



RESEARCH



Home Cooking Fires

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Key findings

Cooking is such a routine activity that it is easy to forget that the high temperatures used can easily start a fire. During 2014–2018, cooking was the leading cause of reported homeⁱ fires and home fire injuries and the second leading cause of home fire deaths.ⁱⁱ

Cooking caused an average of 172,900 reported home structure fires per year (49 percent of all reported home fires in the US). These fires resulted in an average of 550 civilian deaths (21 percent of all home fire deaths) and 4,820 civilian injuries (44 percent of all reported home fire injuries) annually.

The vast majority of reported cooking fires were small. The percentage of apartment fires started by cooking was nearly twice that of cooking fires in one- or two-family homes. But apartments are also more likely to have monitored smoke detection systems than are one- and two-family homes. Such systems could result in fire department responses to incidents that might have been handled by the occupants if the fire department had not been alerted.

Ranges or cooktops were involved in 61 percent of reported home cooking fires, 87 percent of cooking fire deaths, and 78 percent of cooking fire injuries. Households that used electric ranges showed a higher risk of cooking fires and associated losses than those using gas ranges.

Unattended cooking was the leading cause of cooking fires and casualties. Clothing was the item first ignited in less than one percent of these fires, but clothing ignition led to 8 percent of the home cooking fire deaths.

Cooking oil and grease fires are a major part of the cooking fire problem.

More than one-quarter of the people killed by cooking fires were asleep when they were fatally injured. More than half of the non-fatal injuries occurred when people tried to control the fire themselves.

The report also shows that:

- Cooking caused more home fire deaths in 2014–2018 than in 1980–1984.
- An average of 470 home cooking fires were reported per day in 2018.
- The peak days for home cooking fires were Thanksgiving and Christmas.

Unless otherwise specified, the statistics presented in this report are estimates derived from the United States Fire Administration’s National Fire Incident Reporting System (NFIRS) and NFPA’s annual Fire Experience Survey.

For more detailed information, see [Home Cooking Fires: Supporting Tables](#). See [Non-Fire Cooking Burn Injuries](#) to learn more about this related topic.

ⁱ The term *home* encompasses one- or two-family homes, including manufactured homes and apartments or other multifamily housing.

ⁱⁱ Death and injury estimates exclude firefighter casualties.

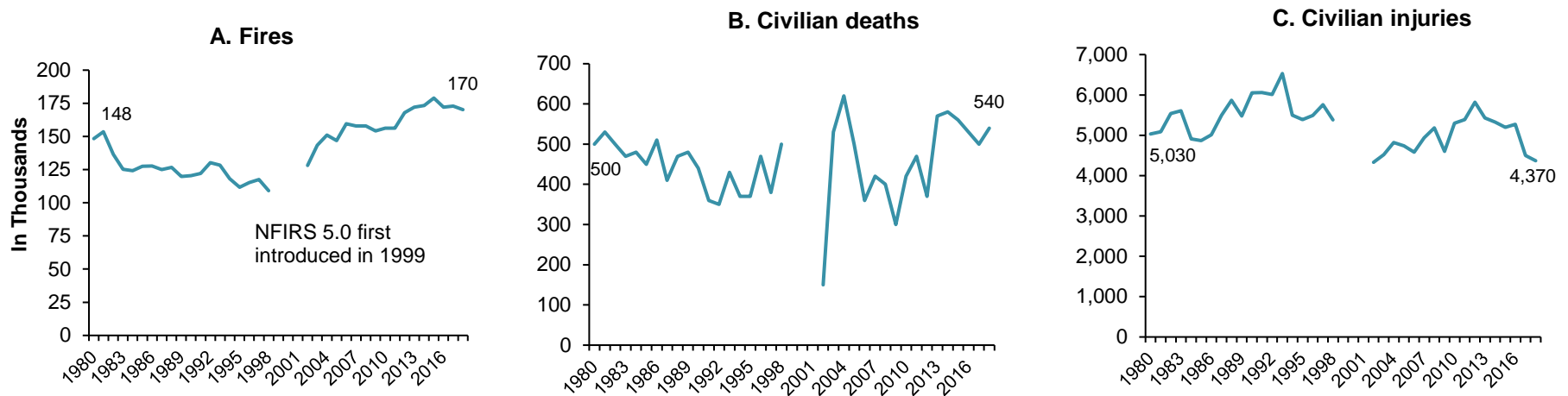
Trends in cooking fires and cooking fire casualties

Data indicate that reported cooking fires started to decline in 1981 and then plateaued before falling again in the 1990s. NFIRS 5.0, first introduced in 1999, made it much easier to document minor cooking fires (referred to as *confined fires*) that did not spread beyond the pan, oven, or other container in which the fire started.ⁱⁱⁱ During the transition years of 1999–2001 — when NFIRS 5.0 was being introduced — less than half of the fire data was collected under the new rules and definitions. Consequently, those estimates were omitted from the trend graphs. The use of NFIRS 5.0 was accompanied by an increase in

reported cooking fires. After leveling off for a few years, reported cooking fires hit consecutive new highs in 2012–2015. In 2016–2018, these fires fell below the 2014 and 2015 levels, but they remained historically high. Changes to NFIRS may have influenced some of these trends.¹ See Figure 1.

