Prevalence of Residential Smoke Alarms and Fire Escape Plans in the U.S.: Results from the Second Injury Control and Risk Survey (ICARIS-2)

Michael F. Ballesteros, PhD, MS[a]
Marcie-jo Kresnow, MS[b]

SYNOPSIS

Objectives. This study was conducted to estimate (*1*) the proportion of U.S. homes with installed smoke alarms and fire escape plans, and (*2*) the frequency of testing home smoke alarms and of practicing the fire escape plans.

Methods. The authors analyzed data on smoke alarms and fire escape plans from a national cross-sectional random-digit dialed telephone survey of 9,684 households.

Results. Ninety-five percent of surveyed households reported at least one installed smoke alarm and 52% had a fire escape plan. The prevalence of alarms varied by educational level, income, and the presence of a child in the home. Only 15% tested their alarms once a month and only 16% of homes with an escape plan reported practicing it every six months.

Conclusion. While smoke alarm prevalence in U.S. homes is high, only half of homes have a fire escape plan. Additional emphasis is needed on testing of installed smoke alarms and on preparedness for fire escape plans.

[a]Division of Unintentional Injury Prevention, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, Atlanta, GA

[b]Office of Statistics and Programming, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, Atlanta, GA

Address correspondence to: Michael F. Ballesteros, PhD, MS, National Center for Injury Prevention and Control, Centers for Disease Control and Prevention, 4770 Buford Highway NE, Mailstop K-63, Atlanta, GA 30341; fax 770-488-1317; e-mail <mballesteros@cdc.gov>.

In 2004, more than 410,500 residential fires in the United States claimed the lives of 3,190 people and injured another 14,175.[1] Most victims of fires are injured and die from smoke inhalation or toxic gases and not from burns.[2,3] Although the number of fatalities and injuries caused by residential fires has declined gradually over the past several decades, this remains a significant public health problem.

Most residential fires and associated injuries are preventable. The use of smoke alarms has been shown to be an effective, reliable, and inexpensive method of providing early warning in residential fires.[4] Regular testing ensures that alarms remain functional. It is recommended that smoke alarms be tested every month to ensure that they work properly and batteries in conventional smoke alarms be replaced once a year.[5,6] Testing means physically pressing the test button on the smoke alarm, either by hand or with an object such as a broom handle (if hard to reach), and holding it for several seconds until it sounds. If a fire occurs in a home with a smoke alarm, the risk of death is decreased by 40%–50%.[5] Despite availability of this prevention method, 40% of fires reported to U.S. fire departments occur in homes without alarms and 70% of home fire deaths occur in homes with either no smoke alarm or homes in which none of the smoke alarms sounded.[5]

Because fires can grow and spread quickly through a home, it is important that residents be prepared to react as soon as the smoke alarm sounds. Developing and practicing a home fire escape plan are prevention strategies commonly taught in fire safety education programs so that reaction will be well rehearsed.[7–11] Home fire escape plans should be developed and practiced every six months. In the plan, at least two different ways of escape should be identified for each household resident, and a safe place should be designated outside of the home to meet after escaping the fire.[2,6]

This report summarizes data from the fire module of the Second Injury Control and Risk Survey (ICARIS-2).

METHODS

ICARIS-2 sample

The ICARIS-2 survey is a national cross-sectional, list-assisted, random-digit dialed (RDD) telephone survey of English and Spanish speaking adults (aged 18 years and older) conducted in all 50 states and the District of Columbia from July 2001 through February 2003. The survey was conducted by the Centers for Disease Control and Prevention's (CDC) National Center for Injury Prevention and Control (NCIPC) using a computer-assisted telephone interviewing (CATI) system. It took an average of 21.5 minutes to complete the survey, which was designed to obtain national estimates on the occurrence of a wide range of injury risk factors. In addition to the fire module questions listed below, it included helmet use, water safety, automobile related safety practices, and pedestrian injuries; injuries related to physical activity, falls, alcohol use; firearm ownership and use; and interpersonal violence and suicide.

Fire module questions

The fire module of ICARIS-2 is a series of questions about smoke alarm presence, placement, and testing; the occurrence of a home fire and associated injuries; and fire escape planning and practice. Each respondent was asked the following questions, presented here as they appear on the survey form:

1. Are there any smoke alarms or smoke detectors installed in your home?
2. Is there at least one working smoke detector on each floor of your home? This includes a finished basement or attic.
3. Is there a smoke detector in or just outside the area where you sleep?
4. How often do you test your smoke detectors?
5. In the past 12 months, have you had an uncontrolled fire in your home?
6. Were you or anyone else in your household injured as a result of this fire?
7. Have you and your family designed a fire escape plan?
8. How often do you and your family practice your fire escape plan?

Survey data were weighted to adjust for unequal selection probabilities, noncoverage and nonresponse. Data were then post-stratified by household composition to conform to the distribution of the March 2002 Current Population Survey (CPS),[12] after incorporating information from the 2000 Census to produce nationally representative estimates. Telephone exchanges with >10% of households occupied by African Americans or Hispanics were over-sampled in our sampling frame in an attempt to approximate their representation in the population. One adult (aged 18 years or older) was selected for interview from each eligible household such that males were over-sampled in attempt to interview equal numbers of males and females. In households with adults of both genders, a gender category was selected with higher probability of choosing males. The gender distribution was monitored throughout the course of the study and the probability

of selecting a male adjusted as needed to obtain a final sample with approximately equal numbers of males and females. In households with multiple eligible adults of the selected gender, the adult with the most recent birthday was selected.

All analyses were conducted using SUDAAN software to address the complexity of the survey design.[13] The unit of analysis for this study was the household. The weighted data analysis provides national estimates of percentages and total number of households with a given residential fire prevention characteristic of interest in the U.S. population. Chi-square tests were performed on weighted percentages to formally test for the association between variables related to residential fire prevention and demographic characteristics.

RESULTS

Of the 113,476 telephone numbers purchased for screening, 66,949 were deemed ineligible and 31,803 numbers were classified as being of unknown eligibility, leaving 14,724 known households eligible for interview. The primary reasons for a classification of ineligible were business and nonworking numbers (90%). Most numbers were classified as being of unknown ineligibility because of failure to determine if the number dialed reached a household (55%), followed by failure to complete the screening portion of the interview at a known household (40%), making it impossible for a respondent to be selected for interview. Of the 14,724 known households eligible for interview, 2,212 refused to participate, 2,138 were unavailable for interview on subsequent contacts, 370 were either physically or mentally incapable of conducting the interview, 320 began but did not complete the interview, and 9,684 (of 14,724 or 66%) completed the interview with usable data. The weighted response rate for the survey was 47.9%, computed using standard definitions (response rate 3 [RR3] as defined by the American Association for Public Opinion Research, 2004).[14]

Prevalence of smoke alarms

We found that 94.9% (95% confidence interval [CI] 94.4%, 95.4%) of U.S. households reported having at least one smoke alarm installed in their home (Table 1). Households reporting income above the poverty level were more likely to have smoke alarms than those below the poverty level (95.6% vs. 90.3%). Smoke alarm prevalence rates were highest in the North Central region of the country (96.3%), while lower rates were reported in the South (94.0%). Reported smoke alarm prevalence increased with increasing household educational attainment ($p<0.01$, test for linear trend) from 86.8% in homes in which none of the adult occupants had graduated from high school to more than 96% in homes where at least one occupant was a college graduate or had some post-college graduate education. We also found that homes with children younger than 15 years of age were more likely to have a smoke alarm than homes without children or homes with older children (96.5% vs. 94.2%).

Among households that reported having a smoke alarm, 93.1% (95% CI 92.5%, 93.7%) reported one or more working smoke alarms per floor, and 95.2% (95% CI 94.7%, 95.7%) reported a smoke alarm just outside the area where they sleep (data not shown).

Testing smoke alarms

Among all households that reported having a smoke alarm in their home, 15.2% (95% confidence interval [CI] 14.3%, 16.1%) indicated that they test their smoke alarm once a month (the standard recommendation), 38.3% (95% CI 37.1%, 39.5%) every six months, 32.7% (95% CI 31.5%, 33.8%) once a year, and 13.8% (95% CI 13.0%, 14.7%) never test it.

In general, except for homes with children, household characteristics that were associated with lower smoke alarm prevalence were more likely to test their alarms once a month (Table 2). Households more likely to test their alarms monthly were below the poverty level, in rural areas, in mobile homes, in the Southern region of the U.S., in homes with lower household educational attainment, in rented property, and in homes with children younger than 15 years of age.

Having a fire escape plan

Only 51.6% of households reported that they had designed a fire escape plan. Living in a mobile home, having at least a high school education, owning the home, and having children in the home were associated with having designed a fire escape plan (Table 3). There were no differences by household income and region of the U.S.

Practicing fire escape plan

Only 45.3% (95% CI 43.6%, 46.9%) of households that reported having a fire escape plan had actually practiced it. Therefore, only 23% of homes in the U.S. have a fire escape plan and practice it. Only 15.9% (95% CI 14.8%, 17.1%) of those with a fire escape plan report practicing it every six months (i.e., 8.3% of homes in the U.S.), the standard recommendation. Households below the poverty level and that rented were more likely to practice every six months (31.2%, 95% CI 25.6%, 36.9%; 26.9%, 95% CI 23.9%, 29.9%, respectively), while detached single family homes were

Table 1. Presence of smoke alarms by household characteristics, Second Injury Control and Risk Survey

Characteristic	Unweighted number of households	Number reporting installed smoke alarms	Weighted		
			National estimate of households with installed smoke alarms	Percent reporting installed smoke alarms	95% CI
Total	9,667	9,192	103,602,243	94.9	94.4, 95.4
Household income[a]					
Below poverty level	695	631	6,750,344	90.3	87.9, 92.7
Above poverty level	7,611	7,286	83,062,911	95.6	95.1, 96.1
Metropolitan Statistical Area					
Urban	9,522	9,059	101,833,083	95.0	94.5, 95.5
Rural	145	133	179,160	91.6	87.0, 96.3
Type of dwelling[b]					
5 or more apartments	1,219	1,171	11,965,305	96.6	95.5, 97.7
2–4 apartments	656	614	6,953,925	93.5	91.4, 96.6
Mobile home	449	422	5,534,387	94.3	92.1, 96.6
Attached home	816	785	7,313,665	96.0	94.5, 97.5
Detached home	6,381	6,061	70,485,252	94.7	94.1, 95.3
Census region[a]					
Northeast	2,161	2,060	20,234,044	95.4	94.4, 96.4
North Central	1,650	1,585	24,681,553	96.3	95.4, 97.2
South	4,022	3,814	36,666,333	94.0	93.1, 94.8
West	1,834	1,733	22,020,313	94.6	93.5, 95.7
Highest educational level in household[a]					
Less than high school	636	555	6,301,199	86.8	84.0, 89.7
High school graduate	1,969	1,848	21,341,198	93.8	92.6, 94.9
Some college	1,899	1,796	21,283,452	94.2	93.0, 95.3
College graduate	3,104	2,913	32,949,795	96.7	96.0, 97.4
Post-college	2,048	1,988	20,793,885	96.9	96.1, 97.8
Home ownership					
Rented	2,571	2,425	26,456,432	94.3	93.4, 95.3
Owned	6,883	6,571	75,236,758	95.2	94.6, 95.8
Children in the home aged 0–14 years[a]					
Yes	3,087	2,975	32,092,375	96.5	95.9, 97.2
No	6,571	6,208	71,383,153	94.2	93.6, 94.8

[a]Statistically significant, *p*-value <0.01

[b]Statistically significant, *p*-value <0.05

CI = confidence interval

less likely (13.8%, 95% CI 12.5%, 15.1%) to practice every six months compared with other types of homes. In addition, educational attainment was associated with more practice (27.4%, 95% CI 21.4%, 33.3% for less than high school; 10.9%, 95% CI 8.6%, 13.2% for post-college), as was having children in the home (22.5%, 95% CI 20.2%, 24.7%). We did not observe any regional or urban/rural differences.

Occurrence of an uncontrolled fire

Seventy-one (0.6%, 95% CI 0.5%, 0.8%) households reported having an uncontrolled fire in their home in the past 12 months. Among these, 11 (of 71, 15.5%) reported someone being injured.

DISCUSSION

Risk factors for residential fire injury have been well described.[4,15,16] At-risk household characteristics include the presence of children or older adults in the home, low income, rural communities, mobile homes, and the presence of smokers or alcohol users living in the home. Our analysis indicated that some household characteristics were associated with higher smoke

Table 2. Frequency of testing smoke alarms once a month by household characteristics, Second Injury Control and Risk Survey

Characteristic	*Weighted percent*	*95% CI*
Total	15.2	14.3, 16.1
Household income[a]		
Below poverty level	28.2	24.1, 32.4
Above poverty level	14.1	13.2, 15.1
Metropolitan Statistical Area[b]		
Urban	15.0	14.1, 15.9
Rural	24.5	16.1, 32.8
Type of dwelling[a]		
5 or more apartments	15.4	12.8, 18.0
2–4 apartments	18.6	15.0, 22.3
Mobile home	29.2	24.3, 34.1
Attached home	16.4	13.2, 19.6
Detached home	13.5	12.5, 14.6
Census region[a]		
Northeast	13.2	11.4, 15.0
North Central	15.6	13.6, 17.5
South	17.1	15.6, 18.6
West	13.3	11.6, 15.1
Highest educational level in household[a]		
Less than high school	21.6	17.5, 25.7
High school graduate	20.3	18.2, 22.5
Some college	17.5	15.4, 19.6
College graduate	13.8	12.3, 15.3
Post-college	7.9	6.4, 9.3
Home ownership[a]		
Rented	20.3	18.4, 22.2
Owned	13.3	12.3, 14.3
Children in the home aged 0–14 years[a]		
Yes	18.5	16.8, 20.1
No	13.7	12.7, 14.7

[a]Statistically significant, *p*-value <0.01

[b]Statistically significant, *p*-value <0.05

CI = confidence interval

alarm and fire escape plan prevalence. In general, these were consistent with the known risk factors for residential fire-related injury (e.g., household income, type of home, and education level). In addition, we found that homes with children were more likely to use smoke alarms, conduct monthly testing, and have developed and practiced fire escape plans. These findings may be explained by parents wanting to have a safe home environment for their children, by school age children potentially bringing home information from fire safety activities at school that typically includes the importance of smoke alarms and fire escape plans, and by the positive effects of ongoing efforts at the local and national levels to educate parents on fire safety. Individuals in mobile homes were more likely to have and to practice escape plans, which may indicate that escape plans for mobile homes are easier to develop because these structures are not as large as most detached homes and apartment buildings. While there is no direct causal evidence in this study or in the fire safety literature that individuals have better escape planning because they know that they are living in a riskier type of home structure, our results do indicate an association between high risk homes and better escape planning. Strategies for improving escape planning would benefit from a better understanding of this relationship.

Other recent national surveys have examined smoke alarms and fire escape plans. The most recent Behavioral Risk Factor Surveillance System (BRFSS) that captured smoke alarm data for the entire U.S. was in 1999. This survey, which relied on self-report, found that 96.0% of respondents had a smoke alarm in their home; 33.5% tested their smoke alarms in the past month, 35.4% in the past six months, 13.1% within the past year, 8.1% over one year ago, and 9.5% never tested their alarms.[17] In 2002, the Home Safety Council commissioned the State of Home Safety in America (SOHS) report, which included a telephone survey that collected smoke alarm and fire escape plan prevalence. They found that 97% of respondents reported having at least one smoke alarm in the household, and 80% had smoke alarms on each level of their home. Eighty-five percent tested their smoke alarms at least once per year, and 20% tested it at least every three months. Among households with more than one resident, 51% had discussed a fire escape plan.[18] In 2004, the National Fire Protection Association conducted the Fire Prevention Week Survey. They found that 96% of respondents had a smoke alarm installed in their home, 66% had an escape plan in case of a fire, and 66% practiced it.[19]

In general, these national surveys are consistent with the findings of ICARIS-2 that indicated that over 90% of households have a smoke alarm in their home. Differences in results for testing of alarms and prevalence and practicing of fire escape plans seen across surveys may be attributed to different survey methodologies. For example, in the current study the question regarding smoke alarm testing refers to the individual respondent, in contrast to the BRFSS,[17] which asks if the respondent "or someone else" deliberately tested the detectors in the home. It is possible that someone other than the respondent is responsible for testing the smoke alarms; therefore, the values we report here for ICARIS-2 may underestimate the true numbers.

