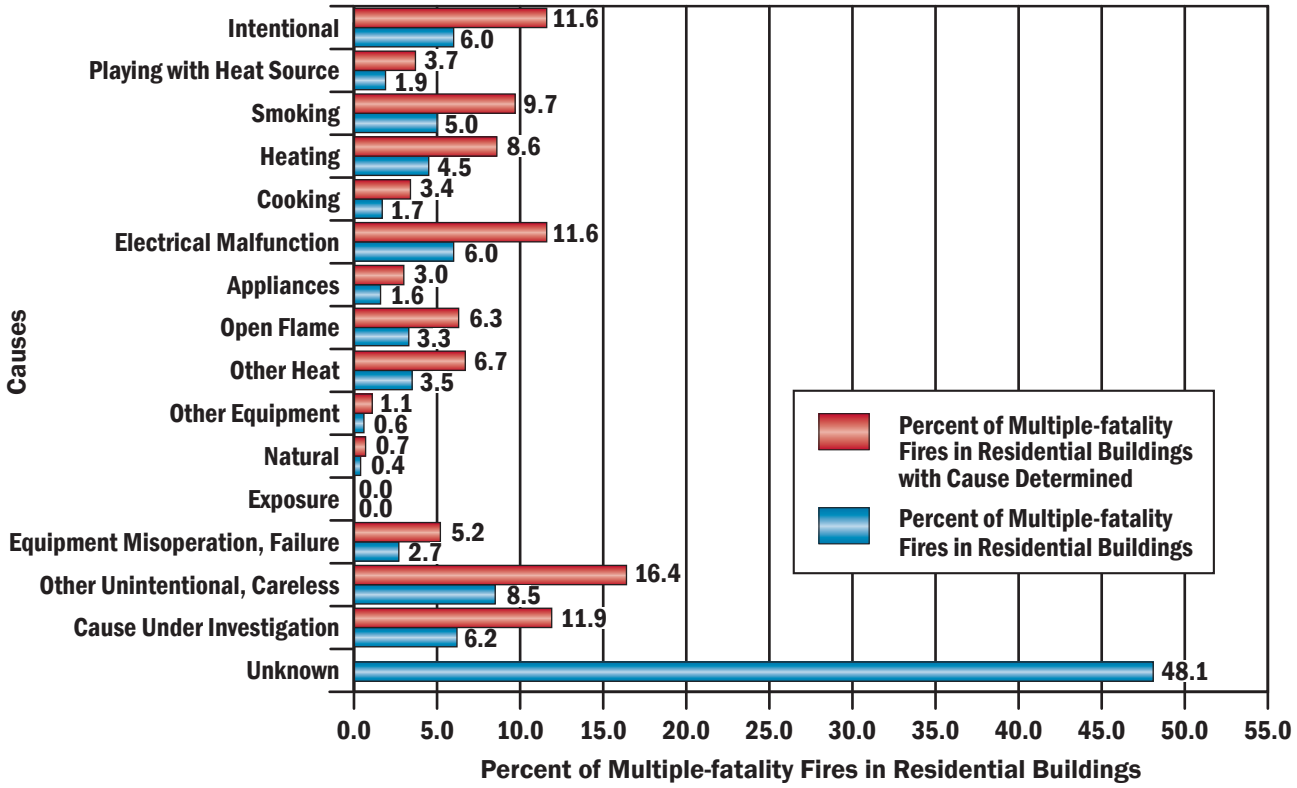
Causes of Multiple-fatality Fires in Residential Buildings

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 to determine cause.[11] A large percentage of residential multiple-fatality fire incidents reported to NFIRS (48 percent), however, did not have sufficient information to determine the cause of the fire. As a result, the cause analyses that follow reflect only the 52 percent of incidents where enough information and detail was reported to determine the cause of the fatal fire, making it difficult to establish conclusions.

"Other unintentional, careless" action was the leading cause of residential multiple-fatality fires at 16 percent (Figure 4). "Other unintentional, careless" actions include misuse of a material or product, abandoned or discarded materials or products, heat source placed too close to combustibles, and miscellaneous unintentional actions. The next leading causes were "cause under investigation," "electrical malfunction" and "intentional" action at 12 percent each. These leading causes accounted for 52 percent of multiple-fatality fires.

By comparison, "other unintentional, careless" action and "smoking"[12] were the leading causes of single-fatality residential fires at 16 percent each. Fires caused by "other unintentional, careless" action played a larger role in both multiple-fatality and single-fatality fires (16 percent each) than in nonfatal residential fires (7 percent), where cooking was the predominant cause (46 percent).