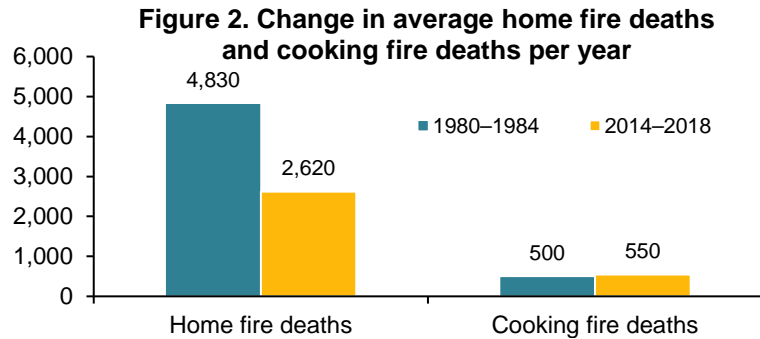
There were more cooking fire deaths in 2014–2018 than in 1980–1984, even though total home fire deaths fell 46 percent from the earlier period. It appears that less progress has been made in reducing deaths from home cooking fires than deaths from most other fire causes. See Figure 2.

Figure 1. Reported home cooking fires^{iv} by year: 1980–2018



ⁱⁱⁱ Causal information is not required for structure fires with the six confined fire incident types, including confined cooking fires, although it is sometimes provided. Structure fires that do not have these incident types are referred to as *non-confined fires*, even though fire spread is sometimes limited to the object of origin. In this analysis, confined cooking fires were analyzed separately from non-confined fires and the results were summed.

^{iv} Estimates for the NFIRS transition years of 1999–2001 are unstable and not shown. NFIRS 5.0, first introduced in 1999, originally defined equipment involved in ignition (EII) as the piece of equipment that provided the principal heat source that caused ignition if the equipment malfunctioned or was used improperly. [Change 290 in Specification changes and corrections](#), effective in 2006, amended the definition to include any equipment that was the principal heat source. Beginning in 2012, Change 337 required the EII data element to be completed if the heat source or another factor contributing to ignition indicated some type of operating equipment was involved. This was removed, effective with 2015 data.



Causes and circumstances of home cooking fires

Unattended cooking was by far the leading factor in cooking fires and cooking fire casualties. See Figure 3. Abandoned or discarded material, which may have been related to unattended cooking, ranked second in the causes of cooking fires and third in cooking fire deaths and injuries.

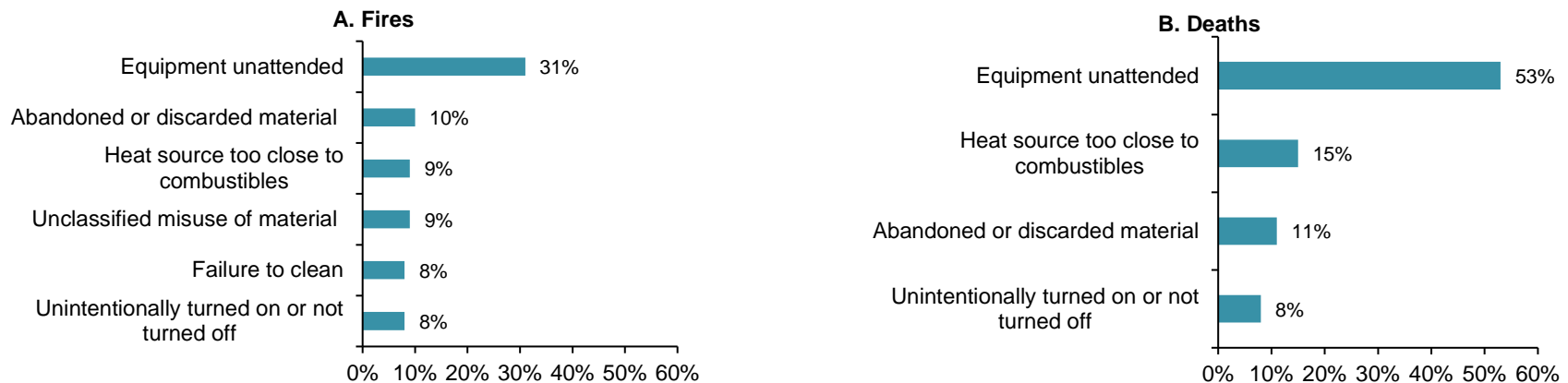
A fatal fire in a Maine single-family home began when a male occupant fell asleep in an adjacent room while cooking oil was being heated on the kitchen stove. Investigators believe that when he woke to the burning oil, he threw water on the fire. This caused the fire to spread. The victim was found in the kitchen with burn and smoke inhalation injuries.²

In another common scenario, combustible materials such as wrappers, potholders, or clothing caught fire when they were left by or came too close to hot cooking equipment.