While these other studies report findings regarding smoke alarm and fire escape planning prevalence, they do not report how these prevalences differ by

Table 3. Presence of fire escape plans by household characteristics, Second Injury Control and Risk Survey

Characteristic	Unweighted number of households	Number reporting fire escape plans	Weighted		
			Extrapolated U.S. number	Percent reporting fire escape plans	95% CI
Total	9,684	4,873	56,202,407	51.6	50.5, 52.7
Household income					
Below poverty level	694	339	3,706,921	49.7	45.6, 53.8
Above poverty level	7,601	3,879	45,037,131	51.9	50.6, 53.2
Metropolitan Statistical Area					
Urban	9,507	4,791	55,094,016	51.5	50.3, 52.6
Rural	144	82	1,108,391	57.8	49.1, 66.4
Type of dwelling[a]					
5 or more apartments	1,212	529	5,342,319	43.3	40.1, 46.5
2–4 apartments	654	282	3,263,583	44.0	39.8, 48.2
Mobile home	450	271	3,531,006	60.2	55.3, 65.1
Attached home	815	375	3,660,019	48.0	44.0, 52.1
Detached home	6,374	3,340	39,633,836	53.3	51.9, 54.7
Census region					
Northeast	2,158	1,048	10,591,201	49.9	47.5, 52.4
North Central	1,642	874	13,521,252	53.0	50.5, 55.5
South	4,016	2,025	20,307,176	52.1	50.3, 54.0
West	1,835	926	11,782,779	50.6	48.2, 53.0
Highest educational level in household[a]					
Less than high school	634	268	3,129,652	43.2	39.0, 47.4
High school graduate	1,968	1,011	11,978,712	52.7	50.2, 55.1
Some college	1,898	1,018	12,200,975	54.0	51.5, 56.5
College graduate	3,009	1,513	17,363,496	51.1	49.0, 53.1
Post-college	2,043	1,019	11,066,927	51.7	49.1, 54.3
Home ownership[a]					
Rented	2,567	1,098	12,022,982	42.9	40.8, 45.0
Owned	6,870	3,672	43,049,723	54.6	53.3, 55.9
Children in the home age 0-14 years[a]					
Yes	3,087	1,719	18,878,125	56.8	54.8, 58.8
No	6,555	3,147	37,225,169	49.2	47.9, 50.6

[a]Statistically significant, p-value <0.001

CI = confidence interval

household characteristics, which is important when targeting prevention programs. Only the first ICARIS study reported a similar analysis.[20] In 1994, this survey was conducted with similar core questions and with a similar fire module. Because this data collection was conducted seven years prior to the ICARIS-2 data collection, it was reasonable to think *a priori* that the newer data may show different results, especially considering that deaths from residential fires have steadily declined over this time period.[1] Results from the 1994 survey[20] and the present study suggest that in the past 10 years, more homes have installed smoke alarms (91.1% in 1994 vs. 94.9% in the current survey; p-value <0.05, chi-square test), but fewer households have fire escape plans (59.8% in 1994 vs. 51.6% in the current survey; $p<0.05$, chi-square test). Associations between household characteristics such as income and education level and smoke alarm presence have not changed in the past 10 years, indicating that those at high risk in 1994 continue to be at high risk today.

The present study has several limitations. First, we relied on self-reported information from telephone surveys to make our estimates. The validity of self-reporting to obtain smoke alarm status information has been examined in previous studies. One telephone survey found that 71% of households in a targeted area reported having a working smoke alarm, but when a home inspection that involved manual testing of smoke alarms was conducted in the same area six months later, only 49% of homes had functioning alarms.[21] Another

study that involved self-reported interview data followed by home observations two to four weeks later found that individuals who reported not having a working smoke alarm and not having a working alarm on each floor of their home were generally accurate (negative predictive values = 100% and 91%); however, among those who reported having a working smoke alarm, only 52% (positive predictive value) actually did, and among those who reported having a working smoke alarm on each floor of their home, only 26% did.[22] These studies suggest that the estimates we observed may be overestimations of the true prevalence of these safety practices.

Second, our response rate of 48%, although lower than we would have liked, is comparable with other RDD studies currently being conducted.[23] Bias in the responses may have occurred if the sample was not representative of the U.S. population. As a means of assessing the representativeness of our data, we compared the demographics of this sample with those of the 2002 population. Our sample was representative with respect to age, race/ethnicity, gender, employment status, and household income. Respondents were slightly more likely (6%–10%) to be more highly educated, married, and own their own homes compared with the general population. Despite this, as previously noted, our overall estimates were consistent with other national surveys, indicating that our response rate did not have a large effect on our estimates.

Third, because less than 1% of respondents indicated that they had an uncontrolled fire in their home in the past 12 months, it was not possible to directly examine risk factors for fire or related injury.

Results from this study indicate the need to emphasize the testing of smoke alarms and the development and practice of fire escape plans. Prevention activities and education should be developed with the understanding that the installation of smoke alarms is a one-time action, whereas monthly testing of alarms and the practicing of escape plans require ongoing intentions for enactment. While we found that better smoke alarm maintenance and fire escape planning education generally is needed in all homes, particular emphasis should be placed on households with lower income and education levels.

As part of the ongoing effort to reduce and minimize injuries and deaths from residential fires, CDC has funded 18 state health departments since 1998 (selection based on competitive applications) to deliver a smoke alarm installation and fire safety education program. By design, this program is conducted in both urban and rural low income communities that are at high risk for residential fires. A key characteristic of this program includes education on smoke alarm maintenance and fire escape planning.[7] This smoke alarm installation and fire safety education program is presently being evaluated to better understand the effect of the program. Additionally, CDC currently is conducting a randomized trial in high risk homes to determine the most effective methods of delivering smoke alarm maintenance education. Results from the ICARIS-2 survey and from these ongoing studies can be used to improve the implementation and effectiveness of residential fire safety programs and to improve the selection of communities at high risk by targeting homes with characteristics associated with lower smoke alarm and escape plan prevalence.

The findings and conclusions in this report are those of the authors and do not necessarily represent the views of the Centers for Disease Control and Prevention.

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NFPA RESEARCH

U.S. Fire Problem

Home cooking fires

01-Sep-2023

Key findings

Cooking is such a routine activity that it is easy to forget that the high temperatures involved can easily start a fire. During 2017–2021, cooking was the leading cause of reported home[1] fires and home fire injuries and the second leading cause of home fire deaths.[2]

Cooking caused an average of 158,400 reported home structure fires per year (44 percent of all reported home fires in the US). These fires resulted in an average of 470 civilian deaths (18 percent of all home fire deaths) and 4,150 civilian injuries (42 percent of all reported home fire injuries) annually.

Ranges or cooktops were involved in 53 percent of the reported home cooking fires, 88 percent of cooking fire deaths, and 74 percent of cooking fire injuries. Households with electric ranges had a higher risk of cooking fires and associated losses than those with gas ranges.

Unattended cooking was the leading factor contributing to cooking fires and casualties. Clothing was the item first ignited in less than one percent of these fires, but clothing ignition led to 7 percent of the home cooking fire deaths.

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.

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.

Trends in cooking fires and cooking fire casualties

Data indicates that the number of 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.[3] During the transition years of 1999–2001 — when NFIRS 5.0 was being introduced — less than half of the fire data was collected using the new rules and definitions. Consequently, those estimates were omitted from the trend graphs.

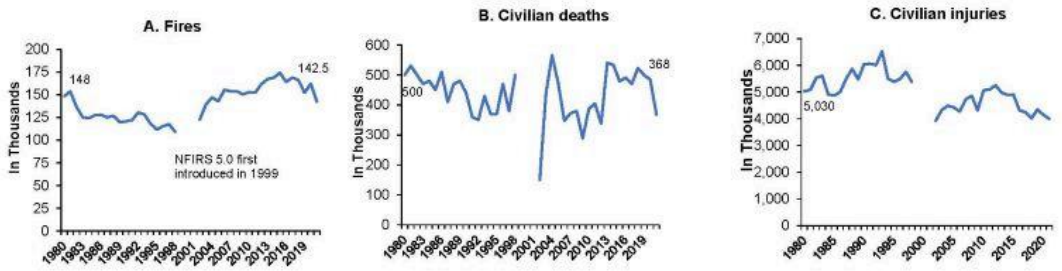
[1]The term *home* encompasses one- or two-family homes, including manufactured homes and apartments or other multifamily housing.

[2]Death and injury estimates exclude firefighter casualties.

[3]Causal information is not required for structure fires of 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.

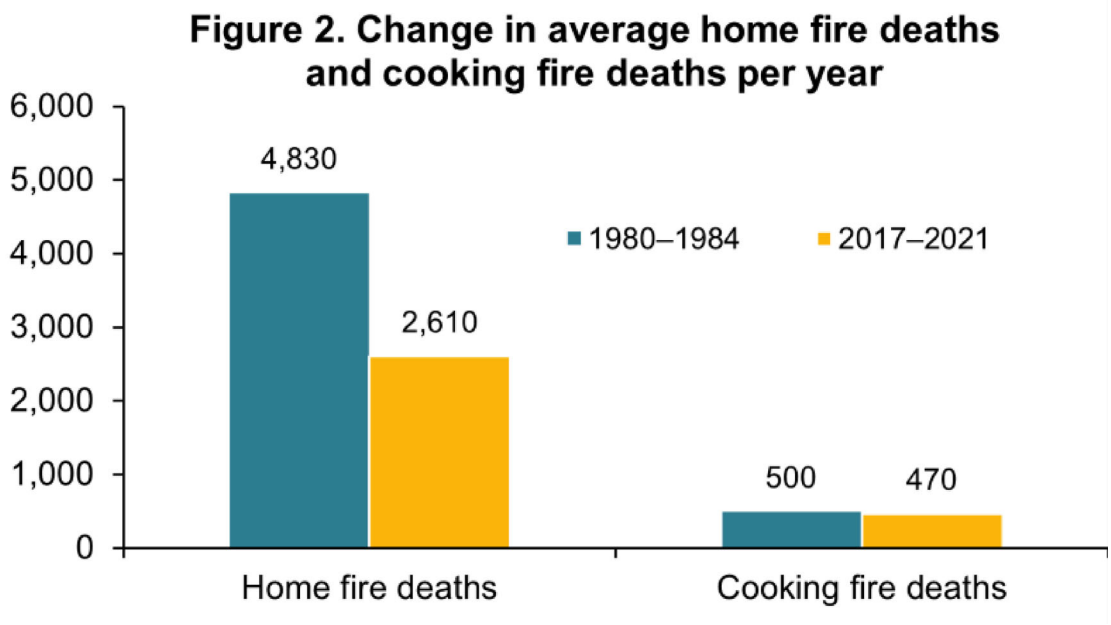
The use of NFIRS 5.0 was accompanied by an increase in reported cooking fires. After leveling off for a few years, the reported number of cooking fires hit consecutive new highs in 2012–2015. In 2016–2018, these fires fell below the 2014 and 2015 levels, but they remained historically high. In 2021, the number of reported cooking fires dropped to the lowest level seen since 2005. Changes to NFIRS may have influenced some of these trends. See Figure 1.

Figure 1. Reported home cooking fires[iv] by year: 1980–2021



[iv] Estimates for the NFIRS transition years of 1999–2001 are unstable and not shown. NFIRS 5.0, first introduced in 1999, originally defined the 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 the 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 other factor contributing to ignition indicated some type of operating equipment was involved. This was removed, effective with the 2015 data.

There were fewer cooking fire deaths in 2017–2021 than in 1980–1984. However, it appears that less progress has been made toward reducing deaths from home cooking fires than deaths from most other fire causes. See Figure 2.



Reported home cooking fires in 2017–2021

During 2017–2021, local fire departments responded to an estimated average of 158,400 home cooking fires per year. These fires caused an average of 470 civilian deaths; 4,150 civilian injuries; and $1.15 billion in direct property damage annually. Cooking caused two in five reported home fires (44 percent) and home fire injuries (42 percent) and one in five home fire deaths

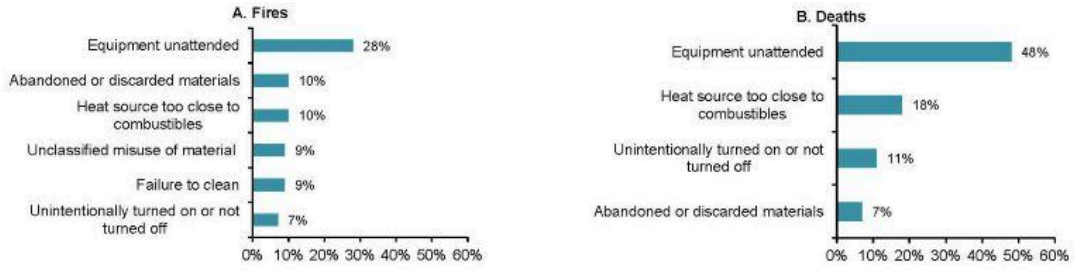
(18 percent). Cooking was the leading cause of reported home fires and home fire injuries and the second leading cause of home fire deaths.

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 materials, which may have been related to unattended cooking, ranked second in the causes of cooking fires and fourth in cooking fire deaths and injuries.

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.

Figure 3. Leading factors in home cooking fires and home cooking fire deaths: 2017–2021



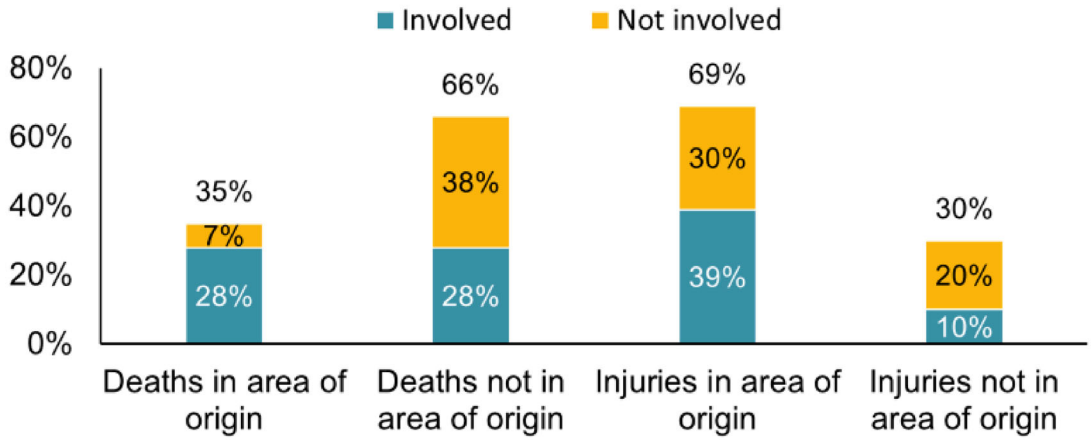
A fatal fire in a Pennsylvania second-story apartment began when a male occupant fell asleep in an adjacent room while cooking oil was being heated on the kitchen stove. After the oil ignited, it spread to the cabinets and throughout the kitchen and entered a decay stage by the time the fire department arrived.

