NFPA RESEARCH

Home Heating Fires

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Key Findings

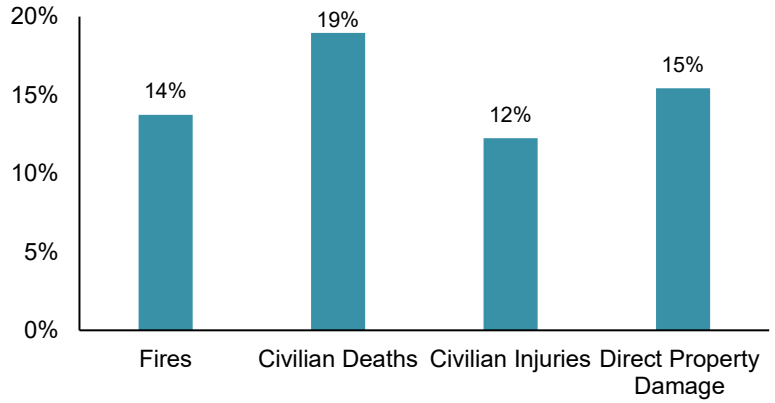
- Heating equipment is a leading cause of fires in US homes.
- Home fires involving heating equipment follow a clear seasonal pattern and are most common during the cold weather months.
- Municipal fire departments in the US responded to an estimated annual average of 48,530 home structure fires caused by heating equipment in 2014–2018.
- Heating equipment fires resulted in an estimated 500 civilian deaths; 1,350 civilian injuries; and $1.1 billion in direct property damage each year in 2014–2018.
- Heating equipment caused one in seven home structure fires (14%) that took place in 2014–2018.
- These fires also accounted for one-fifth (19%) of home fire fatalities, one in seven injuries (12%), and 15 percent of the direct property damage resulting from home fires in 2014–2018.
- Space heaters were most often responsible for the home heating equipment fires, accounting for more than two in five fires, as well as the vast majority of the deaths and injuries in home fires caused by heating equipment.
- Approximately two in five home heating equipment fires involved heating equipment that relied upon a solid fuel, such as wood-burning or pellet stoves or wood-burning fireplaces.
- Failure to clean equipment was the leading factor contributing to home fires involving heating equipment and accounted for a quarter of all the heating equipment fires.
- A frequent cause of chimney fires was the ignition of creosote, a highly combustible by-product of wood fires that can be deposited on the lining of chimney walls.
- Home fires caused by heating equipment were less likely to occur in the overnight hours from midnight to 8 a.m., but these fires accounted for nearly half of the fatalities, as well as a disproportionate share of the injuries and direct property damage.

Home Fires Involving Heating Equipment

Municipal fire departments in the US responded to an estimated annual average of 48,530 home structure fires caused by heating equipment in 2014–2018. These fires resulted in an estimated 500 civilian deaths; 1,350 civilian injuries; and $1.1 billion in direct property damage each year.

Heating equipment is a leading cause of fires in US homes. Heating equipment caused one in seven home structure fires (14%) that took place in 2014–2018, while also accounting for one-fifth (19%) of the home fire fatalities, one in seven injuries (12%), and 15 percent of the direct property damage resulting from home fires in 2014–2018, as shown in Figure 1.

Figure 1. Share of Home Structure Fires Caused by Heating Equipment, 2014–2018 Annual Averages



Types of Heating Equipment Involved in Home Fires

Space heaters were most often responsible for the home heating equipment fires, accounting for more than two in five fires, as well as the vast majority of deaths (81%) and injuries (80%) in home fires caused by heating equipment. Space heaters were also responsible for over half of the direct property damage from home heating fires.

The leading types of heating equipment involved in home heating equipment fires are shown in Figure 2. More detailed information on the types of heating equipment and associated losses can be found in Table 5 in the Supporting Tables for this report.

Fireplaces or chimneys were involved in approximately three in 10 fires caused by heating equipment (29%). The vast majority of these fires were classified as confined fires that were limited in scope and did not extend beyond the chimney. As a result, fires caused by fireplaces or chimneys resulted in a comparatively smaller share of deaths (9%) and injuries (5%).