Reported home cooking fires in 2014–2018

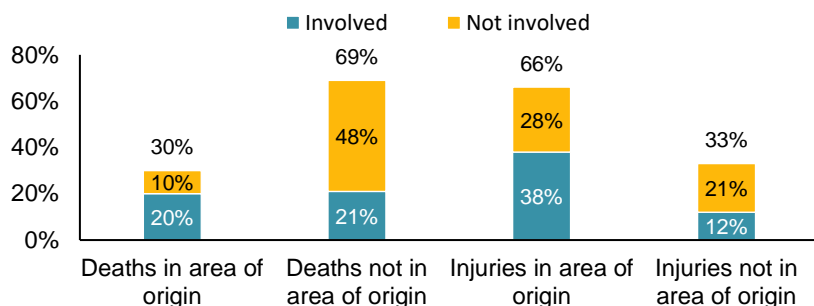
During 2014–2018, local fire departments responded to an estimated average of 172,900 home cooking fires per year. These fires caused an average of 550 civilian deaths; 4,820 civilian injuries; and \$1.2 billion in direct property damage annually. Cooking caused almost half of the reported home fires (49 percent) and home fire injuries (44 percent) and one in five home fire deaths (21 percent). Cooking was the leading cause of reported home fires and home fire injuries and the second leading cause of home fire deaths.

Figure 3. Leading factors in home cooking fires and cooking fire deaths: 2014–2018



Almost one-third of the fatal cooking fire victims and two-thirds of the non-fatally injured were in the area of origin when the fire started. See Figure 4. With unattended cooking being the leading cause, it is not surprising that one-fifth of the fatalities were people involved in the ignition who were not in the area of origin. These were likely cooks who had left the room.

Figure 4. Home cooking fire casualties in or not in area of origin and involved in ignition: 2014–2018



Some types of cooking, such as frying, broiling, and boiling, need continuous attention. When simmering, baking, or roasting, cooks should stay in the home and check on the cooking regularly.

Not surprisingly, two-thirds (66 percent) of home cooking fires began with the ignition of cooking materials, including food. Cooking oil, fat, grease, and related substances were first ignited in half (52 percent) of the home cooking fires that began with cooking materials. Almost three-fifths (58 percent) of the civilian deaths and three-quarters of the civilian injuries (76 percent) and direct property damage (77 percent) associated with cooking material or food ignition resulted from these cooking oil or grease fires.

Death and injury rates per 1,000 fires were higher for food or cooking material fires that began with the ignition of cooking oil, as was the average loss per fire. Injury rates and average loss were also higher for fires beginning with fat, grease, butter, or lard. The frequency and increased risk of oil and grease fires indicate a need for increased

consumer awareness on how to deal with these fires. Flames from a small oil or grease fire can be smothered by sliding a lid over the pan and turning off the burner. The pan should be kept covered until it is completely cool.

Anthony Hamins, Sung Chan Kim, and Daniel Madrzykowski conducted experiments with cooking oil and peanut cooking oil on a free-standing range in the open and a range in a residential kitchen arrangement.³ Their report described three phases of cooking oil fires.

In the first stage, the fire ignites and grows in the pan. Next the oil boils over and flows out of the pan. Other objects often ignite during this phase. The oil is consumed in the decay phase. They found that small cooktop fires could grow ultra-fast in a kitchen. In a subsequent article, it was noted that “cooktop fires can be larger than traditional gasoline pool fires.”⁴

Although clothing was the item first ignited in less than one percent of the reported home cooking fires, clothing ignitions led to 8 percent of the home cooking fire deaths. Nearly two-third of these victims were at least 75 years of age. While it is important for all of those who cook to wear snug or short sleeves, this is especially critical for older adults.

An elderly Oklahoma woman phoned for help, stating that her clothing was on fire and she could not get out of her home. When the fire department arrived, the fire was already out. The severely burned woman was found in her living room. She told the firefighters that she had been making coffee when her clothes were ignited by the gas burner on the range. The victim was transported to the hospital where she later died.⁵

Most reported cooking fires were small. Four out of five (80 percent) were confined to the object or pan of origin. Two percent of the cooking fire deaths and nearly one-third (31 percent) of the reported cooking fire injuries resulted from these small fires. One-quarter (27 percent) of the home cooking fire deaths and 81 percent of the

home cooking fire injuries resulted from the 96 percent of fires that were confined to the room in which the fire began.

Less than one-third (31 percent) of reported home fires were in apartments or other multifamily housing, yet these properties accounted for almost half (46 percent) of the reported home cooking fires. Cooking caused 38 percent of the fires in one- or two-family homes and 73 percent of the fires in apartments or other multifamily homes.⁶ Minor fires in properties with monitored fire alarm systems may be more likely to trigger a fire department response, and such systems are more common in apartments than in one- or two-family homes. More than three of every five apartment fires from all causes were cooking fires that did not spread.⁷

When did cooking fires occur?

Not surprisingly, cooking fires peaked between 5:00 p.m.–8:00 p.m. when people were likely to be preparing dinner. The 12 percent of the fires reported between 11:00 p.m.–7:00 a.m. accounted for 43 percent of the deaths. Sleep and possible alcohol or drug impairment were more common factors in these late-night fires. See Figure 5. Cooking while overtired or under the influence is dangerous.