More than one-quarter of the fatal cooking fire victims and nearly 40 percent of the non-fatally injured were in the area of origin when the fire began. See Figure 4. With unattended cooking being the leading cause of cooking fires and cooking fire casualties, it is not surprising that more than one-quarter of the fatalities were involved in the ignition but not in the area of origin. These were likely cooks who left the room. 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.

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.

Figure 4. Home cooking fire casualties in or not in area of origin and involved in ignition: 2017–2021



Not surprisingly, more than two-thirds (66 percent) of the home cooking fires began with the ignition of cooking materials, including food, fat, and grease. Cooking oil, fat, grease, and related substances were the items first ignited in half (51 percent) of the home cooking fires that began with cooking materials. More than half (53 percent) of the civilian deaths and three-quarters of the civilian injuries (75 percent) and direct property damage (78 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 losses were also higher for fires that began 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.

Although clothing was the item first ignited in less than one percent of the reported home cooking fires, clothing ignition led to 7 percent of the home cooking fire deaths.

> An elderly male died as a result of burn injuries suffered when a burner on his kitchen stove ignited his clothing as he prepared food. On arrival, crews encountered light-colored smoke and limited visibility inside the apartment, which was located on the third floor of a large apartment building. Proceeding into the unit, they found the victim, already deceased, on the kitchen floor, with smoldering materials on and near him.

Most reported cooking fires were small. Four out of five (80 percent) were confined to the object or pan of origin. Four percent of the cooking fire deaths and more than one-third (35 percent) of the reported cooking fire injuries resulted from these small fires. Over one-quarter (28 percent) of the home cooking fire deaths and 82 percent of the home cooking fire injuries resulted from the 97 percent of fires that were confined to the room in which the fire began.

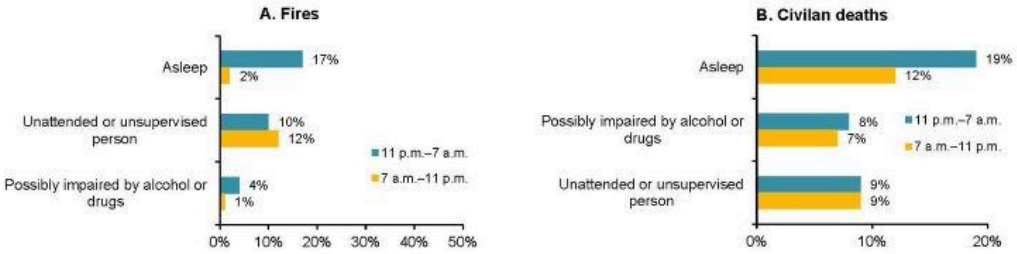
Less than one-third (31 percent) of the reported home fires were in apartments or other multifamily housing, yet these properties accounted for almost half (47 percent) of the reported home cooking fires. Cooking caused 37 percent of the fires in one- or two-family homes and 72 percent of the fires in apartments or other multifamily homes; see Tables 1A and 1B of the Home Structure Fires Supporting Tables for more information.

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 were cooking fires that did not spread.

When did cooking fires occur?

Not surprisingly, cooking fires peaked between 5:00–8:00 p.m. when people were likely preparing dinner. Seventeen percent of the fires reported between 11:00 p.m.–7:00 a.m. accounted for 19 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.

Figure 5. Human factors contributing to ignition in home cooking fires by time of day: 2017–2021



It is possible that many of the fires coded with “unattended or unsupervised person” were 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.” This additional detail is generally not available to firefighters when they complete their incident reports online.

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

Table A. Leading Dates on Average: 2017–2021 Home Cooking Fires Reported to US Fire Departments

Date	Fires	Percent Above Average Daily Fires
November 22 (Thanksgiving)	1,470	(240%)
December 24 (Christmas Eve)	740	(72%)
December 25 (Christmas Day)	740	(71%)
Easter	670	(54%)
November 21 (Day Before Thanksgiving)	600	(40%)
Daily average: 2017–2021	430	

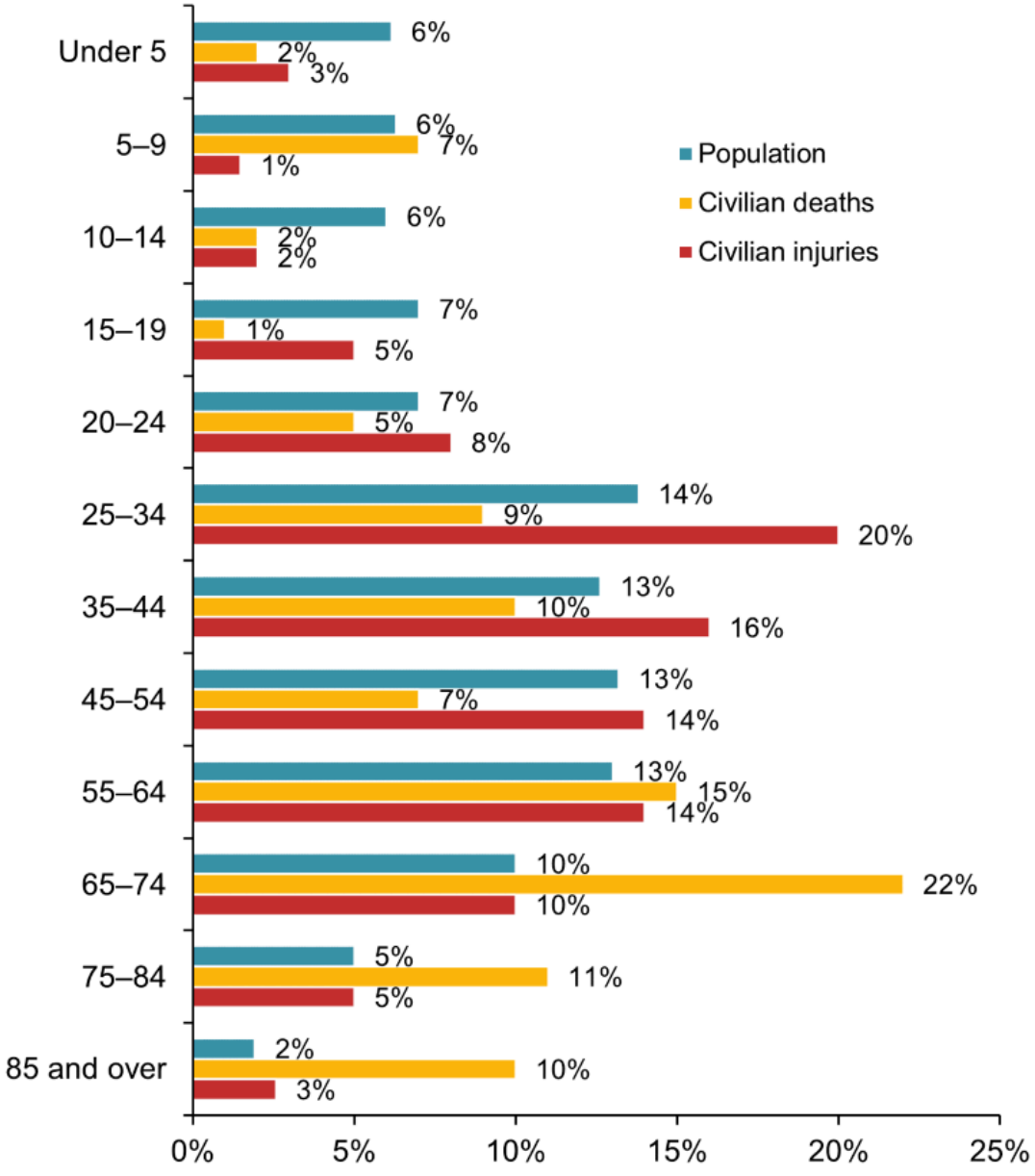
Victims of cooking fires

From 2017 to 2021, more than half (58 percent) of the people who died in cooking fires were 55 years of age or older. The 65–74 age group accounted for the largest share of home cooking fire deaths. See Figure 6.

People 85 and older had a risk of dying in a cooking fire 5.5 times higher than the overall population. A 2018 NFPA 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.

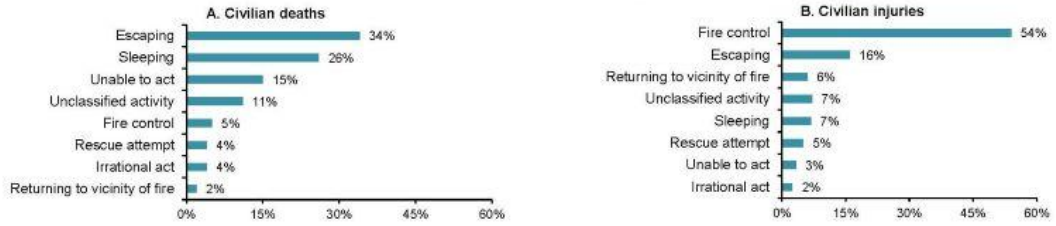
Young adults aged 25–34 were at the highest risk of non-fatal cooking injuries. There was much less variation in risk in the injury age distribution. Only 32 percent of those injured were 55 or older.

Figure 6. Home cooking fire deaths and injuries by age group: 2017–2021



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.

Figure 7. Activity when injured in home cooking fires: 2017–2021



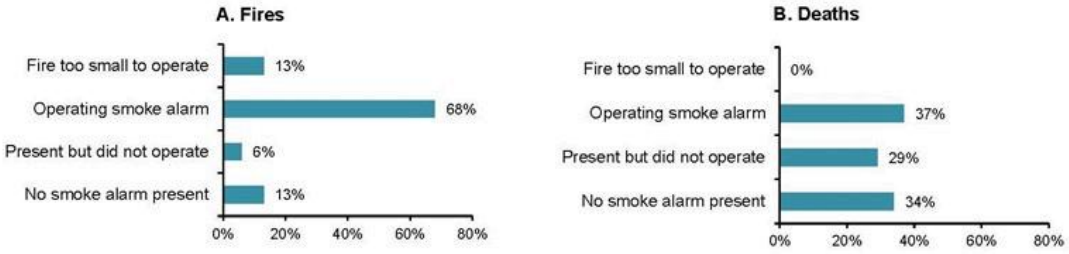
Smoke alarms in home cooking fires

It is easy to assume that cooks are awake and nearby when cooking fires occur. However, Figure 4 shows that two-thirds (66 percent) of cooking fire fatalities were not in the area of origin, although more than one-quarter (28 percent) were involved in the ignition. A working smoke alarm is necessary to alert those outside the kitchen of a fire.

Smoke alarms were more likely to be present and operating at fires caused by cooking than at all other home fires. Some of this 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 likely have been handled by the occupants without fire department assistance. This is particularly true of apartment buildings, which are more likely to have smoke detection systems than one- and two-family homes.

Figure 8 shows that smoke alarms were present at 88 percent of the reported home cooking fires and 76 percent of the cooking fire deaths. As noted earlier, 8 percent of the cooking fire deaths resulted from clothing ignitions. Victims in these fires may have been fatally injured before the smoke alarm sounded. Automatic extinguishing systems (AES) were present in 12 percent of the reported home cooking fires. Only one percent of the civilian deaths occurred when AES systems were present.

Figure 8. Smoke alarm status in home cooking fires: 2017–2021



When possible, smoke alarms should be installed at least 20 feet away from the kitchen range. If that is not possible, any smoke alarm 10 to 20 feet 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 feet 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 are required to ensure their products can distinguish between normal cooking aerosols and those associated with fire by passing a cooking nuisance test. This UL requirement is designed to minimize the number of nuisance alarms triggered by cooking activities. The smoke alarms and detectors must also demonstrate greater sensitivity to smoldering and flaming polyurethane foam. This UL requirement went into effect on June 30, 2021.

Equipment involved in reported home cooking fires

Ranges or cooktops were involved in more than half (53 percent) of the reported home cooking fires, 88 percent of the deaths, and 74 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 had 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 food warmers and hot plates 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.

Figure 9. Casualty rates per 1,000 reported fires and average loss per fire by type of cooking equipment: 2017–2021

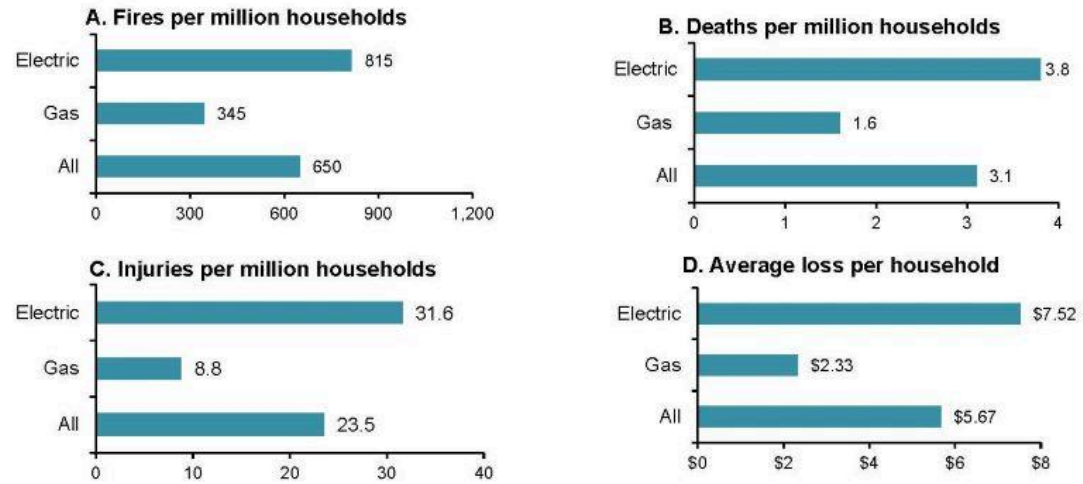
* Grill, hibachi, or barbecue fires that were coded as outside fires are not included

Households with electric ranges had a higher risk of cooking fires and associated losses than those with gas ranges. Although 64 percent of households cook with electricity, four of the five (80 percent) ranges or cooktops involved in the reported cooking fires were powered by electricity. The population-based risks are as follows:

- The rate of reported fires per million households was 2.4 times higher with electric ranges.
- The civilian fire death rate per million households was 1.9 times higher with electric ranges.
- The civilian fire injury rate per million households was 3.6 times higher with electric ranges than in households using gas ranges.
- The average fire dollar loss per household was 3.2 times higher in households with electric ranges.

See Figure 10.

Figure 10. Risk related to usage of electric vs. gas ranges or cooktops: 2017–2021



It is sometimes less obvious when 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, Household Electric Ranges, which took effect in June of 2018, includes requirements for electric coil ranges to prevent the ignition of cooking oil. 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. Because ranges last a long time, it could be years before these safer ranges become common in US homes.

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:

$$\frac{\text{NFPA's fire experience survey projections}}{\text{NFIRS totals}}$$

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 ignition are classified as being caused by cooking equipment. Food preparation devices that do not involve heat, 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 the EII was coded as "None (NNN)" had other causal factors that indicated equipment was a factor or that 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:

$$\frac{\text{All fires}}{\text{(All fires – blank – undetermined – [fires in which EII =NNN and heat source < />40–99])}}$$

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 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 NFIRS.

Contact NFPA Research

If you have questions about this report, or if you have a research request, please contact us.

The Case for Fire Sprinklers in One- and Two-Family Dwellings

National Fire Protection Association
Fire Sprinkler Initiative

Revised October 2014

[This document provides testimony on the importance of home fire sprinklers and the cost and effectiveness of these systems in one- and two-family homes.]