Figure 4. Causes of Multiple-fatality Fires in Residential Buildings (2009-2011)



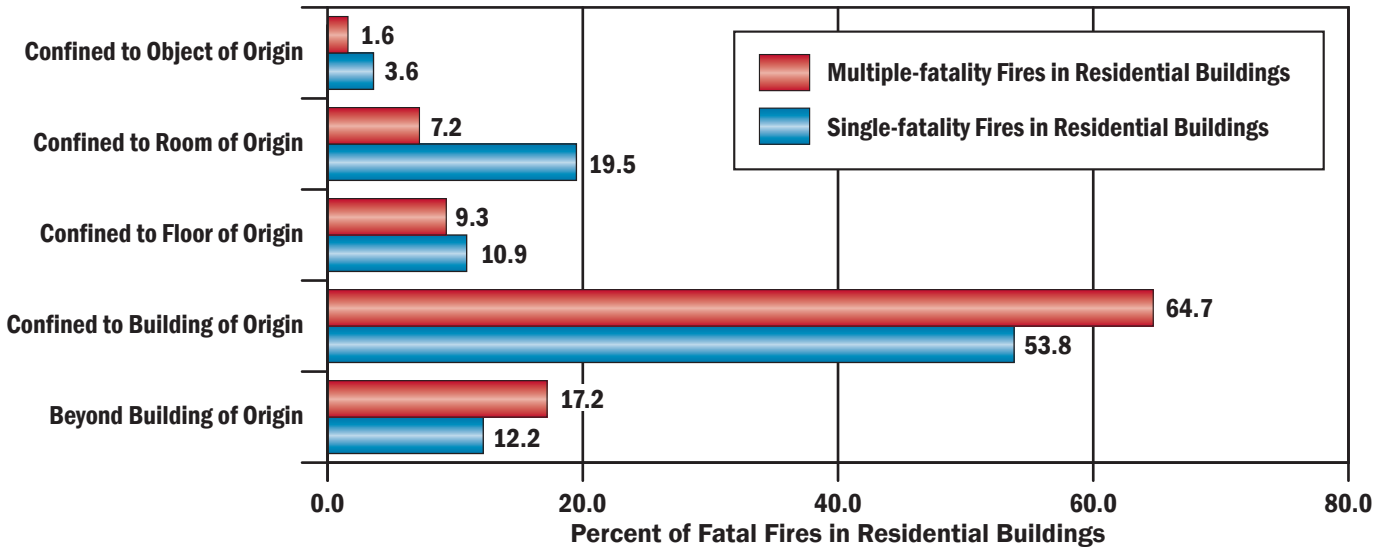
Source: NFIRS 5.0.

Notes: 1. Total of multiple-fatality fires in residential buildings with cause determined does not add up to 100 percent due to rounding.
2. 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.

Fire Spread in Multiple-fatality Fires in Residential Buildings

As shown in Figure 5, 91 percent of residential multiple-fatality fires extended beyond the room of origin. By comparison, 77 percent of single-fatality fires extended beyond the room of origin. While only 9 percent of residential multiple-fatality fires were confined to the room or object of origin, these smaller spreading fires are evidence that a fire does not have to be large to cause multiple fatalities.

Figure 5. Extent of Fire Spread in Multiple- and Single-fatality Fires in Residential Buildings (2009-2011)



Source: NFIRS 5.0.

Human Factors Contributing to Ignition of Multiple-fatality Fires in Residential Buildings

Human factors — the human condition or situation that allowed the heat source and combustible material to combine to ignite the fire — played an important role in residential multiple-fatality fires. The leading human factor contributing to the ignition of the fire was being "asleep" (53 percent). This finding is not unexpected, as 72 percent of residential multiple-fatality fires occurred during the 10-hour period, 9 p.m. to 7 a.m., when many people were expected to be sleeping (Table 5). "Possibly impaired by alcohol or drugs" and "physical disability" were the next leading human factors contributing to the ignition of the fire at 17 percent and 15 percent, respectively.

Table 5. Human Factors Contributing to Ignition of Multiple-fatality Fires in Residential Buildings (Where Human Factor Contributing Specified, 2009-2011)

Human Factors Contributing to Ignition	Percent (Unknowns Apportioned)
Asleep	53.2
Possibly impaired by alcohol or drugs	17.4
Physical disability	14.7
Unattended or unsupervised person	13.7
Age was a factor	12.1
Possible intellectual disability	8.9
Multiple persons involved	7.9

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 Multiple-fatality Fires in Residential Buildings

Over the past 30 years, technologies to detect and extinguish fires have been a major contributor to the drop in fire fatalities and injuries. Households with fires (both fatal and nonfatal), however, were less likely to have had smoke alarms (93 percent) than nonfire households (97 percent).[13] In addition, a continuing trend of multiple-fatality fires in residential buildings is the high proportion with no smoke alarms or nonfunctioning smoke alarms.