It is possible that many of the fires coded with “unattended or unsupervised person” were actually caused by unattended cooking. The

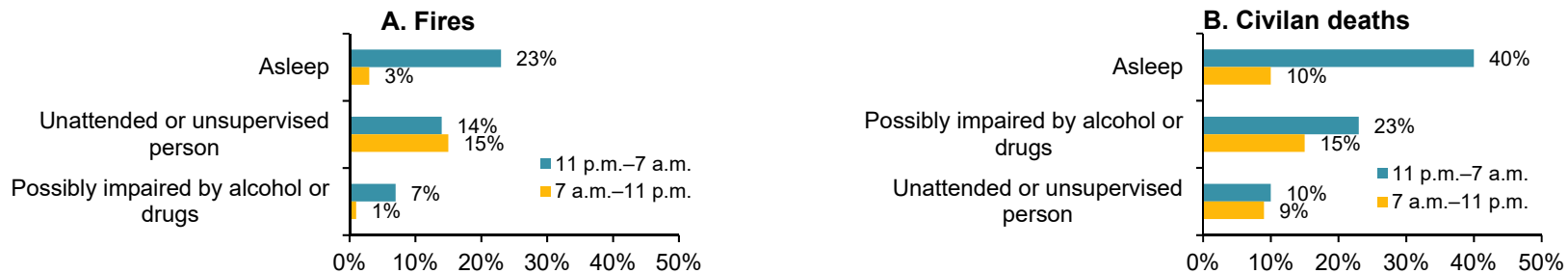
NFIRS 5.0 Complete Reference Guide notes that “unattended or unsupervised person” includes latchkey situations whether the person involved is young or old and situations where the person involved lacked supervision or care.”⁸ This additional detail is generally not visible to firefighters completing incident reports online.

Table A shows that Thanksgiving is by far the leading day for home cooking fires. Christmas, another holiday associated with food, ranked second. Cooking increases during holiday celebrations. Guests, television, and other activities can distract attention from the kitchen.

Table A. Leading Dates for 2018 Home Cooking Fires Reported to US Fire Departments

Date	Fires	Percent Above Average Daily Fires
November 22 (Thanksgiving)	1,630	(250%)
December 25 (Christmas Day)	740	(59%)
November 21 (Day before Thanksgiving)	740	(59%)
April 1 (Easter)	670	(43%)
December 24 (Christmas Eve)	650	(40%)
Daily average in 2018	470	

Figure 5. Human factors contributing to ignition in home cooking fires by time of day: 2014–2018



Victims of cooking fires

In 2014–2018, half (49 percent) of the people who died in cooking fires were at least 55 years of age. The 55–64 age group had the largest share of home cooking fire deaths. See Figure 6.

People 85 and older have a risk of dying in a cooking fire that is 5.5 times higher than that of the overall population. NFPA’s analysis of home fire victims of all causes found that home fire victims who were 85 and older were more likely to have died in a fire caused by cooking than by any other cause.⁹

Young adults aged 20–34 were at the highest risk of non-fatal cooking injuries. There was much less variation in risk in the injury age distribution. Only 28% of the injured were 55 or older.

The *American Time Use Survey* reported that in 2018, 46 percent of men and 69 percent of women engaged in food and drink preparation per day, with men spending an average of 18 minutes and women spending an average of 36 minutes per day on the activity.¹⁰ Although women spent twice as much time cooking, slightly more than half of the people killed (53%) or injured (51%) in reported home cooking fires during 2014–2018 were male.

Compared to those who were injured and survived home cooking fires, those who died were more likely to have been asleep, trying to escape, or unable to act to save themselves, possibly due to disability or impairment. In contrast, more than half of those who were non-fatally injured were trying to control the fire themselves. See Figure 7. Two-thirds (67 percent) of reported non-fatal home cooking fire injuries were minor.