Other leading types of heating equipment involved in home heating equipment fires included central heating systems and water heaters, with each accounting for approximately one in 10 heating equipment fires. These fires were responsible for a comparatively smaller share of deaths, injuries, and direct property damage.

Kerosene heater blamed for fire that kills three children

A fire that claimed the lives of three children started when a kerosene heater was tipped over and ignited carpet and paneling, with the fire rapidly spreading through the residence.

The fire department was notified of the blaze by a 911 call from the children's mother.

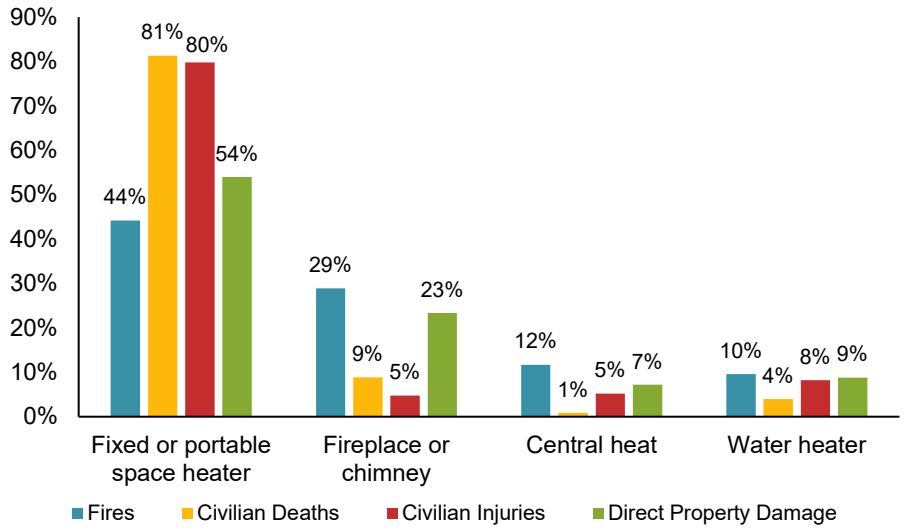
The fire department indicated that the mother was trying to move the heater when it tipped over. According to newspaper reports, the exit was blocked by the fire and the mother straddled a window while trying to get the children out but fell out the window and was unable to get back inside.

Firefighters arrived at the structure, a manufactured home, and used a hose line in their initial attack on the fire. Reports indicated that the hose line provided a quick knockdown. The children had succumbed to their injuries by the time crews gained entry.

The fire department indicated that the family was using the kerosene heater in order to save money on heating bills.

Source: "Firewatch," *NFPA Journal*, January/February 2017.

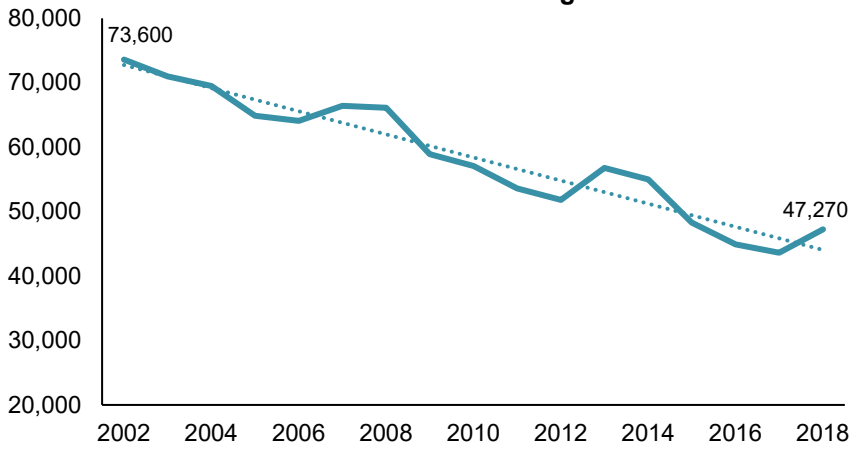
Figure 2. Home Fires Involving Heating Equipment by Type of Equipment, 2014–2018 Annual Averages



Trends in Home Fires Involving Heating Equipment

The number of home fires involving heating equipment has followed a distinct, though somewhat inconsistent, downward trend since 2002, as shown in Figure 3. From over 70,000 heating equipment fires each year in 2002–2003, the estimated number of heating equipment fires has fallen to fewer than 50,000 a year since 2015, with the 43,620 estimated fires in 2017 representing a new low. Improvements in safety standards, such as those requiring automatic cut-off devices that turn off electric or kerosene space heaters when they tip over and more guarding around the heating coils of electric heaters and burners of kerosene heaters, are likely to have influenced the decline in the number of home heating fires. More complete information on home fires involving heating equipment by year is available in Table 1 in the Supporting Tables report.