Note that the data presented in Tables 6 and 7 are the raw counts from the NFIRS data set and are not scaled to national estimates of smoke alarms in residential multiple-fatality 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 point of origin of the fire.

Smoke Alarms

Smoke alarms were reported as present in 36 percent of residential multiple-fatality fires. By comparison, smoke alarms were present in 42 percent of nonfatal residential fires.[14] In 25 percent of residential multiple-fatality fires, there were no smoke alarms present.[15] Nationally, only 3 percent of households do not have a smoke alarm installed.[16] This lack of early warning is a considerable factor in residential multiple-fatality fires. Lastly, in 40 percent of these multiple-fatality fires, firefighters were unable to determine if a smoke alarm was present (Table 6).[17]

Table 6. Presence of Smoke Alarms in Multiple-fatality Fires in Residential Buildings (2009-2011)

Presence of Smoke Alarms	Percent
Present	35.7
None present	24.6
Undetermined	39.7
Total	100.0

Source: NFIRS 5.0.

Where the existence of a smoke alarm was not determined, 91 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 86 percent of residential multiple-fatality fires in which no smoke alarm was present. Multifamily housing accounted for just 10 percent of these fires, perhaps because it is subject to more stringent codes and often requires the landlord or manager to maintain the detection systems.

When smoke alarm operational status was considered (Table 7), the percentage of smoke alarms reported as present (36 percent) consisted of:

—Present and operated — 12 percent.

—Present but did not operate — 8 percent (alarm failed to operate, 8 percent; fire too small, 0 percent).

—Present but operational status unknown — 16 percent.

When the subset of incidents where smoke alarms were reported as present is analyzed separately, smoke alarms were reported to have operated in 33 percent of the incidents and failed to operate in 23 percent. The operational status of the alarm was undetermined in 45 percent of these incidents.[18]

Table 7. NFIRS Smoke Alarm Data for Multiple-fatality Fires in Residential Buildings (2009-2011)

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count	Percent
Present	Fire too small to activate smoke alarm		0	0.0
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	29	5.6
		Smoke alarm alerted occupants, occupants failed to respond	13	2.5
		No occupants	0	0.0
		Smoke alarm failed to alert occupants	1	0.2
		Undetermined	17	3.3
	Smoke alarm failed to operate		42	8.1
	Undetermined		82	15.9
None present			127	24.6
Undetermined			205	39.7
Total incidents			516	100.0

Source: NFIRS 5.0.

Notes: 1. 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 multiple-fatality fires in residential buildings. They are presented for informational purposes.
2. Total does not add up to 100 percent due to rounding.

Automatic Extinguishing Systems

Overall, full or partial automatic extinguishing systems, mainly sprinklers, were present in less than 1 percent of residential multiple-fatality fires (Table 8). This is to be expected, as residential sprinklers are largely absent in residences nationwide.[19]

Table 8. NFIRS AES Data for Multiple-fatality Fires in Residential Buildings (2009-2011)

AES Presence	Count	Percent
AES present	2	0.4
Partial system present	0	0.0
AES not present	473	91.7
Unknown	41	7.9
Total incidents	516	100.0

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

Examples

The following are examples of residential multiple-fatality fires reported by the media:

—April 2013: A mother, 94, and daughter, 64, died in a late night house fire in Whately, Mass. When fire crews arrived on-scene, they rescued the mother and daughter, who were both unconscious. It appeared to officials that the daughter was trying to get the mother out of the house. Both mother and daughter were rushed to a hospital where they were pronounced dead. The fire started under the floor of an old prefabricated metal fireplace that had rusted and decayed, causing the fireplace to malfunction.[20]

—February 2013: A single-story house fire caused by an unattended stove claimed the lives of three adults in Richland, Ga. Two women, ages 84 and 65, and one 59-year-old man, died as a result of the fire. The oldest victim was the mother of the other two victims.[21]

—February 2013: A mobile home fire in English, Ind., killed three adults and two children, ages 3 and 8. The Indiana State Fire Marshal's Office ruled that the fire was accidental and ignited by a wood burning stove.[22]

—December 2012: A morning house fire killed a mother, 28, and her four children, ranging in age from 3 to 8, in northwest Oklahoma City, Okla. The fire, which started about 6:30 a.m., was caused by a space heater sitting too close to flammable material. The mother's boyfriend was also severely burned and in critical condition. In addition to the victims, firefighters found the bodies of three dogs inside of the house.[23]

NFIRS Data Specifications for Multiple-fatality Fires in Residential Buildings

Data for this report were extracted from the NFIRS annual Public Data Release files for 2009, 2010 and 2011. Only version 5.0 data were extracted.