Figure 6. Home cooking fire deaths and injuries by age group: 2014–2018

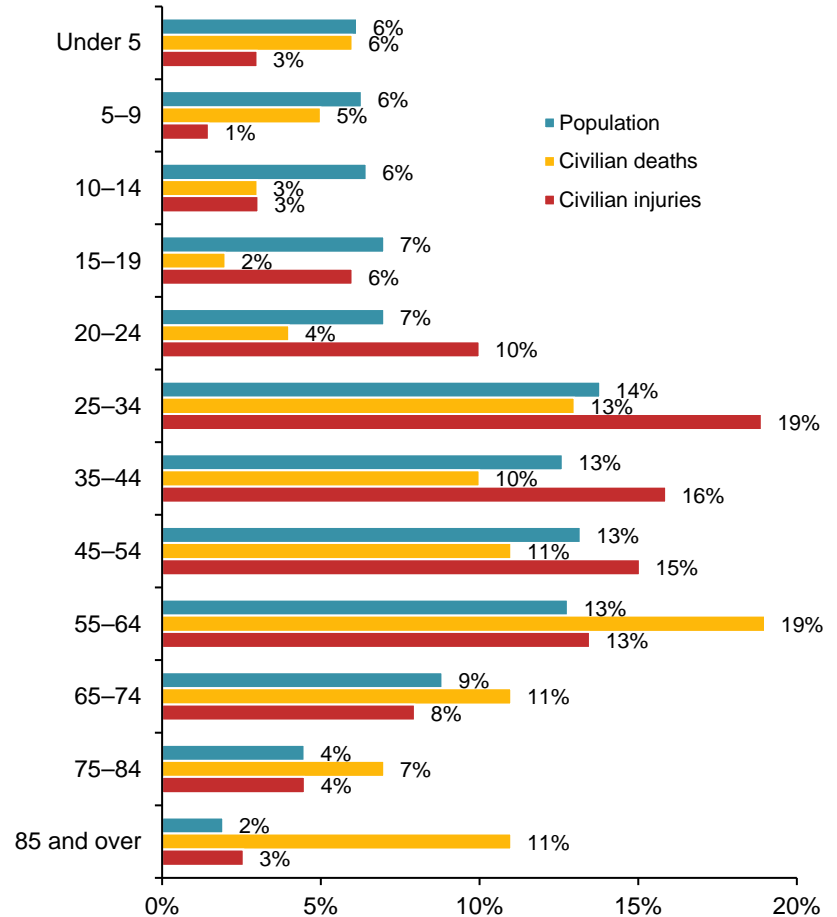
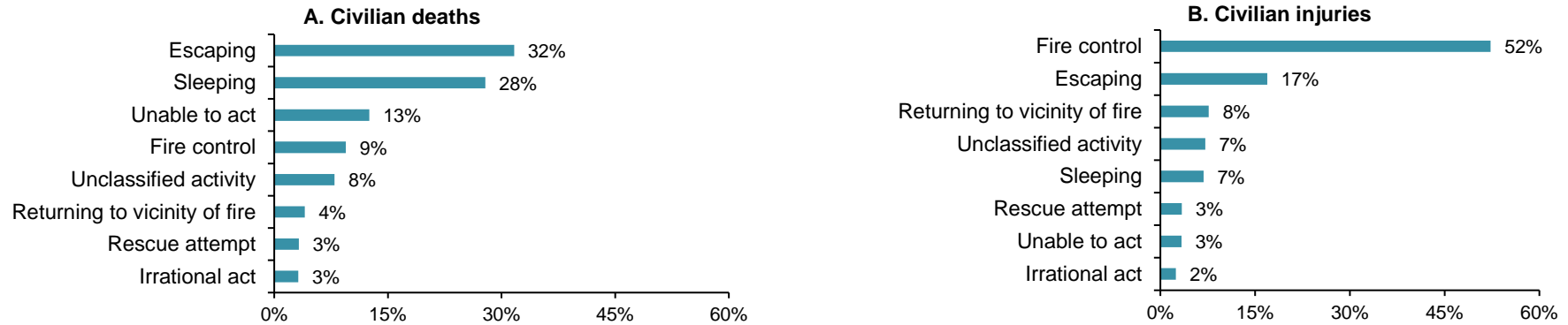


Figure 7. Activity when injured in home cooking fires: 2014–2018



Smoke alarms in home cooking fires

It is easy to assume that cooks are awake and nearby when cooking fires take place. Figure 4 showed that more than two-thirds (69 percent) of cooking fire fatalities were not in the area of origin, although one-fifth (21 percent) were involved in the ignition. A working smoke alarm is necessary to alert those outside the kitchen to the fire.

Smoke alarms were more likely to be present and operating in fires caused by cooking than in total home fires. Some of the difference is likely due to fire department responses triggered by monitored smoke detection systems activated by minor cooking fires. Without such monitoring, many of these situations would have been handled by the occupants without fire department assistance.

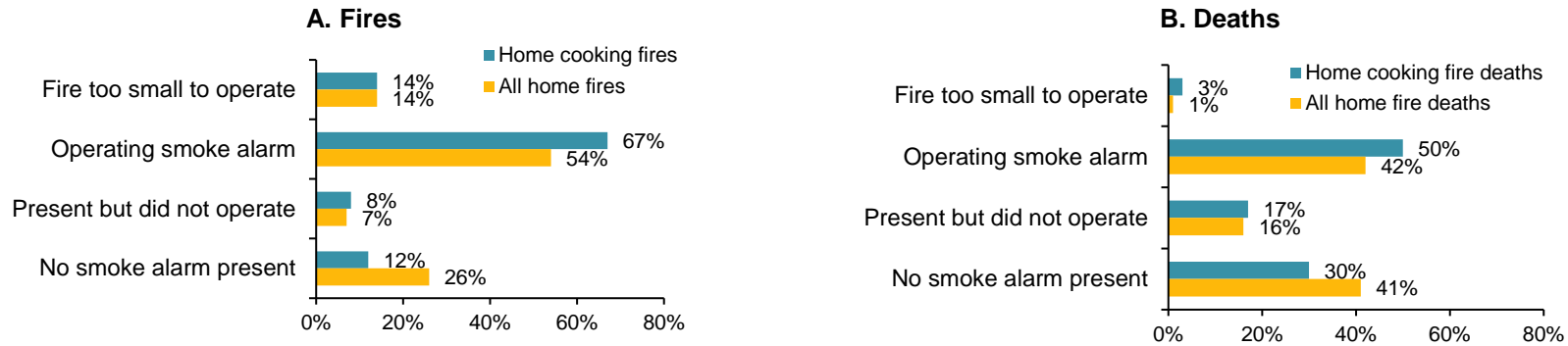
Figure 8 shows that smoke alarms were present in 88 percent of reported home cooking fires and 70 percent of cooking fire deaths. As noted earlier, 8 percent of cooking fire deaths resulted from clothing ignitions. Victims in these fires may have been fatally injured before the smoke alarm sounded.