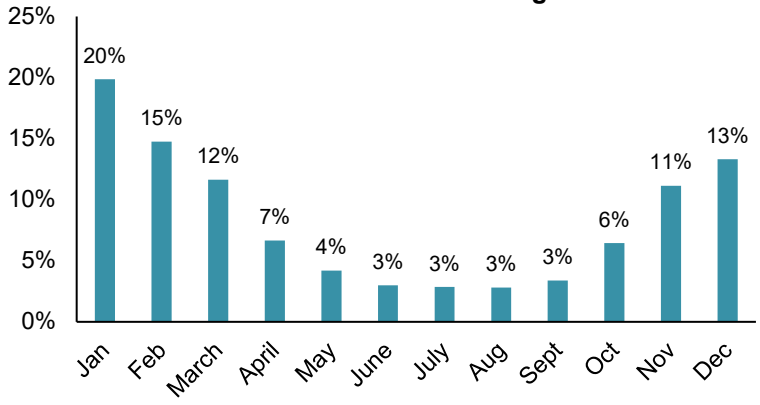
Figure 3. Home Fires Involving Heating Equipment by Year, 2002–2018 Annual Averages



Home Fires Involving Heating Equipment by Month

Home fires involving heating equipment follow a clear seasonal pattern and are highest during the cold weather months. As shown in Figure 4, nearly half (48%) of the heating equipment fires in 2014–2018 occurred in January, February, and December, while a much smaller share of the fires (12%) occurred in the warm weather months of June through September. Generally, the deaths, injuries, and direct property damage associated with these fires followed the same pattern as the distribution of fires, as shown in Table 2 in the Supporting Tables report.

Figure 4. Home Fires Involving Heating Equipment by Month, 2014–2018 Annual Averages



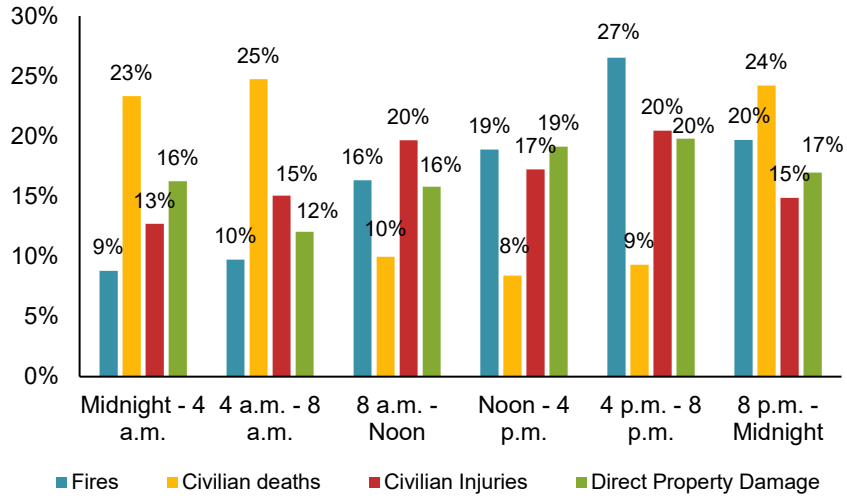
Home Fires Involving Heating Equipment by Time of Day

Home fires caused by heating equipment were less likely to occur in the overnight hours from midnight to 8 a.m. (19% of total), but fires in that time period accounted for nearly half of the fatalities (48%), as well as a disproportionate share of the injuries (28%) and direct property damage (28%), as shown in Figure 2.

Occupants have less time to respond to fires in the overnight hours when they are likely to be asleep and farther away from areas of egress, underscoring the importance of equipping residences with detection systems that provide early warning.