THE CASE FOR HOME FIRE SPRINKLERS

The mission of the international nonprofit NFPA, established in 1896, is to reduce the worldwide burden of fire and other hazards on the quality of life by providing and advocating consensus codes and standards, research, training, and education. This document provides testimony on the importance of home fire sprinklers and the cost and effectiveness of these systems in one- and two-family homes.

The U.S. Fire Problem

Fire in the home poses one of the biggest threats to the people of your community. U.S. fire departments responded to an average of 371,700 home structure fires per year during the five-year-period of 2006-2010. About 350,000 of the fires occurred in homes without automatic extinguishing equipment. These fires caused an estimated average of 2,600 civilian deaths, 12,900 civilian injuries, $7.2 billion in direct property damage, and 25,600 firefighter injuries at the fireground per year.

Those at greatest risk are:

- Older adults – over age 65
- Children – under 5 years old
- Persons with disabilities

These high risk groups may not be able to exit on their own, even with working smoke alarms. They may need the additional escape time provided by home fire sprinkler systems. NFPA 13D systems are designed to provide a ten minute escape time.

Fire Sprinklers Reduce Civilian Fire death and Costs

- Sprinklers reduce civilian fire deaths by **83%**.
- civilian fire death cost reduction of **$10.4 billion** per year

A fatal home fire impacts the entire community. It begins with grieving survivors, having to mourn the loss of loved ones. Burn injury survivors require lifelong support to recover from them, as found on the website of the Phoenix Society for Burn Survivors. According to the Burn Survivor Resource Center; "burns are one of the most expensive catastrophic injuries to treat. For example, a burn of 30% of total body area can cost as much as $200,000 in initial hospitalization costs and for physicians' fees. For extensive burns, there are additional significant costs which will include costs for repeat admission for reconstruction and for rehabilitation." Homes sustaining extensive fire damage will have to be demolished and will remain off the tax rolls for some time, impacting community revenue. The long term effects of home fire burn injuries and the impact of home fires on the community must be included in the home fire sprinkler debate.

Fire Sprinklers Reduce Injury Cost

While there has long been data correlating sprinklers with reductions in deaths and property loss, recent research also shows a significant impact on injury cost when sprinklers are present.

- Sprinklers reduce civilian fire injury **medical costs by 53%**,
- Sprinklers reduce civilian fire injury **total costs by 41%.**
- Sprinklers are responsible for an estimated **65% reduction in firefighter fireground injuries**.

Fire Sprinklers Reduce the Cost of Loss

If all homes had been sprinklered when the fire occurred it would have resulted in:

- civilian fire injury medical costs reduction of **$0.2 billion** per year
- civilian fire injury total cost reduction of **$0.7 billion** per year

THE NATIONAL CONSENSUS IS IN FAVOR OF HOME FIRE SPRINKLERS

All model safety codes now require the use of home fire sprinklers in new one- and two-family homes. This ocurred through a process properly vetted by both private and public concerns and not influenced by any single special interest group. These are minimum standards of safety to protect the people in their homes. NFPA is against any proposal that removes this requirement from the code, thus reducing the established minimum standards of life safety in one- and two-family homes. Amending the requirement out of the code equates substandard housing.

The matter of choice

Building, fire, and life safety codes must always be guided by minimum codes and policy decisions and are not a matter of consumer choice. These safety standards are always included in the fixed costs of homes, cars, etc. Only the original buyers of "custom homes" will be able to make the choice. Buyers of "spec" homes and existing homes will be deprived of the ability to make that choice. Requiring home fire sprinklers protects the housing stock for the next 75-100 years

SMOKE ALARMS AND SPRINKLERS BOTH SAVE LIVES FROM FIRE

Home fire sprinklers are a proven way to protect lives and property against fires at home. These life-safety systems respond quickly and effectively to the presence of a nearby fire. When sprinklers are present, they save lives. Sprinkler systems provide additional benefits, on top of the benefits already provided by smoke alarms.

- Working smoke alarms cut the risk of dying in a home fire by 50 percent.
- If you have a reported fire in your home, the risk of dying decreases by about 80 percent when sprinklers are present.

Percentages of survival and death

You will hear sprinkler opponents using a statistic of 99.4% to illustrate the effectiveness of smoke alarms in reducing home fire deaths. This NFPA statistic is based on the total number of fires, the vast majority of which are not fatal. Does that mean 2,500 deaths every year are acceptable? Most people would say no. It is similar to saying that because the survivability of motor vehicle crashes is also around 99.4%, that we should not look for ways to improve highway safety. Smoke alarms and fire sprinklers provide the required level of fire safety in the home, just as seat belts and airbags do so in cars.

SPRINKLERS DO MORE THAN SAVE LIVES

Home fire sprinklers protect property

"Saving lives" means more than just preventing deaths. Just as there is no other fire safety technology or programs that produce as great a reduction in risk of death as sprinklers, there also is no other fire safety technology or program that produces as great a reduction in property loss per fire as sprinklers.

- Sprinklers reduce direct property damage per fire by **69%**.
- Sprinklers reduce direct property damage by **$4.8 billion** per year

Home fire sprinklers are good for the environment

The findings of a groundbreaking study, made possible through a collaborative effort of FM Global and the Home Fire Sprinkler Coalition, titled *The Environmental Impact of Automatic Fire Sprinklers*, released in March 2010 found that fire sprinklers:

- Reduce greenhouse gases by **98%**
- Reduce fire damage by up to **97%**
- Reduce water usage to fight a home fire by upwards of **90%**

- Reduce the amount of water pollution released into the environment
- Reduce debris to landfills

EFFECTIVENESS AND RELIABILITY OF FIRE SPRINKLERS
Home sprinkler systems respond quickly to reduce the heat, flames, and smoke from a fire, giving families valuable time to get to safety.

It is important to recognize that home fire sprinkler systems are designed to activate to the heat of a fire that grows large enough for the temperature to reach 135°-160°F. They are not activated by smoke, nor should they be.

In home fires deemed large enough to activate an operational sprinkler, in 2006-2010, sprinklers were effective in 96% of the cases.

- When wet-pipe sprinklers operated, 88% of reported fires involved only 1 or 2 sprinklers.
- Each individual sprinkler is designed and calibrated to go off with a significant heat change.
- Only the sprinkler closest to the fire will activate, spraying water directly on the fire.

INSPECTION AND MAINTENANCE
The installer must provide the owner/occupant instructions on inspecting, testing, and maintaining the system. NFPA 13D systems do not require the use of professional inspection services. The sprinkler system must be inspected and tested by the homeowner periodically to ensure it is in good working order. The system must be maintained in good working order in accordance with the standard and following manufacturer's instructions.

NFPA 13D mandates additional testing and maintenance of antifreeze systems. Samples of antifreeze solution must be collected by qualified individuals on an annual basis to verify that the solution is in compliance with concentration requirements, and that the solution provides the appropriate antifreeze protection.

NFPA 13D multipurpose piping systems do not require testable backflow preventers. When backflow preventers are required by the jurisdiction, a yearly inspection performed by a professional is necessary.

NEWER HOMES AND FIRE
Opponents of residential fire sprinkler systems like to boast that newer homes are safer homes and that the fire and death problem is limited to older homes. Age of housing is a poor predictor of fire death rates. When older housing is associated with higher rates, it usually is because older housing tends to have a disproportionate share of poorer, less educated households. Statistically, the only fire safety issue that is relevant to the age of the home is outdated electrical wiring. Beyond that, age of the home has little to nothing to do with fire safety.

In fact, new methods of contruction negatively impact occupant and firefighter life safety under fire conditions. The National Resarch Council of Canada (NRC) tested the performance of unprotected floor assemblies exposed to fire. The findings of the study, *The Performance of Unprotected Floor Assemblies in Basement Fire Scenarios* assert that these structures are prone to catastrophic collapse as early as six minutes from the onset of fire.

In 2008, Underwriters Laboratories® (UL) conducted a study to identify the danger to firefighters created by the use of lightweight wood trusses and engineered lumber in residential roof and floor designs. The findings of the report, *Structural Stability of Engineered Lumber in Fire Conditions*, point to the failure of lightweight engineered wood systems when exposed to fire. Firefighters expecting

thirty minutes of structural integrity with dimensional wood structures face higher peril in lightweight structures.

The same UL study found that the synthetic construction of today's home furnishings add to the increased risk by providing a greater fuel load. Larger homes, open spaces, increased fuel loads, void spaces, and changing building materials contribute to:

- Faster fire propagation
- Shorter time to flashover
- Rapid changes in fire dynamics
- Shorter escape time
- Shorter time to collapse

In May, 2011 the NRC released Research Report IRC-RR-307 Performance of Protected Ceiling/Floor Assemblies and Impact on Tenability with A Basement Fire Scenario [Phase II (PII)]. In addition to testing the structural integrity of engineered wood assemblies under fire conditions, both phases of the study also tested smoke alarm performance, fire development, sequence of events, and tenability, in relation to evacuation of occupants.

The results of the NRC research projects are considered critically important due to the perceived notion by numerous stakeholders (including some in the fire service) that protection of engineered floor assemblies constitutes equivalency to fire sprinklers.
Protection of engineered floor assemblies is included in the 2012 IRC. This requirement in the model code is in addition to the requirement of fire sprinkler installation in the dwelling. There are very good reasons for this; protection of engineered floor assemblies, while extending the time to structural instability and collapse under fire conditions, does nothing to prevent the fire from growing or to become deadly for occupants and responding fire crews; as supported by this NRC report

Although passive protection of solid-sawn wood joists, wood I-joists, steel c-joists, metal web trusses with gypsum board increases structural stability for longer time periods, the structures always failed and collapsed after a certain time during the experiments. The same applies to suspended ceilings. Most importantly, the structural failure of the test assembly occurred well after the untenable conditions were reached.

The test assemblies protected by residential fire sprinklers did not fail or collapse. Conditions that would cause incapacitation did not exist, or were quickly reversed by sprinkler activation. Tenable conditions remained throughout the structure.

Passive protection of engineered wood assemblies by gypsum and suspended ceilings will do little to increase life safety in the event of fire in the home, especially for susceptible (high risk) persons. These high risk groups; young children, adults older than 65 and disabled persons are disproportionately incapacitated earlier in fire events by FED values reached when structures are not protected by fire sprinklers. Fire sprinklers can offset the increased dangers posed by lightweight construction and create a safer fire environment for occupants and firefighters to operate in.

THE COST OF NFPA 13D SPRINKLER SYSTEMS
The Fire Protection Research Foundations' *Home Fire Sprinkler Cost Assessment- 2013* report revealed that the cost of installing home fire sprinklers averages $1.35 per square sprinklered foot (SF) for new construction. The data included in the report also reflects the sprinkler system bid price plus all associated costs for the system which were not included in the bid, such as; permit fees, increase in water service line, and increase in tap fee.

To put the cost of a sprinkler system into perspective, many people pay similar amounts for carpet upgrades, granite countertops, paving a stone driveway, or a whirlpool bath.

INCENTIVES TO OFFSET COSTS

Most recently, the Fire Protection Research Foundation released the *Incentives for the Use of Residential Fire Sprinkler Systems in U.S. Communities* report t revealing that typical incentives offered by communities may offset up to one-third of the cost of home fire sprinkler systems.

HOUSING COST AND SUPPLY IMPACT

In a recently released study, *Comparative Analysis of Housing Cost and Supply Impacts of Sprinkler Ordinances at the Community Level*, conducted by Newport Partners for NFPA, it is reported that: ***"…analysis did not reveal that the enactment of sprinkler ordinances caused any detrimental effects on housing supply and costs."*** The report clearly indicates there is no merit to the claim that a residential sprinkler requirement creates an unfair market advantage for an area that does not have a requirement, as claimed by sprinkler opponents.

INTEGRATION OF RESIDENTIAL SPRINKLERS WITH WATER SUPPLY SYSTEMS

NFPA 13D requires only the standard operating water pressure of the domestic plumbing system. Most domestic water supply systems are able to manage the operating pressure demands of a home fire sprinkler system.

The *Integration of Residential Sprinklers with Water Supply Systems* study conducted by Newport Partners for NFPA addressed the requirement of local water purveyors and building departments in twenty communities, and its impact on system design, operation, cost, and maintenance.

Key findings of the study follow:

- Majority did not experience water meter cost increase
- 90% experienced no increase in service fees
- Domestic water consumption rates did not increase
- Majority did not see an increase in tapping fees

The study concluded that communities integrating residential fire sprinklers with water supply systems employ practical solutions that satisfy the needs of builders, water purveyors, and the fire service.

On site water supply

Well systems can be set up to effectively address a fire protection application. Generally speaking, they are set up at the inception of the home building process and a larger well pump is usually installed along with larger expansion tanks. Homes on well water most likely will need a pump to serve the domestic water supply. The cost associated with providing additional pressure to run the fire sprinkler system may simply be the difference between the regular pump the homeowner must install to obtain the necessary pressure for domestic use, and a higher flow pump, or a booster pump and tank. The expansion tanks are sized to pick up the difference between the well capacity and demand so they are not necessarily large. To meet the requirements of NFPA 13D, many installations have been done using this method, effectively and cost competitively.

WATER CONSERVATION

A recent study, *Residential Fire Sprinklers – Water Usage and Water Meter Performance*, evaluated total water usage during sprinkler activation at a fire scene (fire flow) in comparison to water usage by the fire service performing extinguishment operations in non-sprinklered homes. The study revealed that, assuming ten minutes of operation, a home fire sprinkler system could discharge up to 280 gallons of water per fire. By comparison, the average water discharged at a home fire without

a fire sprinkler system averaged 2,935 gallons. Water infrastructure demand is reduced at least 47% when the homes within a community are protected by fire sprinkler systems

This study also evaluated water meter performance during typical sprinkler actuation. All water meters exhibited metering accuracy within the industry standards at flow conditions up to approximately 150% of their normal operating range. The pressure loss profiles from these meters was less than or similar to the generic NFPA 13D suggested values at the respective flow rates.

HOMEOWNER INSURANCE ISSUES

ISO Fact Sheet

ISO, an independent statistical, rating, and advisory organization that serves the property/casualty insurance industry and the leading supplier of underwriting information, advisory loss costs, supplementary rating information, and standardized policy information language to insurers in all fifty states and the District of Columbia offers the following advisory on its *ISO Fact Sheet*:

Premium discounts

The ISO provides premium credits for installation of fire sprinkler protection up to a maximum of:

- 13% for full sprinkler protection that includes all areas of a home, including attics, bathrooms, closets, and attached structures;
- 8% for fire sprinkler protection of all areas of a home excluding the attic, bathrooms, closets, and attached structures as long as fire detection equipment is installed in those areas where sprinklers are omitted;

Individual insurer programs may provide different credits. The cost assessment report found insurance discounts ranging from 0% to 12%, with an average of 7%.

Sprinkler leakage coverage

The presence of a residential sprinkler system may raise concern about the risk of accidental water leakage from the system. ISO's standard Homeowners policy forms provide coverage for "…accidental discharge or overflow of water…from within a…fire protective sprinkler system…". This coverage is included in the basic policy. There is no extra charge for this coverage. Also, coverage is provided for water damage related to the suppression or extinguishment of a covered fire. Individual insurer programs may provide variations to this coverage.

Building Code Effectiveness Grading Schedule (BCGES©)

The ISO Building Code Effectiveness Grading Schedule (BCEGS®) is used to review public building code enforcement agencies and to develop a classification that is provided as advisory information to insurers who may use it for insurance underwriting and rating.

POSSIBLE IMPACT OF AMMENDING THE SPRINKLER REQUIREMENT FROM THE CODE

If the requirement for automatic fire sprinkler protection of residential dwellings was removed by legislation or local ordinance, BCEGS would not provide full recognition for adoption of code without amendments. ***A building code enforcement agency that adopted a code with amendments that weaken hazard mitigation issues, as defined in the model codes and referenced standards, would not receive maximum recognition for code adoption.*** This statement is vitally important to the debate over one- in two family dwelling fire sprinklers.