A 2010 Harris Interactive poll done for the NFPA found that half (52 percent) of households reported having smoke alarms in the kitchen.¹¹ Such placement is an invitation for frequent nuisance alarms. *NFPA 72®*, *National Fire Alarm and Signaling Code®*, provides requirements to help prevent nuisance alarms.

When possible, smoke alarms should be installed at least 20 ft away from the kitchen range. If that is not possible, any smoke alarm between 10 and 20 ft away from the stove should have a hush feature, which temporarily reduces the sensitivity of the alarm, or it should include a photoelectric sensor. Smoke alarms should not be installed within 10 ft of a cooking appliance. Additional details can be found in *NFPA 72*.

Manufacturers of smoke alarms and smoke detectors who wish to obtain or maintain UL certification of their products will soon be required to ensure their products can distinguish normal cooking aerosols from those associated with fire to pass a cooking nuisance test. This UL requirement has been designed to minimize the number of nuisance alarms triggered by cooking activities. The new smoke alarms and detectors must also demonstrate greater sensitivity to smoldering and flaming polyurethane foam.¹² The UL requirement becomes effective on June 30, 2021.¹³

Figure 8. Smoke alarm status in home structure fires: 2014–2018



Equipment involved in reported home cooking fires

Ranges or cooktops were involved in three-fifths (61 percent) of the reported cooking fires, 87 percent of the deaths, and 78 percent of the injuries. Ranges or cooktops had higher death and injury rates per 1,000 reported fires than most other cooking equipment. Ovens and microwave ovens showed lower casualty and loss rates than most other cooking equipment. Cooking that is done in an oven or microwave oven is less likely to extend outside of the equipment. Grills and deep fryers had the highest average loss per home structure fire. Such equipment tends to be portable and may be used too close to things that can catch fire. Although deep fryers had the highest death rate and grease hoods had the highest injury rate per 1,000 fires, fires involving these types of equipment were less common than other types of cooking fires. See Figure 9.

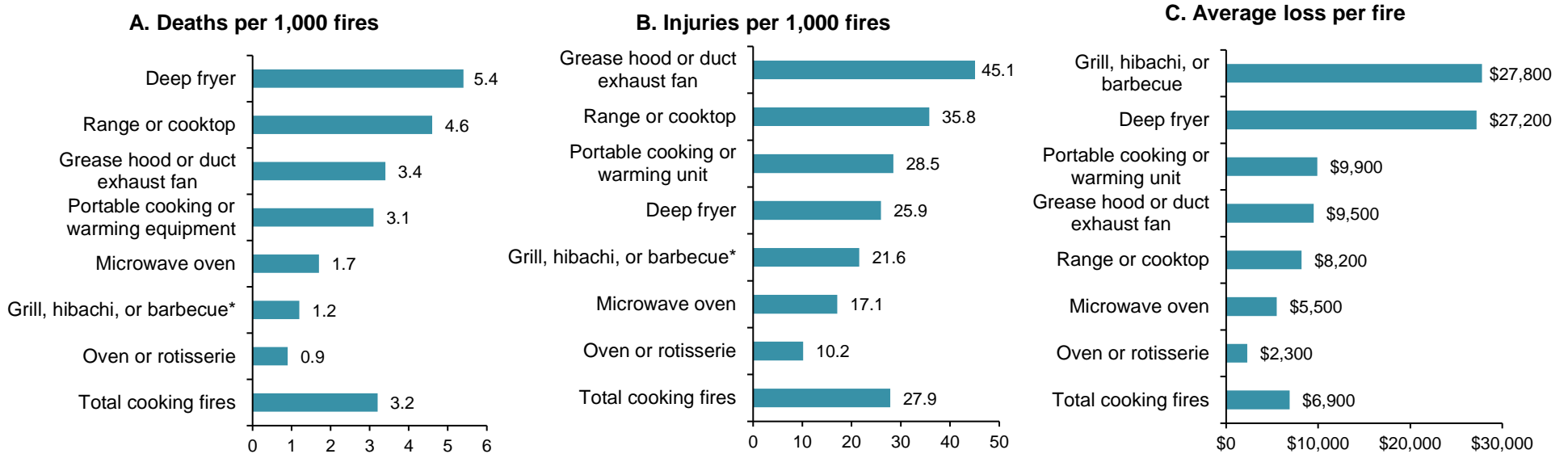
The Worcester Fire Department in Massachusetts retrofitted electric coil ranges with temperature limiting controls in four apartment buildings for low-income older adults that had experienced a combined average of 12 reported cooking fires per month in 2015.