The peak period for fires was the four-hour period from 4 p.m. to 8 p.m., which accounted for nearly three in 10 fires (27%). These fires resulted in a smaller share of deaths (9%), injuries (20%), and direct property damage (20%), likely because people were awake and in the room or in a nearby area. Figure 5 shows that one-fifth of the fires occurred between 8 p.m. and midnight, but most of these occurred between 8 p.m. and 10 p.m., as indicated in Table 4 in the Supporting Tables report.

Figure 5. Home Fires Involving Heating Equipment by Time of Day, 2014–2018 Annual Averages



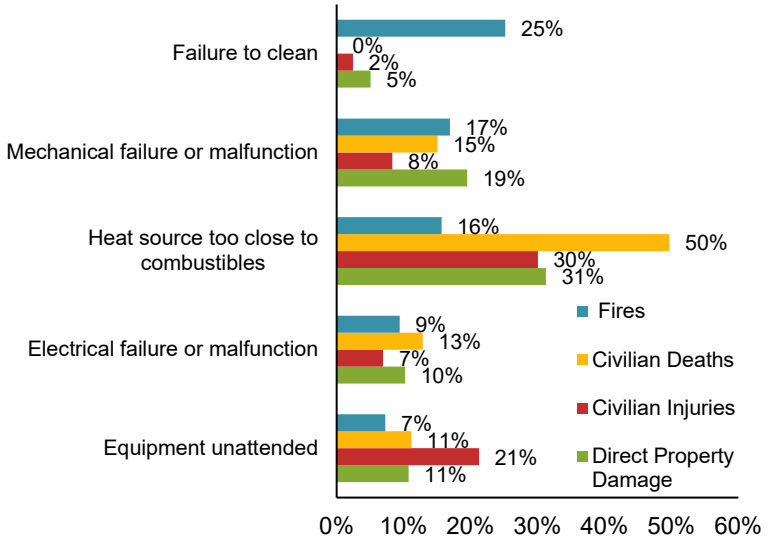
Factors That Contributed to Home Fires Involving Heating Equipment

Failure to clean equipment was the leading factor contributing to home fires involving heating equipment and accounted for a quarter of all the heating equipment fires. Most of these fires were confined fires, which limited the associated losses, as indicated in Figure 6. Fires in which a heat source was too close to combustible materials were far more likely to spread beyond the object of fire origin and were associated with the largest share of civilian deaths and injuries, as well as direct property damage.

Anything that can burn should be kept at least three feet away from heating equipment, whether it be a furnace, fireplace, wood stove, or space heater.

Unattended equipment was determined to be a factor in fewer than one in 10 heating equipment fires (7%), but these fires accounted for one-fifth (21%) of the heating equipment fire injuries. While unattended equipment is not itself a direct cause of fire, fires can start or grow unnoticed when no one is present around fireplaces, stoves, or space heaters.

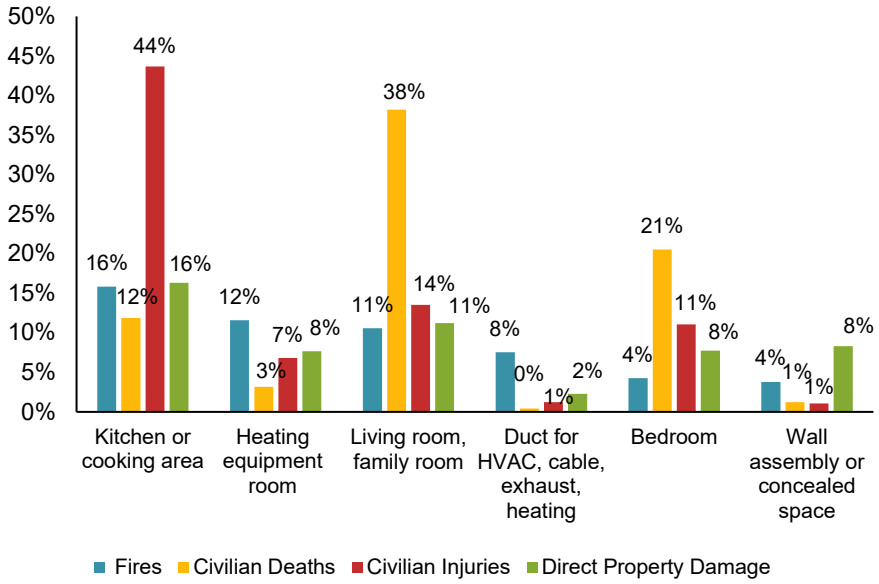
Figure 6. Home Fires Involving Heating Equipment by Factor Contributing to Ignition, 2014–2018 Annual Averages