The National Flood Insurance Program's (NFIP) *Community Rating System (CRS)* is a voluntary incentive program that recognizes and encourages community floodplain management activities that exceed the minimum NFIP requirements. FEMA and the insurance industry look for uniformity in code adoption because the code development process takes into account the total effect of all

relevant factors. Amendments to the code affect the structural integrity of the entire code document. In this case, the penalty can have devastating effects.

The table below shows the credit points earned, classification awarded, and premium reductions

Credit Points	Class	Premium Reduction
4,500+	1	45%
4,000 – 4,499	2	40%
3,500 – 3,999	3	35%
3,000 – 3,499	4	30%
2,500 – 2,999	5	25%
2,000 – 2,499	6	20%
1,500 – 1,999	7	15%
1,000 – 1,499	8	10%
500 – 999	9	5%
0 – 499	10	0

given for communities in the NFIP CRS. As you will note, every change in Community Classification results in a 5% change in flood insurance premium.

The following is from the FEMA/NFIP classification system manual:

> *b. Class 7 Prerequisite:*
>
> *In addition to having sufficient points, in order to be a Class 7 or better, a community must have received a classification of 6/6 or better under the Building Code Effectiveness Grading Schedule (BCEGS).* ***Both BCEGS classifications (residential/personal and commercial) must be a class 6 or better*** (emphasis added).
>
> *c. Class 4 Prerequisite: In order to be a Class 4 or better, a community MUST:*
> *• Have received a classification of 5/5 or better under the BCEGS*

The BCEGS penalty, although small (about 4%), can mean the difference between one class and the next-better class. The CRS Eligible Communities table contains the rating ofeach of the eligible communities. The economic impact on communities with a five or six rating is greater, should their rating class change. The communities, the fire departments, and the insurance-buying homeowners of have potentially millions of dollars riding on this decision.

HOME FIRE SPRINKLER REQUIREMENTS – IMPACT ON FIRE SERVICE

Requiring fire sprinklers in new homes helps fire service efforts. Adopting home fire sprinkler requirements have allowed the fire service to keep up with growth, and to continue to provide an appropriate level of service, which many times translate into savings for a community.

CONCLUSION

Extensive research has revealed that fire sprinklers save lives, protect property, and benefit the environment. Home fire sprinklers can also offset the increased dangers posed by homes built with lightweight construction and create a safer fire environment for occupants and firefighters.

Bill Text: NH HB1065 | 2024 | Regular Session | Amended
New Hampshire House Bill 1065 ***(Prior Session Legislation)***

Bill Title: Relative to fire sprinkler requirements in residential buildings.

Spectrum: Bipartisan Bill

Status: *(Passed)* 2024-08-07 - Signed by Governor Sununu 08/02/2024; Chapter 324; 10/01/2024 House Journal 16 [HB1065 Detail]

Download: New_Hampshire-2024-HB1065-Amended.html

HB 1065 - AS AMENDED BY THE SENATE

28Mar2024... 1046h
05/22/2024 2006s

2024 SESSION

24-2313
12/10

HOUSE BILL ***1065***

AN ACT relative to fire sprinkler requirements in residential buildings.

SPONSORS: Rep. Damon, Sull. 8; Rep. Alexander Jr., Hills. 29; Rep. Read, Rock. 10; Rep. McConkey, Carr. 8; Rep. Yokela, Rock. 32

COMMITTEE: Special Committee on Housing

AMENDED ANALYSIS

This bill adds an exception to the state fire code for fire suppression or sprinkler system requirements for certain existing residential buildings with no more than 4 dwelling units and prohibits municipalities from adopting certain fire suppression device ordinances and regulations.

- -

Explanation: Matter added to current law appears in ***bold italics.***
Matter removed from current law appears [~~in brackets and struckthrough.~~]
Matter which is either (a) all new or (b) repealed and reenacted appears in regular type.
28Mar2024... 1046h
05/22/2024 2006s 24-2313
12/10

STATE OF NEW HAMPSHIRE

In the Year of Our Lord Two Thousand Twenty Four

AN ACT relative to fire sprinkler requirements in residential buildings.

Be it Enacted by the Senate and House of Representatives in General Court convened:

1 State Fire Code and Rules; Fire suppression or Sprinkler Systems. Amend RSA 153:5, IV to read as follows:
IV. The state fire marshal may exempt a building, structure, or equipment from such rules if he or she finds that such exemption does not constitute a hazard to the public welfare and safety. A reasonable time, as determined by the state fire marshal, shall be allowed to make necessary alterations. Nothing in this section shall be construed to prevent municipalities from adopting bylaws or ordinances relative to a subject area of rules adopted by the state fire marshal in accordance with this section if such bylaws or ordinances are no less restrictive than rules adopted by the state fire marshal. ***However, counties, towns, cities, and village districts shall not adopt rules, regulations, or ordinances that are more stringent than the state fire code relative to residential sprinkler systems.***

2 Local Land Use Planning and Regulatory Powers; Amending and Establishing Building Code and Enforcement Procedures; Fire Suppression Sprinklers. Amend RSA 674:51, V to read as follows:

V. No municipality or local land use board as defined in RSA 672:7 shall adopt any ordinance, regulation, code, or administrative practice requiring the installation of automatic fire suppression sprinklers in any new or existing detached single family or 2-family dwelling unit in a structure used only for residential purposes, ***or in existing buildings that contain, or will contain, no more than 4 dwelling units, unless fire sprinklers are existing or are required by a nonresidential occupancy***. Notwithstanding any provision of law to the contrary, no municipality or local land use board shall enforce any existing ordinance, regulation, code, or administrative practice requiring the installation or use of automatic fire suppression sprinklers in any manufactured housing unit as defined in RSA 674:31 situated in a manufactured housing park as defined in RSA 205-A:1, II. Nothing in this paragraph shall affect the ability of an applicant for a local land use permit to include the installation of fire suppression sprinklers pursuant to RSA 674:36, IV, or affect the validity or enforceability of such inclusion.

3 Effective Date. This act shall take effect 60 days after its passage.

2006–2008 Residential Fire Loss Estimates*

U.S. National Estimates of Fires, Deaths, Injuries, and Property Losses from Unintentional Fires

David Miller
Risana Chowdhury
Division of Hazard Analysis
Directorate for Epidemiology
U.S. Consumer Product Safety Commission
Bethesda, MD 20814
July 2011

* This analysis was prepared by the CPSC staff. It has not been reviewed or approved by, and may not necessarily reflect the views of, the Commission.

Executive Summary

This report presents estimates of consumer product-related fire losses that occurred in U.S. residential structure fires attended by the fire service. The estimates were derived from data for 2006 through 2008, provided by the U.S. Fire Administration's (USFA) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA) Survey of Fire Departments for U.S. Fire Experience.

The fire and fire loss estimates presented in this report pertain to unintentional residential structure fires and civilian casualties. These estimates show that there were:

- 390,900 fires, 2,280 deaths, 12,070 injuries, and $6.30 billion in property loss in 2006;
- 389,200 fires, 2,490 deaths, 12,910 injuries, and $6.77 billion in property loss in 2007;
- 378,800 fires, 2,390 deaths, 12,610 injuries, and $7.69 billion in property loss in 2008; and
- an estimated annual average of 386,300 fires, 2,390 deaths, 12,530 injuries, and $6.92 billion in property loss over the three year period 2006–2008.

Consumer products involved in fires can be categorized as sources of ignition or as the materials first ignited. As sources of ignition, they can be small sources like candles or large sources like ranges, which are usually categorized as the equipment involved in ignition. Because the fire losses are derived separately for sources of ignition and materials first ignited, estimates presented in this report overlap in some cases.

For 2006 through 2008, the relative ranking of the greatest contributors remained largely unchanged from that reported for 2005–2007. An exception is that the annual average electrical distribution fire death estimate is just as high (150) as the cooking equipment fire death estimate for 2006–2008. In previous years the estimated annual average of cooking equipment deaths had been higher than that for electrical distribution equipment. Tables 1a–1d show that:

- Cooking equipment accounted for the largest percentage of fires. An estimated annual average of 149,500 cooking equipment-related fires during 2006–2008 accounted for 38.7 percent of the average annual estimate of total residential fires for the same period. The corresponding death estimate is an annual average of 150 deaths, which is 6.1 percent of the average annual estimate of total residential fire deaths. The annual average number of cooking fire injuries for 2006–2008 was estimated to be 3,400, which represents 27.1 percent of the total estimated annual average number of injuries for the same time period. Much of these losses were associated with range and oven fires.

- Heating and cooling equipment fires constituted the second largest share of total residential fires. The estimated annual average of 56,500 fires for 2006–2008 was 14.6 percent of the annual average estimate of total residential fires during the same period. The corresponding death estimate is an annual average of 220 deaths, which is 9.1 percent of the average annual estimated number of total residential fire deaths. The corresponding injuries for the three years averaged to an annual estimate of 1,070. This accounts for 8.5 percent of the annual average estimate of total injuries during 2006–2008.

- During 2006–2008, an estimated annual average of 12,300 fires was attributable to electrical distribution system components (*e.g.*, installed wiring, lighting). This corresponds to 3.2 percent of the estimated annual average number of total residential fires for the same time period. The annual average death estimate is 150 (6.2 percent of average annual estimated number of total residential fire deaths); while the injury estimates averaged 470, which is 3.8 percent of the estimated annual average of total residential fire injuries.

- By item first ignited, upholstered furniture ignition was involved in the greatest number of deaths. From 2006 through 2008, an estimated annual average of 510 deaths was associated with these fires. This constitutes 21.3 percent of the estimated annual average of total deaths associated with residential structure fires for the same period. On average, during 2006 to 2008, mattress or bedding ignitions accounted for an annual average of 350 deaths, which is 14.5 percent of the average annual estimated number of total residential fire deaths.

- By heat source, smoking materials were the largest contributor to deaths, associated with an annual average of 600 deaths from 2006 to 2008. This accounts for 25.2 percent of the estimated annual average of total residential fire deaths. The estimated annual average number of deaths from candle fires is 130, which represents 5.3 percent of the average annual estimated total number of residential fire deaths during 2006 to 2008. There were an estimated 50 deaths from lighter fires(2.2 percent of the estimated annual average of the total number of residential fire deaths); while, on average, matches were responsible for 40 deaths, or 1.5 percent of total deaths annually.

  Beginning with 1999, the NFIRS system underwent some major changes. As such, staff at the U.S. Consumer Product Safety Commission (CPSC) recommends against comparing fire loss estimates from before 1999, with those after 1999. Rather, the estimates in this report are best viewed as reflecting estimates from a substantially different reporting system because of the inherent system design differences.

Introduction

The fire loss estimates presented in this report are based on the National Fire Protection Association's (NFPA) national fire loss estimates[1] and the U.S. Fire Administration's (USFA) National Fire Incident Reporting System (NFIRS) data. The NFPA makes national estimates of fires, deaths, injuries, and property loss based on a probability sample survey of U.S. fire departments. The NFIRS is a compilation of voluntarily submitted fire incident reports by U.S. fire departments that are sent to the USFA. Not all the states reporting data include data from all fire departments in the state. Among the multitude of information collected, product-specific information, such as the equipment involved in the ignition of the fire, or the item that was first ignited in the fire, is available in NFIRS data. The NFIRS product-specific frequency counts are weighted up to the NFPA estimates for total U.S. fire losses, to arrive at the estimates that are presented in this report.

The estimated number of fires and fire loss estimates pertain only to fires in residential properties. These include single family and multifamily dwellings. Mobile and motor homes, while used as a structure and not in transit, are also included. Injury and death estimates pertain to civilian casualties only. The property losses include property and content losses, as estimated by fire departments. For convenience, they are referred to as "property losses" in this report.

The estimates for 2005 through 2007 were published in the August 2010 Residential Fire Loss Estimates report.[2] The estimates for 2006 and 2007 that are presented here remain unchanged from that earlier report. Annual average estimates generated from the most recent three years of data are presented in this report.

CPSC staff has been producing estimates of residential fires and related deaths, injuries, and property losses since the early 1980s. However, over the years, NFIRS has undergone major changes. This, in turn, has necessitated changes in the way CPSC analysts produce the product-specific estimates. A discussion of some of these changes follows.

Beginning with 1999 data, a major revision to the NFIRS data coding system, designated version 5.0, was implemented. In 1999, 5 percent of the residential fire data was coded by fire departments in the new NFIRS version 5.0; in 2000, 20 percent was coded in version 5.0. The proportion increased to 50 percent in 2001; 70 percent in 2002; 80 percent in 2003; 89 percent in 2004; 94 percent in 2005; 95 percent in 2006; 97 percent in 2007; and 99 percent in 2008. However, from 1999 onwards, the NFIRS data received from the USFA is entirely in version 5.0 format. Data were converted from NFIRS 4.1 to NFIRS 5.0 by computer programs. Since version 5.0 has many more data fields than version 4.1, and some of the new data fields have many more choices than in 4.1, the converted data are not likely to be the same as data originally coded in version 5.0.

[1] M.J. Karter, "Fire Loss in the U.S. During 2006," National Fire Protection Association (NFPA), September 2007; M.J. Karter, "Fire Loss in the U.S. During 2007," National Fire Protection Association (NFPA), August 2008; M.J. Karter, "Fire Loss in the U.S. During 2008," National Fire Protection Association (NFPA), August 2009.
[2] D. Miller, R. Chowdhury, M. Greene, "2005–2007 Residential Fire Loss Estimates," CPSC, August 2010.

As mentioned above, in 2006, 2007, and 2008, 95 percent, 97 percent, and 99 percent of the residential fire data, respectively, were originally coded in version 5.0. Given this large proportion of version 5.0 data, CPSC analysts excluded reports originally coded in version 4.1 and produced these estimates using the version 5.0 data only. The NFIRS product-specific frequency counts based only on this component of the data were weighted up to the 2006, 2007, and 2008 NFPA estimates for total U.S. fire losses, to arrive at the product-specific estimates presented in this report.

Beginning with version 5.0, NFIRS introduced newly created codes to identify confined fires (those that do not spread beyond the originating item). To encourage the reporting of these fires, NFIRS requires only limited information on these fires. From 1999 forward, as the use of version 5.0 increased, an increasingly larger number of confined fires were reported. In 1999, about 2 percent of residential fires were reported as confined; by 2008, about 46 percent of fires reported to NFIRS were confined fires.

Because it is not required information, in most confined fire cases, it is not possible by looking at the codes to determine the type of equipment involved. For example, when a fire is identified as a "confined cooking fire" in NFIRS, it is not possible to separate ranges from other cooking equipment. As a result, confined cooking fire losses are only included as part of the "cooking equipment" totals and cannot be broken down further into ranges or other cooking equipment (*e.g.*, toasters, microwaves), or by the power source. However, because ranges certainly are involved in some confined fires, evaluation of the range-related hazard needs to take into account that some cooking fires that are included only in the totals are likely to have been range fires.

The changes cited above, and the gradual implementation of these changes in the NFIRS data system, have affected the estimates since 1999 considerably. CPSC staff strongly discourages comparison of pre-1999 estimates with estimates from later years.

Results

In keeping with reports from previous years, there are five main tables in this report. Each numbered table (1–5) has four tables associated with it; Table "a" presents the fire estimates; "b" presents the death estimates; "c" presents the injury estimates; and "d" presents the property loss estimates. As in previous years, only selected product-specific estimates are included in these tables. Therefore, the detail may not add to the totals that appear in the headings. All of the product categories in the tables, with the exception of smoking materials, contain products within the jurisdiction of the CPSC. Intentionally set fires and their associated losses, which include the deliberate misuses of heat sources, or fires of an incendiary nature, are excluded from the estimates.