Roughly 800 ranges were retrofitted. No stovetop fires were reported in any of those units during the 10 months after installation.¹⁴

Households that use electric ranges have a higher risk of cooking fires and associated losses than those using gas ranges. Although 60 percent of households cook with electricity,¹⁵ four out of five (80 percent) ranges or cooktops involved in reported cooking fires were powered by electricity. Population-based risks are shown below,

- The rate of reported fires per million households was 2.6 times higher with electric ranges.
- The civilian fire death rate per million households was 3.4 times higher with electric ranges.
- The civilian fire injury rate per million households was 4.8 times higher with electric ranges than in households using gas ranges.
- The average fire dollar loss per household was 3.8 times higher in households with electric ranges. See Figure 10.

Figure 9. Casualty rates per 1,000 reported fires and average loss per fire by type of cooking equipment: 2014–2018



* Grill, hibachi, or barbecue fires that were coded as outside fires are not included.

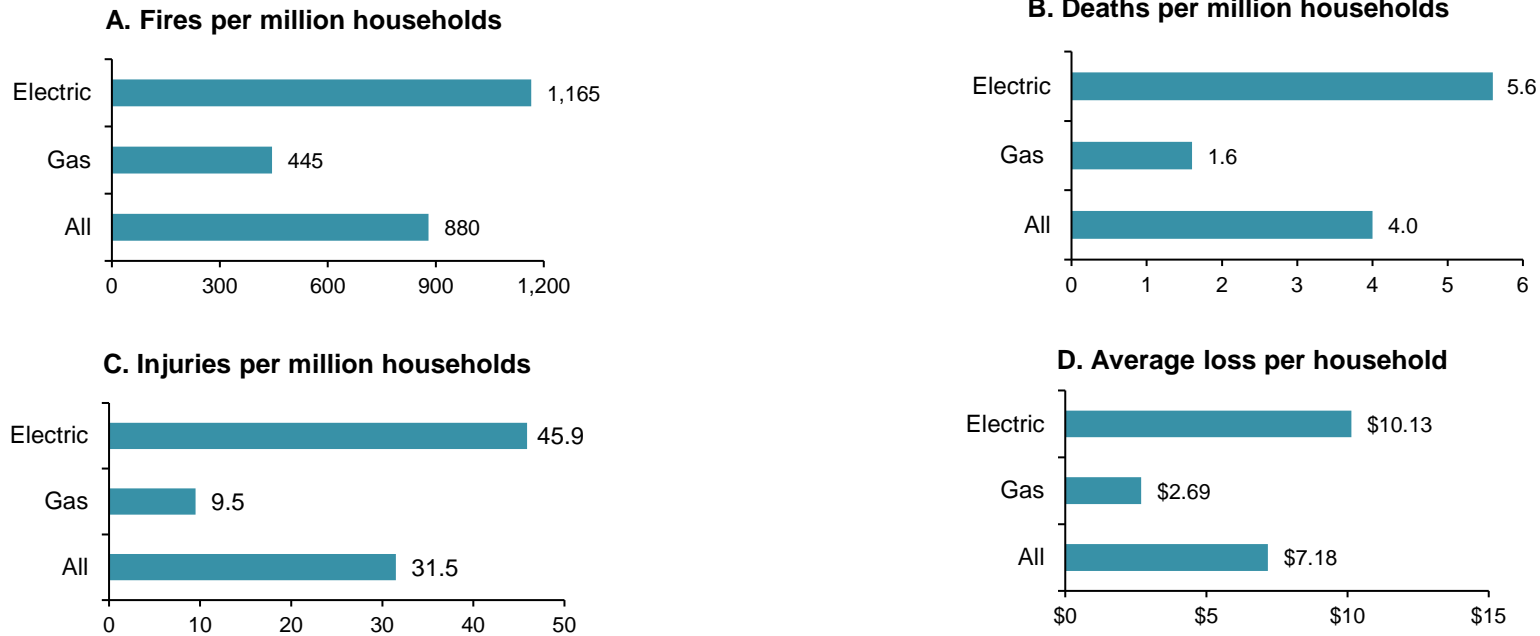
It is sometimes less obvious that an electric burner is turned on or is still hot than it is with gas burners. In addition, once turned off, it takes time for an electric burner to cool.

UL 858, *Standard for Household Electric Ranges*, includes requirements for electric coil ranges to prevent the ignition of cooking oil, and it took effect in June 2018. Compliance may be demonstrated by either not igniting cooking oil in a cast iron pan or keeping the average temperature of the inside bottom surface of the pan below or equal to 725° F (385° C). All electrical coil ranges being manufactured now must meet these requirements.¹⁶ Because ranges last a long time, it will be years before these ranges become common in US homes.