Areas of Origin for Home Fires Involving Heating Equipment

Heating equipment fires in homes most often originated in the kitchen or cooking area. While they accounted for approximately one in six of the heating equipment fires, more than two in five injuries occurred in kitchen fires (44%). Fires originating in the living room or family room accounted for approximately one in 10 heating equipment fires, but almost two in five deaths (38%). Heating equipment fires originating in the bedroom represented a small share of the total but accounted for a disproportionate share of deaths (21%) and injuries (11%). The direct property damage from fires caused by heating equipment in a bedroom or wall assembly or concealed space (8%) was double their share of the heating equipment fire total (4%). See Figure 7.

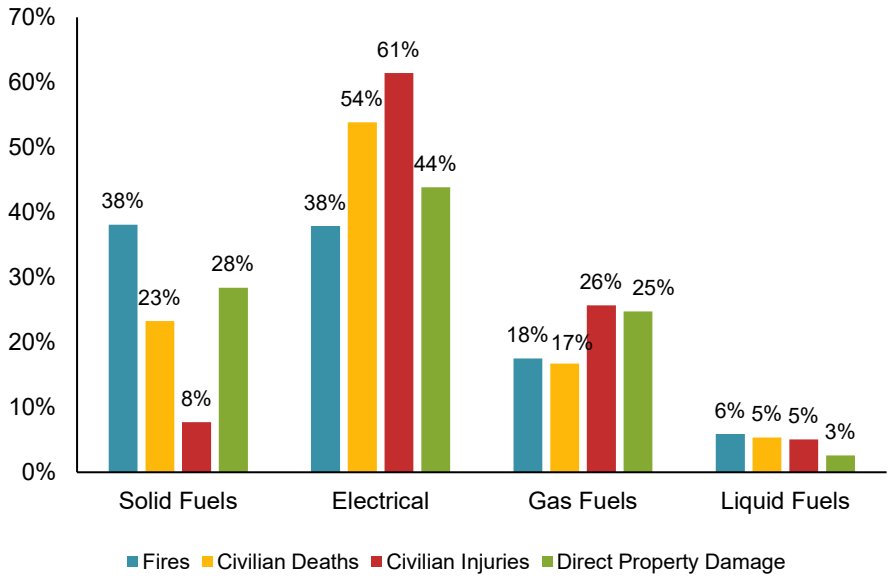
Figure 7. Home Fires Involving Heating Equipment by Area of Origin, 2014–2018 Annual Averages



Type of Fuel or Power Source in Home Fires Involving Heating Equipment

Approximately two in five home heating equipment fires involved heating equipment that relied upon a solid fuel, such as wood-burning or pellet stoves or wood-burning fireplaces. However, electric-powered heating devices were the equipment responsible for the largest share of losses, accounting for more than half the fatalities, three in five injuries, and two-fifths of the direct property damage.

Figure 8. Home Fires Involving Heating Equipment by Fuel or Power Source, 2014–2018 Annual Averages



Type of Fuel or Power Source in Home Fires Involving Space Heaters

Space heaters accounted for the largest share of home fires involving heating equipment in 2014–2018. Just over half of the space heaters involved in these fires relied upon electrical power (52%). The vast majority of the space heater fires were non-confined fires. As indicated in Table A, fires caused by electrical space heaters accounted for the vast majority of the deaths, injuries, and direct property damage resulting from space heater fires. Space heaters that relied upon a solid fuel source accounted for a quarter of the space heater fires. Less than a quarter of the space heater fires relied upon a gas fuel (16%), but the majority of the fires were non-confined incidents.