In Tables 1, 3, 4, and 5, equipment codes were used to identify the products; while in Table 2, either the heat source or the item first ignited was the primary means of identifying the product. As such, some estimates provided in the different sections of the tables overlap. For example, in Table 2, estimates of fires involving cigarette ignition of upholstered furniture are included in the estimates for cigarettes (by heat source) as well as in the estimates for upholstered furniture-smoking material ignition (by item first ignited). Additional details about the estimates and the data system are included in the Methodology section of this report.

TABLE 1a
ESTIMATED RESIDENTIAL STRUCTURE FIRES
SELECTED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**390,900**	**389,200**	**378,800**	**386,300**
Total Heating and Cooling Equipment[1]	**55,500**	**57,700**	**56,300**	**56,500**
Local Fixed Heater	4,400	4,500	4,900	4,600
Portable Heater	1,400	1,900	1,900	1,700
Central Heating	1,000	1,100	1,200	1,100
Fireplace, Chimney, Chimney Connector[1]	26,400	27,000	27,200	26,900
Water Heater	2,500	2,700	2,300	2,500
Air Conditioning	1,200	1,300	1,000	1,200
Other[1]	18,700	19,100	17,800	18,500
Total Cooking Equipment[1]	**150,600**	**148,700**	**149,100**	**149,500**
Range/Oven	14,300	15,000	14,600	14,600
Gas	*2,700*	*2,600*	*2,300*	*2,500*
Electric	*11,500*	*12,400*	*12,300*	*12,100*
Other	*	*	*	*
All Other Cooking	5,500	5,800	5,500	5,600
Gas	*800*	*900*	*900*	*900*
Electric	*4,200*	*4,500*	*4,300*	*4,300*
Other	*500*	*400*	*300*	*400*
Total Electrical Distribution	**12,000**	**12,700**	**12,100**	**12,300**
Installed Wiring	4,600	5,200	5,100	5,000
Cord, Plug	1,400	1,400	1,300	1,400
Receptacle, Switch	1,400	1,500	1,400	1,400
Lighting	2,600	2,500	2,200	2,500
Other	2,000	2,000	2,100	2,000
Other Selected Equipment	**9,700**	**10,600**	**9,800**	**10,100**
Audio/Visual Equipment	700	500	600	600
Clothes Dryer	6,800	7,500	6,800	7,000
Washing Machine	300	400	300	300
Torch	600	600	500	600
Refrigerator/Freezer	700	900	900	800
Shop/Garden Tool	700	900	800	800

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Fire estimates are rounded to the nearest 100. Rounded estimates of fewer than 100 fires are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude intentionally set fires.

[1] There are confined fire estimates included in *Total Residential*, *Total Heating and Cooling Equipment*, *Fireplace, Chimney*, *Chimney Connector*, *Other*, and *Total Cooking Equipment* categories. These confined fire estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment and power source. See Table 6a on p. 31 for details.

TABLE 1b
ESTIMATED RESIDENTIAL STRUCTURE FIRE DEATHS
SELECTED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**2,280**	**2,490**	**2,390**	**2,390**
Total Heating and Cooling Equipment	**200**	**230**	**220**	**220**
Local Fixed Heater	80	100	60	80
Portable Heater	50	70	100	70
Central Heating	20	*	*	10
Fireplace, Chimney, Chimney Connector	*	20	10	10
Water Heater	20	10	10	10
Air Conditioning	*	*	*	*
Other[1]	30	20	30	30
Total Cooking Equipment[1]	**130**	**160**	**140**	**150**
Range/Oven	130	110	130	120
Gas	*50*	*40*	*40*	*40*
Electric	*80*	*70*	*90*	*80*
Other	*	*	*	*
All Other Cooking	10	50	10	20
Gas	*	*	*	*
Electric	*	*20*	*10*	*10*
Other	*	*30*	*	*10*
Total Electrical Distribution	**140**	**100**	**210**	**150**
Installed Wiring	50	50	120	70
Cord, Plug	50	30	30	40
Receptacle, Switch	*	*	10	*
Lighting	20	10	10	20
Other	10	*	40	20
Other Selected Equipment	*****	*****	**40**	**10**
Audio/Visual Equipment	*	*	*	*
Clothes Dryer	*	*	40	*
Washing Machine	*	*	*	*
Torch	*	*	*	*
Refrigerator / Freezer	*	*	*	*
Shop/Garden Tool	*	*	*	*

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Death estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude deaths from intentionally set fires.

[1] There were no NFIRS confined cooking fire deaths in 2006 or 2008, and a rounded estimate of fewer than 10 confined cooking fire deaths in 2007.

TABLE 1c
ESTIMATED RESIDENTIAL STRUCTURE FIRE INJURIES
SELECTED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**12,070**	**12,910**	**12,610**	**12,530**
Total Heating and Cooling Equipment[1]	**890**	**1,260**	**1,050**	**1,070**
Local Fixed Heater	230	320	360	300
Portable Heater	130	200	210	180
Central Heating	50	40	50	50
Fireplace, Chimney, Chimney Connector[1]	90	150	80	110
Water Heater	130	170	130	150
Air Conditioning	60	50	20	40
Other[1]	200	330	200	240
Total Cooking Equipment[1]	**3,120**	**3,520**	**3,560**	**3,400**
Range/Oven	1,260	1,480	1,410	1,390
Gas	*220*	*220*	*150*	*190*
Electric	*1,040*	*1,260*	*1,270*	*1,190*
Other	*10*	*	*	*
All Other Cooking	350	350	400	370
Gas	*60*	*30*	*70*	*50*
Electric	*270*	*290*	*310*	*290*
Other	*30*	*20*	*20*	*20*
Total Electrical Distribution	**430**	**570**	**420**	**470**
Installed Wiring	120	150	100	120
Cord, Plug	100	130	100	110
Receptacle, Switch	60	70	20	50
Lighting	90	180	130	130
Other	60	40	70	60
Other Selected Equipment	**310**	**530**	**330**	**390**
Audio/Visual Equipment	40	60	40	40
Clothes Dryer	170	300	230	230
Washing Machine	20	10	*	10
Torch	40	40	10	30
Refrigerator/Freezer	20	50	10	30
Shop/Garden Tool	20	60	40	40

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Injury estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude injuries from intentionally set fires.

[1] There are confined fire injury estimates included in *Total Residential*, *Total Heating and Cooling Equipment*, *Fireplace, Chimney, Chimney Connector, Other*, and *Total Cooking Equipment* categories. These confined fire injury estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment. See Table 6b on p. 32 for details.

TABLE 1d
ESTIMATED RESIDENTIAL STRUCTURE FIRE PROPERTY LOSS
(In Millions)
SELECTED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**$6,303.3**	**$6,771.5**	**$7,692.0**	**$6,922.3**
Total Heating and Cooling Equipment[1]	**$586.5**	**$548.9**	**$649.0**	**$594.8**
Local Fixed Heater	$147.6	$125.9	$148.3	$140.6
Portable Heater	$67.6	$87.6	$87.4	$80.8
Central Heating	$26.5	$24.9	$37.9	$29.8
Fireplace, Chimney, Chimney Connector[1]	$126.6	$110.3	$147.6	$128.2
Water Heater	$77.8	$51.3	$62.3	$63.8
Air Conditioning	$27.0	$30.9	$24.4	$27.4
Other[1]	$113.3	$118.0	$141.3	$124.2
Total Cooking Equipment[1]	**$372.4**	**$434.8**	**$483.9**	**$430.4**
Range/Oven	$225.1	$276.6	$300.8	$267.5
Gas	*$39.9*	*$57.3*	*$45.2*	*$47.5*
Electric	*$183.8*	*$219.0*	*$255.2*	*$219.3*
Other	*$1.4*	*$0.2*	*$0.5*	*$0.7*
All Other Cooking	$123.6	$136.9	$157.5	$139.3
Gas	*$22.4*	*$24.5*	*$41.1*	*$29.3*
Electric	*$89.1*	*$103.9*	*$104.0*	*$99.0*
Other	*$12.0*	*$8.5*	*$12.4*	*$11.0*
Total Electrical Distribution	**$388.6**	**$425.5**	**$476.5**	**$430.2**
Installed Wiring	$145.3	$175.7	$210.5	$177.1
Cord, Plug	$44.0	$44.7	$50.2	$46.3
Receptacle, Switch	$52.6	$36.4	$41.2	$43.4
Lighting	$82.3	$95.6	$85.0	$87.6
Other	$64.5	$73.1	$89.5	$75.7
Other Selected Equipment	**$181.5**	**$281.7**	**$201.8**	**$221.7**
Audio/Visual Equipment	$19.6	$14.5	$19.5	$17.9
Clothes Dryer	$82.8	$101.0	$91.5	$91.8
Washing Machine	$3.1	$2.0	$2.9	$2.7
Torch	$23.4	$113.9	$30.8	$56.0
Refrigerator/Freezer	$21.1	$21.0	$24.6	$22.3
Shop/Garden Tool	$31.9	$29.3	$32.4	$31.2

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Property loss estimates are rounded to the nearest tenth of a million dollars. Subtotals do not necessarily add to heading totals. Estimates exclude property loss from intentionally set fires.

[1] There are confined fire property loss estimates included in *Total Residential, Total Heating and Cooling Equipment, Fireplace, Chimney, Chimney Connector, Other,* and *Total Cooking Equipment* categories. These confined fire property loss estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment. See Table 6c on p. 32 for details.

TABLE 2a
ESTIMATED RESIDENTIAL STRUCTURE FIRES
SELECTED PRODUCTS, 2006–2008

Product	2006	2007	2008	2006–2008 Average
Total Residential[1]	**390,900**	**389,200**	**378,800**	**386,300**
By Heat Source				
Cigarette, Other Tobacco Products	**12,200**	**11,600**	**11,100**	**11,600**
Match	**1,000**	**1,000**	**700**	**900**
Lighter	**2,100**	**2,100**	**1,800**	**2,000**
Candle	**10,800**	**9,700**	**8,800**	**9,700**
By Item First Ignited				
Upholstered Furniture	**6,900**	**6,600**	**6,000**	**6,500**
Smoking Material Ignition	1,900	1,700	1,600	1,800
Open-Flame Ignition	1,100	1,000	800	1,000
Other	3,900	3,800	3,600	3,800
Mattress, Bedding	**10,000**	**9,500**	**8,900**	**9,500**
Smoking Material Ignition	2,200	1,900	1,900	2,000
Open-Flame Ignition	2,400	2,200	1,900	2,100
Other	5,400	5,400	5,100	5,300
Other Materials				
Cooking Materials[1]	154,000	150,900	150,800	151,900
Electric Cable Insulation	17,900	17,800	17,200	17,600
Interior Wall Covering	7,800	8,100	7,800	7,900
Wearing Apparel-Worn	300	300	300	300
Wearing Apparel-Not Worn	6,800	6,600	5,900	6,400
Floor Covering	4,600	5,000	4,700	4,800
Curtains, Drapes	2,100	2,000	1,800	2,000
Magazines, Newspaper	2,300	2,000	2,000	2,100
Thermal Insulation	6,100	6,600	6,500	6,400
Cabinet, Desk	5,300	5,400	4,900	5,200
Trash, Rubbish[1]	23,100	21,200	19,600	21,300
Toy, Game	200	200	200	200
Box, Carton, Bag, Basket, Barrel	2,800	2,900	2,700	2,800

Source: U. S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Fire estimates are rounded to the nearest 100. Subtotals do not necessarily add up to heading totals.
Estimates exclude intentionally set fires.

[1] There are confined fire estimates included in *Total Residential*, *Cooking Materials*, and *Trash, Rubbish* categories. Estimates for confined cooking fires are included in the *Cooking Materials* fire losses because cooking materials are most likely the item first ignited. See Table 6a on p. 31 for details.

TABLE 2b
ESTIMATED RESIDENTIAL STRUCTURE FIRE DEATHS
SELECTED PRODUCTS, 2006–2008

Product	2006	2007	2008	2006–2008 Average
Total Residential[1]	**2,280**	**2,490**	**2,390**	**2,390**
By Heat Source				
Cigarette, Other Tobacco Products	**600**	**660**	**550**	**600**
Match	**40**	**40**	**30**	**40**
Lighter	**70**	**60**	**30**	**50**
Candle	**120**	**160**	**100**	**130**
By Item First Ignited				
Upholstered Furniture	**480**	**540**	**510**	**510**
Smoking Material Ignition	290	320	210	270
Open-Flame Ignition	20	50	50	40
Other	170	170	250	200
Mattress, Bedding	**370**	**360**	**310**	**350**
Smoking Material Ignition	160	190	160	170
Open-Flame Ignition	60	30	20	40
Other	150	140	130	140
Other Materials				
Cooking Materials[1]	110	140	90	110
Electric Cable Insulation	80	100	70	80
Interior Wall Covering	80	60	90	80
Wearing Apparel-Worn	90	100	90	90
Wearing Apparel-Not Worn	40	10	30	30
Floor Covering	120	80	160	120
Curtains, Drapes	10	30	20	20
Magazines, Newspaper	50	50	30	40
Thermal Insulation	*	*	20	10
Cabinet, Desk	40	40	70	50
Trash, Rubbish	50	70	50	60
Toy, Game	*	*	*	*
Box, Carton, Bag, Basket, Barrel	20	10	*	10

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Death estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude deaths from intentionally set fires.

[1] There were no NFIRS confined cooking fire deaths in 2006 or 2008, and a rounded estimate of fewer than 10 confined cooking fire deaths in 2007.

TABLE 2c
ESTIMATED RESIDENTIAL STRUCTURE FIRE INJURIES
SELECTED PRODUCTS, 2006–2008

Product	2006	2007	2008	2006–2008 Average
Total Residential[1]	**12,070**	**12,910**	**12,610**	**12,530**
By Heat Source				
Cigarette, Other Tobacco Products	**1,240**	**1,080**	**1,120**	**1,150**
Match	**150**	**160**	**100**	**130**
Lighter	**340**	**380**	**380**	**370**
Candle	**1,040**	**900**	**790**	**910**
By Item First Ignited				
Upholstered Furniture	**860**	**780**	**940**	**860**
Smoking Material Ignition	320	300	320	310
Open-Flame Ignition	190	170	220	190
Other	340	310	400	350
Mattress, Bedding	**1,250**	**1,200**	**1,140**	**1,200**
Smoking Material Ignition	400	300	280	330
Open-Flame Ignition	380	330	310	340
Other	480	570	550	530
Other Materials				
Cooking Materials[1]	3,640	3,930	4,000	3,860
Electric Cable Insulation	490	470	480	480
Interior Wall Covering	280	260	340	300
Wearing Apparel-Worn	100	120	120	110
Wearing Apparel-Not Worn	360	350	360	350
Floor Covering	230	300	260	260
Curtains, Drapes	170	200	140	170
Magazines, Newspaper	180	110	190	160
Thermal Insulation	100	120	70	100
Cabinet, Desk	270	350	330	320
Trash, Rubbish[1]	250	270	310	280
Toy, Game	30	10	20	20
Box, Carton, Bag, Basket, Barrel	130	110	150	130

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Injury estimates are rounded to the nearest 10. Subtotals do not necessarily add to heading totals. Estimates exclude injuries from intentionally set fires.

[1]There are confined fire injury estimates included in *Total Residential, Cooking Materials,* and *Trash, Rubbish* categories. Estimates for confined cooking fire injuries are included in the *Cooking Materials* fire losses because cooking materials are most likely the item first ignited. See Table 6b on p. 32 for details.