Unreported home cooking fires

The estimates of home cooking fires reported to local fire departments are a tiny fraction of all the home fires involving home cooking equipment. In their analysis of the Consumer Product Safety Commission’s 2004–2005 survey of residential fires, Michael Greene and Craig Andres found that United States households handled an average of 4.7 million home fires involving cooking equipment per year without having the fire department on scene. Roughly one of every 23 occupied households had a cooking fire. The overwhelming majority of home cooking fires were handled safely by individuals without fire department assistance. Twelve percent of the unreported stove or range fires self-extinguished, as did 24 percent of the fires caused by other cooking equipment.¹⁷

Figure 10. Risk related to usage of electric vs. gas ranges or cooktops: 2014–2018



Safety information

The Educational Messages Advisory Committee to NFPA’s Public Education Division developed a collection of safety tips for a wide variety of activities, including fire-safe cooking.

Fire and life safety educators can download the [NFPA Educational Messages Desk Reference](#) to find consistent safety messaging.

NFPA also has [safety resources to help consumers](#) protect themselves from cooking fires. These include videos, safety tip sheets, public service announcements, and illustrated handouts in several different languages.

Since 1922, the NFPA has sponsored the public observance of [Fire Prevention Week](#).

During Fire Prevention Week, children, adults, and teachers learn how to stay safe in case of a fire.

The [2020 Fire Prevention Week](#) campaign theme, “Serve Up Fire Safety in the Kitchen!™” works to educate everyone about the simple but important actions they can take to keep themselves and those around them safe in the kitchen.

Additional information – Supporting Tables

See [Home Cooking Fires: Supporting Tables](#), July 2020, for more detailed information about the material presented in this report.

Methodology

The statistics in this analysis are estimates derived from the US Fire Administration’s [National Fire Incident Reporting System \(NFIRS\)](#) and the NFPA’s annual survey of US fire departments. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

Only civilian (non-firefighter) casualties are included in this analysis.

NFPA’s Fire Experience Survey provides estimates of the big picture. NFIRS is a voluntary system through which participating fire departments report detailed factors about the fires to which they respond. To compensate for fires reported to local fire departments but not captured in NFIRS, a scaling ratio was calculated and then applied to the NFIRS database using the formula below:

NFPA’s Fire Experience Survey projections

NFIRS totals

Cooking equipment refers to equipment used to cook, heat, or warm food [NFIRS Equipment involved in ignition (EII) codes 630-649 and 654]. Fires in which ranges, ovens or microwave ovens, food warming appliances, fixed or portable cooking appliances, deep fat fryers, open-fired charcoal or gas grills, grease hoods or ducts, or other cooking appliances were involved in the ignition are classified as being caused by cooking equipment. Food preparation devices that do not involve heating, such as can openers or food processors, are not included here.

All fires with NFIRS incident type code 113, “Cooking fire in or on a structure and confined to the vessel of origin,” were classified as cooking fires regardless of the EII code. Fires with other confined fire incident types were excluded from the analysis. NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source that caused ignition if the equipment malfunctioned or was used improperly. NFPA noticed that many fires in which EII was coded as

None (NNN) had other causal factors that indicated equipment was a factor or the other causal factors were completely unknown. To compensate, NFPA treats fires in which EII = NNN and the heat source is not in the range of 40–99 as an additional unknown.

To allocate unknown data for EII, the known data is multiplied by:

All fires

(All fires – blank – undetermined – [fires in which EII =NNN and heat source <>40-99])

In addition, fires and losses associated with Code EII 600, “Kitchen and cooking equipment, other,” were allocated proportionally across specific kitchen and equipment codes, such as EII Codes 611-699. Equipment that is totally unclassified was not allocated further. Unfortunately, equipment that is truly different can erroneously be assigned to other categories.

For more information on the methodology used for this report, see [How NFPA’s National Estimates Are Calculated for Home Structure Fires](#).

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.

We are also grateful to the US Fire Administration for its work in developing, coordinating, and maintaining the NFIRS.

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- ¹ NFIRS 5.0, first introduced in 1999, originally defined EII as the piece of equipment that provided the principal heat source that caused ignition if the equipment malfunctioned or was used improperly. [Change 290](#), effective in 2006, amended the definition to include any equipment that was the principal heat source. Beginning in 2012, Change 337 required EII to be completed if the heat source or factor contributing to ignition indicated some type of operating equipment was involved. This was removed, effective with 2015 data.
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- ³ H., Anthony, K., Sung Chan, and D. Madrzykowski, “Characterization of Stovetop Cooking Oil Fires.” *Journal of Fire Sciences*, 36(3), 224–239. 2018. Accessed at <https://doi.org/10.1177/0734904118761884>
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- ⁵ Campbell, Richard, “Firewatch: Elderly Woman Dies of Injuries Sustained in Cooking Fire.” *NFPA Journal*, July/August 2017.
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- ⁷ Ahrens, Marty. *How NFPA’s National Estimates Are Calculated for Home Structure Fires*. Quincy, MA: NFPA, 2018.
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- ¹¹ Ahrens, Marty. *Smoke Alarms in U.S. Home Fires*. Quincy, MA: NFPA. September 2010, pp. 14.
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- ¹⁷ Greene, Michael A. and Craig Andres. *2004–2005 National Sample Survey of Unreported Residential Fires*. U.S. Consumer Product Safety Commission, July 2009.