Table A. Home Fires Involving Space Heaters by Fuel or Power Source, 2014–2018 Annual Averages

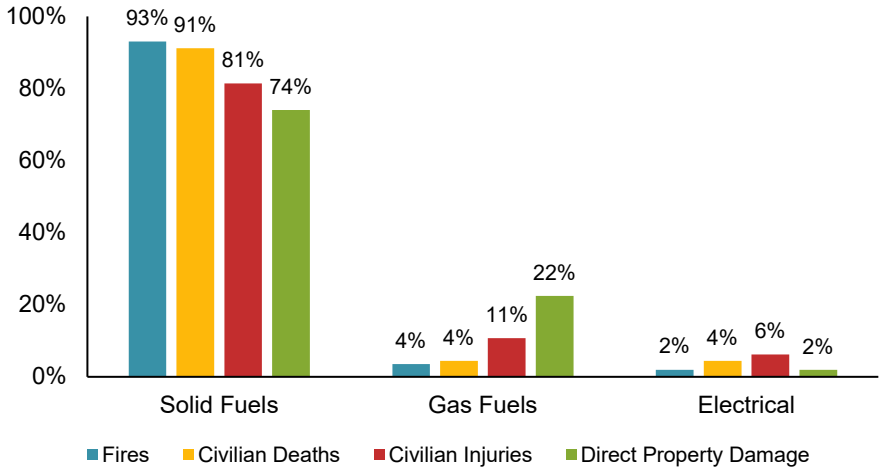
Equipment Power	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage
Electrical	52%	57%	70%	56%
Non-confined	48%	57%	70%	56%
Confined	4%	0%	0%	0%
Solid Fuels	25%	19%	5%	20%
Non-confined	8%	19%	5%	20%
Confined	17%	0%	0%	0%
Gas Fuels	16%	17%	20%	20%
Non-confined	13%	17%	19%	20%
Confined	3%	0%	1%	0%
Liquid Fuels	6%	6%	5%	3%
Non-confined	2%	6%	5%	3%
Confined	4%	0%	0%	0%

Type of Fuel or Power Source in Home Fires Involving Fireplaces or Chimneys

Fireplaces or chimneys were involved in approximately three in 10 home fires involving heating equipment in 2014–2018. These fires most often occurred in fireplaces or chimneys that relied upon a solid fuel source, with only a small share of the fires involving equipment that was gas-fueled or electrical, as indicated in Figure 9.

A frequent cause of chimney fires is the ignition of creosote, a highly combustible by-product of wood fires that can be deposited on the lining of chimney walls. Annual inspection and maintenance of chimneys are important for reducing the risk of fire due to creosote buildup. Although the majority of chimney fires tend to be confined fire incidents, these fires can present a challenge for firefighters.

Figure 9. Home Fires Involving Fireplaces or Chimneys by Fuel or Power Source, 2014–2018 Annual Averages