Multiple-fatality fires in residential buildings 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 (excludes 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
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 and 120-123:
—1—Enclosed building.
—2—Fixed portable or mobile structure.

—Civilian deaths greater than one.

The analyses contained in this report reflect the current methodologies used by the USFA. USFA is committed to providing the best 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.

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

Notes:

[1] The U.S. fire death rate for 2011 shown here is based on the National Fire Protection Association's estimate of fire deaths in 2011 and the U.S. Census Bureau's July 1 estimate of the 2011 U.S. resident population.

[2] USFA, "Fire Death Rate Trends: An International Perspective," July 2011, Volume 12, Issue 8, http://www.usfa.fema.gov/downloads/pdf/statistics/v12i8.pdf.

[3] The Geneva Association, "World Fire Statistics," *Geneva Association Information Newsletter*, Number 28, October 2012. **Note:** Belgium was excluded from this review, as its 2007-2009 death rates were unavailable.

[4] The 2009-2011 annual average estimate of civilian fire deaths is based on data from the NFPA's report, "Fire Loss in the United States During 2011," September 2012.

[5] National estimates are based on 2009-2011 native version 5.0 data from NFIRS, residential structure fire loss estimates from the NFPA's annual surveys of fire loss, and the USFA's residential building fire loss estimates: http://www.usfa.fema.gov/statistics/estimates/index.shtm. Fires are rounded to the nearest 100, deaths to the nearest five, injuries to the nearest 25, and losses to the nearest million dollars.

[6] 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. 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.

[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 national estimates are based on a sample of fire departments that report fatality totals. The NFIRS data are based on a large set of fires, with the data at the individual fire incident level. The fire death rate computed from national estimates is 740/200 = 3.7 deaths per multiple-fatality fire in residential buildings and the fire injury rate is 175/200 = 0.9 injuries per multiple-fatality fire in residential buildings.

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

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

[10] The U.S. Census Bureau shows that in 2011, 76.3 percent (87.7 million) of occupied housing units were one-unit attached and detached structures or manufactured/mobile homes (http://www.census.gov/housing/ahs/data/national.html for occupied housing). Household size (2007-2011) was estimated at 2.6 people per household (http://quickfacts.census.gov/qfd/states/00000.html). Thus, 87.7 million housing units x 2.6 people per household = 228 million people lived in one-unit attached and detached structures or mobile homes. With the 2011 U.S. population estimate given as 311.6 million, (Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2012 (NST-EST2012-01) http://www.census.gov/popest/data/national/totals/2012/index.html), approximately 73.2 percent of the population lived in what NFIRS defines as one- and two-family housing.

[11] The USFA Structure Fire Cause Methodology was used to determine the cause of multiple-fatality fires in residential buildings: http://www.usfa.dhs.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm.

[12] 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.

[13] 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, Table 5-3, July 2009.

[14] Here, 42 percent reflects nonconfined residential nonfatal fires only. Nonconfined fires are generally large and more serious fires. Confined fires, defined in NFIRS as Incident Types 113-118, are excluded from this analysis as the NFIRS smoke alarm data elements are not required to be completed for these types of fires.

[15] Here, **at least** 25 percent of multiple-fatality fires in residential buildings had no smoke alarms present — the 25 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.

[16] Greene, Michael, and Craig Andres. 2004-2005 *National Sample Survey of Unreported Residential Fires*. Division of Hazard Analysis, Directorate for Epidemiology, CPSC, July 2009.

[17] The percentages cited for the presence of smoke alarms in multiple-fatality fires in residential buildings do not add up to 100 percent due to rounding.

[18] When the subset of incidents where smoke alarms were reported as present is analyzed separately, the percentages cited for the presence of smoke alarms in multiple-fatality fires in residential buildings do not add up to 100 percent due to rounding.

[19] Department of Housing and Urban Development and U.S. Census Bureau, American Housing Survey Branch, "American Housing Survey for the United States: 2009," Table 1-4, www.census.gov/hhes/www/housing/ahs/ahs09/ahs09.html.

[20] Samantha Lavien, "House Fire in Whately on Wednesday Night Leaves 2 Women Dead," cbs3springfield.com, April 4, 2013. http://www.cbs3springfield.com/story/21880128/house-fire-in-whately-wednesday-night-leaves-two-women-dead (accessed April 5, 2013).

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