TABLE 2d
ESTIMATED RESIDENTIAL STRUCTURE FIRE PROPERTY LOSS (In Millions)
SELECTED PRODUCTS, 2006–2008

Product	2006	2007	2008	2006–2008 Average
Total Residential[1]	**$6,303.3**	**$6,771.5**	**$7,692.0**	**$6,922.3**
By Heat Source				
Cigarette, Other Tobacco Products	**$408.5**	**$433.2**	**$435.3**	**$425.7**
Match	**$34.6**	**$31.3**	**$30.4**	**$32.1**
Lighter	**$61.3**	**$64.9**	**$82.3**	**$69.5**
Candle	**$360.3**	**$367.2**	**$352.6**	**$360.0**
By Item First Ignited				
Upholstered Furniture	**$342.0**	**$334.3**	**$352.0**	**$342.8**
Smoking Material Ignition	$111.3	$103.8	$87.2	$100.8
Open-Flame Ignition	$64.5	$47.7	$61.3	$57.8
Other	$166.1	$182.8	$203.5	$184.2
Mattress, Bedding	**$343.4**	**$339.9**	**$324.5**	**$335.9**
Smoking Material Ignition	$61.5	$53.9	$48.4	$54.6
Open-Flame Ignition	$86.5	$79.8	$96.2	$87.5
Other	$195.3	$206.3	$179.9	$193.8
Other Materials				
Cooking Materials[1]	$409.2	$418.8	$511.6	$446.5
Electric Cable Insulation	$385.1	$407.1	$522.3	$438.2
Interior Wall Covering	$264.1	$316.5	$333.8	$304.8
Wearing Apparel-Worn	$7.3	$6.9	$5.7	$6.6
Wearing Apparel-Not Worn	$144.3	$132.0	$169.5	$148.6
Floor Covering	$151.5	$164.3	$167.9	$161.3
Curtains, Drapes	$52.7	$63.0	$45.9	$53.9
Magazines, Newspaper	$73.7	$62.5	$75.4	$70.5
Thermal Insulation	$134.8	$240.0	$178.8	$184.5
Cabinet, Desk	$188.6	$181.0	$190.4	$186.7
Trash, Rubbish[1]	$148.9	$112.5	$136.4	$132.6
Toy, Game	$1.3	$6.0	$8.2	$5.1
Box, Carton, Bag, Basket, Barrel	$105.8	$110.2	$157.9	$124.6

Source: U. S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Property loss estimates are rounded to the nearest tenth of a million dollars. Subtotals do not necessarily add to heading totals. Estimates exclude property loss from intentionally set fires.

[1] There are confined fire property loss estimates included in *Total Residential, Cooking Materials,* and *Trash, Rubbish* categories. Estimates for confined cooking fire property losses are included in the *Cooking Materials* fire losses because cooking materials are most likely the item first ignited. See Table 6c on p. 32 for details.

TABLE 3a
ESTIMATED RESIDENTIAL STRUCTURE FIRES
HEATING AND COOLING EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**390,900**	**389,200**	**378,800**	**386,300**
Total Heating and Cooling Equipment[1]	**55,500**	**57,700**	**56,300**	**56,500**
Solid Fuel	**2,500**	**2,800**	**3,000**	**2,800**
Fixed Heater	600	700	800	700
Portable Heater	*	*	*	*
Fireplace, Chimney, Chimney Connector	1,800	2,100	2,100	2,000
Central Heating	*	*	*	*
Water Heater	*	*	*	*
Other	*	*	*	*
Gas-Fired	**3,900**	**3,900**	**3,600**	**3,800**
Fixed Heater	1,100	1,100	1,100	1,100
Portable Heater	200	200	100	200
Fireplace, Chimney, Chimney Connector	200	200	200	200
Central Heating	500	500	500	500
Water Heater	1,700	1,600	1,300	1,500
Fixed, Central Air Conditioning	*	*	*	*
Other	200	300	300	300
Electric	**9,600**	**11,100**	**10,500**	**10,400**
Fixed Heater	2,500	2,600	2,900	2,700
Portable Heater	1,000	1,400	1,500	1,300
Central Heating	400	400	500	400
Water Heater	800	1,100	900	900
Fixed, Central Air Conditioning	800	800	700	800
Portable Air Conditioner	400	500	300	400
Other	3,700	4,200	3,700	3,900
Liquid Fuel	**600**	**600**	**600**	**600**
Fixed Heater	100	100	100	100
Portable Heater	300	300	300	300
Fireplace, Chimney, Chimney Connector	*	*	*	*
Central Heating	100	100	200	100
Water Heater	*	*	*	*
Other	100	100	*	100
All Other Fuel	**200**	**200**	**100**	**200**

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Fire estimates are rounded to the nearest 100. Rounded estimates less than 100 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude intentionally set fires.

[1] There are confined fire estimates included in *Total Residential*, and *Total Heating and Cooling Equipment* categories. These confined fire estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6a on p. 31 for details.

TABLE 3b
ESTIMATED RESIDENTIAL STRUCTURE FIRE DEATHS
HEATING AND COOLING EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**2,280**	**2,490**	**2,390**	**2,390**
Total Heating and Cooling Equipment	**200**	**230**	**220**	**220**
Solid Fuel	**30**	**60**	**50**	**40**
Fixed Heater	20	30	40	30
Portable Heater	*	*	*	*
Fireplace, Chimney, Chimney Connector	*	20	10	10
Central Heating	*	*	*	*
Water Heater	*	*	*	*
Other	*	*	*	*
Gas-Fired	**70**	**80**	**30**	**60**
Fixed Heater	30	40	20	30
Portable Heater	*	20	*	10
Fireplace, Chimney, Chimney Connector	*	*	*	*
Central Heating	10	*	*	*
Water Heater	20	10	10	10
Fixed, Central Air Conditioning	*	*	*	*
Other	*	*	*	*
Electric	**80**	**90**	**110**	**90**
Fixed Heater	30	30	10	20
Portable Heater	30	40	80	50
Central Heating	10	*	*	*
Water Heater	*	*	*	*
Fixed, Central Air Conditioning	*	*	*	*
Portable Air Conditioner	*	*	*	*
Other	20	10	30	20
Liquid Fuel	**20**	**10**	**30**	**20**
Fixed Heater	*	*	*	*
Portable Heater	20	10	20	20
Fireplace, Chimney, Chimney Connector	*	*	*	*
Central Heating	*	*	*	*
Water Heater	*	*	*	*
Other	*	*	*	*
All Other Fuel	*	*	10	*

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Death estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude deaths from intentionally set fires.

[1] There were no NFIRS confined cooking fire deaths in 2006 or 2008, and a rounded estimate of fewer than 10 confined cooking fire deaths in 2007.

TABLE 3c
ESTIMATED RESIDENTIAL STRUCTURE FIRE INJURIES
HEATING AND COOLING EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**12,070**	**12,910**	**12,610**	**12,530**
Total Heating and Cooling Equipment[1]	**890**	**1,260**	**1,050**	**1,070**
Solid Fuel	**80**	**110**	**60**	**80**
Fixed Heater	20	30	20	20
Portable Heater	*	*	*	*
Fireplace, Chimney, Chimney Connector	50	70	40	50
Central Heating	*	*	*	*
Water Heater	10	*	*	*
Other	*	*	*	*
Gas-Fired	**250**	**270**	**280**	**270**
Fixed Heater	90	50	100	80
Portable Heater	10	30	30	20
Fireplace, Chimney, Chimney Connector	*	*	*	*
Central Heating	30	20	40	30
Water Heater	110	140	120	120
Fixed, Central Air Conditioning	*	*	*	*
Other	10	20	*	10
Electric	**390**	**690**	**590**	**550**
Fixed Heater	120	220	230	190
Portable Heater	70	160	170	130
Central Heating	10	10	10	10
Water Heater	20	30	10	20
Fixed, Central Air Conditioning	30	50	10	30
Portable Air Conditioner	20	10	10	10
Other	120	210	150	160
Liquid Fuel	**60**	**40**	**30**	**40**
Fixed Heater	*	*	10	10
Portable Heater	50	10	20	30
Fireplace, Chimney, Chimney Connector	*	10	*	*
Central Heating	10	10	*	*
Water Heater	*	*	*	*
Other	*	*	*	*
All Other Fuel	*****	**10**	*****	*****

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Injury estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude injuries from intentionally set fires.

[1] There are confined fire injury estimates included in *Total Residential*, and *Total Heating and Cooling Equipment* categories. These confined fire injury estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6b on p. 32 for details.

TABLE 3d
ESTIMATED RESIDENTIAL STRUCTURE FIRE PROPERTY LOSS (In Millions)
HEATING AND COOLING EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**$6,303.3**	**$6,771.5**	**$7,692.0**	**$6,922.3**
Total Heating and Cooling Equipment[1]	**$586.5**	**$548.9**	**$649.0**	**$594.8**
Solid Fuel	**$110.7**	**$121.7**	**$165.0**	**$132.5**
Fixed Heater	$21.6	$31.1	$34.8	$29.2
Portable Heater	$1.2	$1.3	$0.3	$0.9
Fireplace, Chimney, Chimney Connector	$85.1	$88.3	$125.5	$99.6
Central Heating	$2.3	*	$2.4	$1.6
Water Heater	*	*	*	*
Other	$0.5	$1.0	$2.1	$1.2
Gas-Fired	**$173.0**	**$114.5**	**$126.4**	**$138.0**
Fixed Heater	$34.0	$31.0	$30.0	$31.6
Portable Heater	$12.7	$5.3	$7.3	$8.4
Fireplace, Chimney, Chimney Connector	$34.0	$13.0	$14.3	$20.4
Central Heating	$13.7	$13.0	$18.5	$15.1
Water Heater	$70.3	$40.0	$49.5	$53.3
Fixed, Central Air Conditioning	*	*	*	*
Other	$8.4	$12.2	$6.8	$9.1
Electric	**$268.1**	**$278.0**	**$321.6**	**$289.2**
Fixed Heater	$86.9	$58.7	$75.5	$73.7
Portable Heater	$43.2	$68.8	$70.6	$60.9
Central Heating	$4.9	$9.8	$12.2	$8.9
Water Heater	$7.4	$11.1	$12.7	$10.4
Fixed, Central Air Conditioning	$19.8	$20.2	$16.4	$18.8
Portable Air Conditioner	$7.2	$10.7	$7.9	$8.6
Other	$98.6	$98.8	$126.2	$107.9
Liquid Fuel	**$25.1**	**$21.5**	**$20.3**	**$22.3**
Fixed Heater	$4.4	$5.0	$5.2	$4.9
Portable Heater	$10.4	$12.1	$8.3	$10.3
Fireplace, Chimney, Chimney Connector	$1.6	$1.0	$0.5	$1.0
Central Heating	$5.6	$2.2	$4.8	$4.2
Water Heater	*	*	$0.1	*
Other	$3.0	$1.3	$1.4	$1.9
All Other Fuel	**$2.7**	**$5.8**	**$6.5**	**$5.0**

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Property loss estimates are rounded to the nearest tenth of a million dollars. Rounded estimates less than $0.1m are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude property loss from intentionally set fires.

[1] There are confined fire property loss estimates included in *Total Residential*, and *Total Heating and Cooling Equipment* categories. These confined fire property loss estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6c on p. 32 for details.

TABLE 4a
ESTIMATED RESIDENTIAL STRUCTURE FIRES
SELECTED ELECTRICAL EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**390,900**	**389,200**	**378,800**	**386,300**
Total Electrical	**48,000**	**52,200**	**50,100**	**50,100**
Electric Heating and Cooling	**9,600**	**11,100**	**10,500**	**10,400**
Central Heating	400	400	500	400
Local Fixed Heater	2,500	2,600	2,900	2,700
Portable Heater	1,000	1,400	1,500	1,300
Water Heater	800	1,100	900	900
Fixed, Central Air Conditioning	800	800	700	800
Portable Air Conditioner	400	500	300	400
Other	3,700	4,200	3,700	3,900
Electric Cooking Equipment	**15,700**	**17,000**	**16,600**	**16,400**
Range-/-Oven	11,500	12,400	12,300	12,100
Range/Oven Hood	200	200	200	200
Deep Fat Fryer	100	100	100	100
Grill	*	*	*	*
Small Heat-Producing Appliance	1,000	900	900	900
Other	3,000	3,300	3,100	3,100
Electrical Distribution	**12,000**	**12,700**	**12,100**	**12,300**
Installed Wiring	4,600	5,200	5,100	5,000
Light Fixture	1,600	1,500	1,400	1,500
Receptacle, Switch	1,400	1,500	1,400	1,400
Cord, Plug	1,400	1,400	1,300	1,400
Lamp, Light Bulb	1,000	1,000	800	900
Panel Board	600	700	700	700
Meter	300	300	300	300
Transformer	100	100	100	100
Other	1,000	900	1,000	1,000
Other Selected Electrical Appliances	**7,000**	**7,600**	**7,200**	**7,300**
Clothes Dryer	5,100	5,500	5,100	5,200
Audio/Visual Equipment	600	500	600	600
Washing Machine	300	400	300	300
Refrigerator/Freezer	600	800	800	800
Shop/Garden Tools	200	300	300	200
Torch	100	100	100	100

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Fire estimates are rounded to the nearest 100. Rounded estimates less than 100 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude intentionally set fires.

[1] There are confined fire estimates included in *Total Residential* category. These confined fire estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6a on p. 31 for details.

TABLE 4b
ESTIMATED RESIDENTIAL STRUCTURE FIRE DEATHS
SELECTED ELECTRICAL EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**2,280**	**2,490**	**2,390**	**2,390**
Total Electrical	**370**	**320**	**510**	**400**
Electric Heating and Cooling	**80**	**90**	**110**	**90**
Central Heating	10	*	*	*
Local Fixed Heater	30	30	10	20
Portable Heater	30	40	80	50
Water Heater	*	*	*	*
Fixed, Central Air Conditioning	*	*	*	*
Portable Air Conditioner	*	*	*	*
Other	20	10	30	20
Electric Cooking Equipment	**80**	**90**	**110**	**90**
Range/Oven	80	70	90	80
Range/Oven Hood	*	*	*	*
Deep Fat Fryer	*	*	*	*
Grill	*	*	*	*
Small Heat-Producing Appliance	*	*	*	*
Other	*	20	10	10
Electrical Distribution	**140**	**100**	**210**	**150**
Installed Wiring	50	50	120	70
Light Fixture	10	*	*	10
Receptacle, Switch	*	*	10	*
Cord, Plug	50	30	30	40
Lamp, Light Bulb	10	10	*	10
Panel Board	10	*	10	10
Meter	*	*	*	*
Transformer	*	*	*	*
Other	10	*	30	10
Other Selected Electrical Appliances	*****	*****	**30**	**10**
Clothes Dryer	*	*	30	10
Audio/Visual Equipment	*	*	*	*
Washing Machine	*	*	*	*
Refrigerator/Freezer	*	*	*	*
Shop/Garden Tool	*	*	*	*
Torch	*	*	*	*

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Death estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude deaths from intentionally set fires.

[1] There were no NFIRS confined cooking fire deaths in 2006 or 2008, and a rounded estimate of fewer than 10 confined cooking fire deaths in 2007.