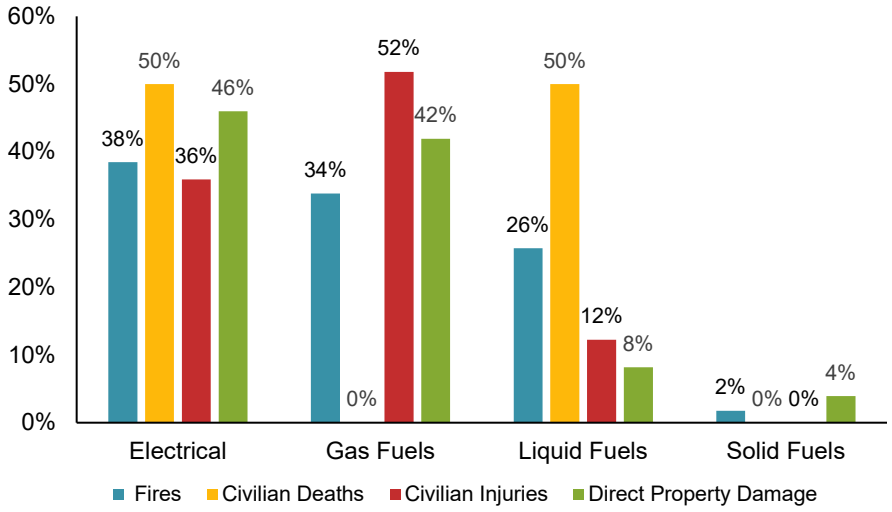


Type of Fuel or Power Source in Home Fires Involving Central Heat

Just over one in 10 home heating equipment fires involved central heating equipment. As Figure 10 indicates, electrical-powered and gas- or liquid-fueled equipment accounted for sizeable shares of these fires. Equipment powered by electricity (38%) accounted for a somewhat disproportionate share of deaths (50%), while gas-fueled equipment accounted for just over half of the civilian injuries. Few fires involving central heat were powered by equipment using solid fuels.

Occasional maintenance of furnaces or boilers by heating service professionals is important for detecting and repairing problems caused by the deterioration of equipment, such as the deterioration of the physical integrity of the heat exchanger.

Figure 10. Home Fires Involving Central Heat by Fuel or Power Source, 2014–2018 Annual Averages



Wood stove ashes start fatal fire
An elderly man suffered fatal injuries in a house fire that began when ashes from a wood stove ignited a cardboard box in which they were being stored. A friend of the resident called 911 after stopping by the house and discovering the fire.

According to news reports, flames could be seen shooting from the windows and roof of the house shortly after the fire was detected. Firefighters from at least six departments assisted in fighting the fire and were said to be at the scene for several hours.

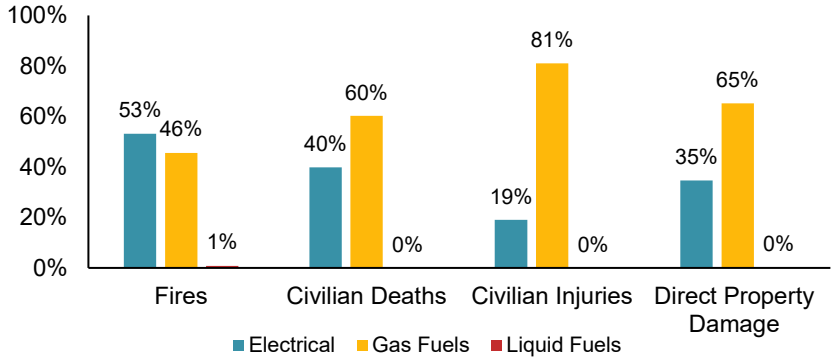
Investigators indicated that the fire started in the basement, where the wood stove was located, and spread via an open stairway to the main floor where the victim was located. The man was unable to escape due to poor health and was found in the doorway of the residence.

Source: "Firewatch." *NFPA Journal*. Januarv/Februarv 2017.

Type of Fuel or Power Source in Home Fires Involving Water Heaters

Water heaters accounted for one in 10 of the home fires involving heating equipment, almost all of which were either electric-powered or gas-fueled equipment. Just under half of the fires were caused by gas-fueled water heaters, but these fires accounted for a substantially larger share of the deaths, injuries, and direct property damage, as shown in Figure 11.

Figure 11. Home Fires Involving Water Heaters by Fuel or Power Source, 2014–2018 Annual Averages



Safety with Heating Equipment

NFPA has identified a number of home safety practices that can help to prevent fires caused by heating equipment. These include the following:

- Keep anything that can burn at least three feet away from heating equipment.
- Maintain a three-foot kid-free zone around home fireplaces and space heaters.
- Never use your oven to heat your home.
- Have a qualified professional install stationary space heating equipment, water heaters, and central heating equipment according to local codes and manufacturer's instructions.
- Have heating equipment and chimneys inspected and cleaned every year by a qualified professional.
- Remember to turn portable heaters off when leaving a room or going to bed.
- Always use the appropriate type of fuel, as specified by the manufacturer, for fuel-burning space heaters.
- Ensure that the fireplace has a sturdy screen to stop embers from flying into the room. Make sure that ashes are cool before placing them in a bin for removal.

Acknowledgments

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the NFIRS and the annual NFPA Fire Experience Survey. These firefighters are the original sources of the detailed data that makes this analysis possible. Their contributions allow us to estimate the size of the fire problem.

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