TABLE 4c
ESTIMATED RESIDENTIAL STRUCTURE FIRE INJURIES
SELECTED ELECTRICAL EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**12,070**	**12,910**	**12,610**	**12,530**
Total Electrical	**2,550**	**3,390**	**3,030**	**2,990**
Electric Heating and Cooling	**390**	**690**	**590**	**550**
Central Heating	10	10	10	10
Local Fixed Heater	120	220	230	190
Portable Heater	70	160	170	130
Water Heater	20	30	10	20
Fixed, Central Air Conditioning	30	50	10	30
Portable Air Conditioner	20	10	10	10
Other	120	210	150	160
Electric Cooking Equipment	**1,310**	**1,550**	**1,580**	**1,480**
Range/Oven	1,040	1,260	1,270	1,190
Range/Oven Hood	*	10	*	10
Deep Fat Fryer	10	*	10	10
Grill	*	*	*	*
Small Heat-Producing Appliance	80	80	80	80
Other	180	190	220	200
Electrical Distribution	**430**	**570**	**420**	**470**
Installed Wiring	120	150	100	120
Light Fixture	40	100	70	70
Receptacle, Switch	60	70	20	50
Cord, Plug	100	130	100	110
Lamp, Light Bulb	50	80	60	60
Panel Board	10	20	20	20
Meter	*	*	*	*
Transformer	*	*	*	*
Other	50	10	50	30
Other Selected Electrical Appliances	**200**	**390**	**250**	**280**
Clothes Dryer	120	210	170	170
Audio/Visual Equipment	30	60	40	40
Washing Machine	20	10	*	10
Refrigerator/Freezer	20	50	10	30
Shop/Garden Tool	10	30	20	20
Torch	10	20	*	10

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Injury estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude injuries from intentionally set fires.

[1] There are confined fire injury estimates included in *Total Residential* category. These confined fire injury estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6b on p. 32 for details.

TABLE 4d
ESTIMATED RESIDENTIAL STRUCTURE FIRE PROPERTY LOSS (In Millions)
SELECTED ELECTRICAL EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**$6,303.3**	**$6,771.5**	**$7,692.0**	**$6,922.3**
Total Electrical	**$1,174.6**	**$1,312.3**	**$1,463.1**	**$1,316.7**
Electric Heating and Cooling	**$268.1**	**$278.0**	**$321.6**	**$289.2**
Central Heating	$4.9	$9.8	$12.2	$8.9
Local Fixed Heater	$86.9	$58.7	$75.5	$73.7
Portable Heater	$43.2	$68.8	$70.6	$60.9
Water Heater	$7.4	$11.1	$12.7	$10.4
Fixed, Central Air Conditioning	$19.8	$20.2	$16.4	$18.8
Portable Air Conditioner	$7.2	$10.7	$7.9	$8.6
Other	$98.6	$98.8	$126.2	$107.9
Electric Cooking Equipment	**$272.9**	**$323.0**	**$359.2**	**$318.3**
Range/Oven	$183.8	$219.0	$255.2	$219.3
Range/Oven Hood	$2.7	$2.2	$3.0	$2.7
Deep Fat Fryer	$2.2	$2.6	$3.5	$2.8
Grill	$0.1	$0.3	*	$0.1
Small Heat-Producing Appliance	$26.3	$20.8	$20.2	$22.5
Other	$57.7	$78.0	$77.2	$71.0
Electrical Distribution	**$388.6**	**$425.5**	**$476.5**	**$430.2**
Installed Wiring	$145.3	$175.7	$210.5	$177.1
Light Fixture	$51.6	$59.0	$61.6	$57. 4
Receptacle, Switch	$52.6	$36.4	$41.2	$43.4
Cord, Plug	$44.0	$44.7	$50.2	$46.3
Lamp, Light Bulb	$30.7	$36.6	$23.4	$30.2
Panel Board	$10.4	$15.5	$30.3	$18.7
Meter	$3.9	$9.4	$5.7	$6.3
Transformer	$6.7	$9.6	$4.4	$6.9
Other	$43.5	$38.6	$49.1	$43.7
Other Selected Electrical Appliances	**$116.7**	**$133.0**	**$132.3**	**$127.3**
Clothes Dryer	$63.2	$83.4	$72.2	$72.9
Audio/Visual Equipment	$19.5	$14.5	$19.5	$17.9
Washing Machine	$3.1	$2.0	$2.9	$2.7
Refrigerator/Freezer	$20.8	$20.8	$24.5	$22.0
Shop/Garden Tool	$2.4	$9.5	$6.9	$6.3
Torch	$7.7	$2.8	$6.2	$5.5

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Estimates are rounded to the $0.1m. Rounded estimates less than $0.1m are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude property loss from intentionally set fires.

[1] There are confined fire property loss estimates included in *Total Residential* category. These confined fire property loss estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6c on p. 32 for details.

TABLE 5a
ESTIMATED RESIDENTIAL STRUCTURE FIRES
SELECTED GAS-FIRED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**390,900**	**389,200**	**378,800**	**386,300**
Total Gas-Fired Equipment	**10,300**	**10,700**	**9,700**	**10,200**
Gas Heating Equipment	**3,900**	**3,900**	**3,600**	**3,800**
Fixed Heater	1,100	1,100	1,100	1,100
Portable Heater	200	200	100	200
Central Heating	500	500	500	500
Fireplace, Chimney, Connector	200	200	200	200
Water Heater	1,700	1,600	1,300	1,500
Fixed, Central Air Conditioning	*	*	*	*
Other	200	300	300	300
Gas Cooking Equipment	**3,500**	**3,500**	**3,200**	**3,400**
Range/Oven	2,700	2,600	2,300	2,500
Open Gas Grill	400	400	500	400
Other	500	500	500	500
Other Selected Gas Equipment	**2,500**	**2,800**	**2,500**	**2,600**
Clothes Dryer	1,700	1,900	1,700	1,800
Torch	500	400	400	400
Shop/Garden Tool	400	500	400	400

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Fire estimates are rounded to the nearest 100. Rounded estimates less than 100 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude losses from intentionally set fires.

[1] There are confined fire estimates included in *Total Residential* category. These confined fire estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6a on p. 31 for details.

TABLE 5b
ESTIMATED RESIDENTIAL STRUCTURE FIRE DEATHS
SELECTED GAS-FIRED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**2,280**	**2,490**	**2,390**	**2,390**
Total Gas-Fired Equipment	**120**	**120**	**70**	**110**
Gas Heating Equipment	**70**	**80**	**30**	**60**
Fixed Heater	30	40	20	30
Portable Heater	*	20	*	10
Central Heating	10	*	*	*
Fireplace, Chimney, Connector	*	*	*	*
Water Heater	20	10	10	10
Fixed, Central Air Conditioning	*	*	*	*
Other	*	*	*	*
Gas Cooking Equipment	**50**	**40**	**40**	**40**
Range/Oven	50	40	40	40
Open Gas Grill	*	*	*	*
Other	*	*	*	*
Other Selected Gas Equipment	*****	*****	*****	*****
Clothes Dryer	*	*	*	*
Torch	*	*	*	*
Shop/Garden Tool	*	*	*	*

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Death estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude deaths from intentionally set fires.

[1]Includes an estimated 20 deaths in 2005 from confined cooking fires. There were no NFIRS confined cooking fire deaths in 2006 and a rounded estimate of fewer than 10 confined cooking fire deaths in 2007.

TABLE 5c
ESTIMATED RESIDENTIAL STRUCTURE FIRE INJURIES
SELECTED GAS-FIRED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**12,070**	**12,910**	**12,610**	**12,530**
Total Gas-Fired Equipment	**620**	**760**	**620**	**670**
Gas Heating Equipment	**250**	**270**	**280**	**270**
Fixed Heater	90	50	100	80
Portable Heater	10	30	30	20
Central Heating	30	20	40	30
Fireplace, Chimney, Connector	*	*	*	*
Water Heater	110	140	120	120
Fixed, Central Air Conditioning	*	*	*	*
Other	10	20	*	*
Gas Cooking Equipment	**270**	**250**	**210**	**250**
Range/Oven	220	220	150	190
Open Gas Grill	10	10	20	20
Other	40	20	40	30
Other Selected Gas Equipment	**80**	**140**	**80**	**100**
Clothes Dryer	50	90	60	70
Torch	20	20	10	20
Shop/Garden Tool	10	30	10	20

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Injury estimates are rounded to the nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude injuries from intentionally set fires.

[1] There are confined fire injury estimates included in *Total Residential* category. These confined fire injury estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6b on p. 32 for details.

TABLE 5d
ESTIMATED RESIDENTIAL STRUCTURE FIRE PROPERTY LOSS (In Millions)
SELECTED GAS-FIRED EQUIPMENT, 2006–2008

Equipment	2006	2007	2008	2006–2008 Average
Total Residential[1]	**$6,303.3**	**$6,771.5**	**$7,692.0**	**$6,922.3**
Total Gas-Fired Equipment	**$308.0**	**$357.1**	**$289.1**	**$318.1**
Gas Heating Equipment	**$173.0**	**$114.5**	**$126.4**	**$138.0**
Fixed Heater	$34.0	$31.0	$30.0	$31.6
Portable Heater	$12.7	$5.3	$7.3	$8.4
Central Heating	$13.7	$13.0	$18.5	$15.1
Fireplace, Chimney, Connector	$34.0	$13.0	$14.3	$20.4
Water Heater	$70.3	$40.0	$49.5	$53.3
Fixed, Central Air Conditioning	*	*	*	*
Other	$8.4	$12.2	$6.8	$9.1
Gas Cooking Equipment	**$62.4**	**$81.8**	**$86.3**	**$76.8**
Range/Oven	$39.9	$57.3	$45.2	$47.5
Open Gas Grill	$9.5	$15.0	$24.2	$16.2
Other	$12.9	$9.5	$16.9	$13.1
Other Selected Gas Equipment	**$60.5**	**$140.4**	**$61.6**	**$87.5**
Clothes Dryer	$19.6	$17.6	$19.3	$18.8
Torch	$14.8	$110.6	$24.5	$50.0
Shop/Garden Tool	$26.1	$12.1	$17.8	$18.7

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Property loss estimates are rounded to the nearest tenth of a million dollars. Rounded estimates less than $0.1m are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. Estimates exclude property loss from intentionally set fires.

[1] There are confined fire property loss estimates included in *Total Residential* category. These confined fire property loss estimates could not be included in the detail lines because NFIRS does not provide information to determine the type of equipment or the power source of the equipment. See Table 6c on p. 32 for details.

Methodology

The Methodology section is divided into five major sections. Section 1 describes the data from which fire loss estimates were made; Section 2 describes the procedures for preparing the data, especially focusing on missing data; Section 3 describes the quality control checking and correction of the data; Section 4 describes how the fire loss estimates were made; and Section 5 describes other issues that relate to the data and the estimates.

Data

Sources of Data for Fire Loss Estimates

The estimates in this report are based on the National Fire Protection Association's (NFPA) Survey of Fire Departments and the USFA's (USFA) National Fire Incident Reporting System (NFIRS) data.

The NFPA survey is a stratified random sample of fire departments in the United States.[1] The sample is stratified by the size of the community protected. The NFPA makes national estimates of aggregated fires, deaths, injuries, and property loss, by weighting sample results according to the proportion of the total U.S. population accounted for by communities of each size. The table below shows the NFPA estimates of residential structure fires and the associated losses for 2006 through 2008.

NFPA Estimates of Residential Structure Fires and Associated Losses 2006–2008

	2006	2007	2008
Structure Fires	412,500	414,000	403,000
Civilian Deaths	2,580	2,865	2,780
Civilian Injuries	12,925	14,000	13,560
Property Loss	$6.99 billion	$7.55 billion	$8.55 billion

Source: See footnote 1 below.

The table above contains the only data used from the NFPA survey for making fire loss estimates.

The NFIRS is a compilation of voluntarily submitted incident reports completed by U.S. fire departments. As such, the NFIRS is not a probability sample and is insufficient to support precision estimation. The reports come from all 50 states (in each of 2006, 2007, and 2008), the District of Columbia (in 2007), and U.S. territories. Not all the states reporting data included data from all fire departments in the state. In 2008, more than 21,000 fire departments participated in NFIRS. The next table shows the number of residential structure fires and the corresponding losses reported to USFA during the years 2006 through 2008.

[1] M.J. Karter, "Fire Loss in the U.S. During 2006," National Fire Protection Association (NFPA), September 2007; M.J. Karter, "Fire Loss in the U.S. During 2007," National Fire Protection Association (NFPA), August 2008; M.J. Karter, "Fire Loss in the U.S. During 2008," National Fire Protection Association (NFPA), August 2009. NFPA estimates include intentionally set fires and associated losses.

Residential Structure Fires and Associated Losses Reported to USFA 2006–2008

	2006		2007		2008	
	All	5.0 Only	All	5.0 Only	All	5.0 Only
Structure Fires	260,507	247,201	268,017	260,478	272,665	269,079
Civilian Deaths	1,444	1,335	1,472	1,419	1,453	1,437
Civilian Injuries	7,387	6,867	7,447	7,098	7,563	7,388
Property Loss	$3.55 billion	$3.24 billion	$4.73 billion	$4.53 billion	$4.58 billion	$4.51 billion

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA.

According to the NFPA, there was an estimated annual average of 409,833 residential structure fires in the U.S. during 2006 to 2008. NFIRS captured about 63 percent of these fires. During the same time period, NFPA also estimated an annual average of 2,742 deaths, 13,495 injuries, and $7.7 billion in property losses. On average, NFIRS captured 51 percent of the deaths, 53 percent of the injuries, and 53 percent of the property loss.

NFIRS Variables

The NFIRS version 5.0 coding system includes many variables, but CPSC staff used only a few for this report. The list of variables used by CPSC staff is shown below.

Variable	Description
Civilian Deaths	Number of people who died in connection with the fire incident other than fire service personnel.
Civilian Injuries	Number of people who were injured (but did not die) in connection with the fire incident other than fire service personnel.
Property Loss	Estimate of loss, in whole dollars, if structure sustained damage from flame, smoke, or suppression efforts. Property loss is not adjusted for inflation.
Contents Loss	Estimate of loss in whole dollars for contents (which had value) that sustained damage from flame, smoke, suppression efforts, or otherwise. Contents loss is not adjusted for inflation.
Property Use	Refers to the specific use of the property where the incident occurred. For residential structure fires, the properties that were deemed appropriate were single/ multifamily dwellings, any type of boarding houses, dormitories, sorority/fraternity houses, hotels/motels and mobile property not in transit.

Incident Type	Identifies the various types of incidents to which fire departments respond. It may include fires, rescue and emergency medical services, false alarms. For this report, the incident codes of interest included structure fires (which include confined fires) and fires in mobile and portable structures used as fixed residences.
Equipment Involved	Device that provided the heat which started the fire (*e.g.*, heater, clothes dryer).
Power Source	The type of power for the equipment involved in the fire's ignition. These are grouped into electrical, gas-fueled, liquid-fueled, solid-fueled, and other.
Equipment Portability	Identifies the equipment involved as stationary or portable.
Heat Source	Source of heat that ignited the fire (*e.g.*, candle, lighter, cigarette, heat from operating equipment, hot object).
Item First Ignited	The functional description or use of that item which was first ignited by the heat source (*e.g.*, upholstered furniture, mattress, bedding, electric cable insulation, curtains or drapes).
Cause of Ignition	The general causal factor that resulted in a heat source igniting a combustible material. The cause code values are: 1: intentional 2: unintentional 3: failure of equipment or heat source 4: act of nature 5: cause under investigation 0: cause, other U: cause undetermined after investigation. CPSC staff regrouped the codes as: 1: intentional 0, 2, 3, 4 or fire involving child play*: unintentional 5, U, missing information: unknown.
Factors Contributing to Ignition	The event that allowed the heat source and the item first ignited to combine to start the fire. These add specificity to the cause of ignition, such as playing with heat source, heat source too close to combustibles, equipment malfunction.

* See discussion on child play later in this section.

Human Factors Contributing to Ignition	Factors relating to the person or persons involved with the start of the fire. Examples are asleep, possibly impaired by alcohol or drugs, age, unattended or unsupervised person.
Age	Age of the person, if age was considered a factor in contributing to the ignition of the fire.

The NFIRS coding manual defines some variables as "required fields," that is, if known, values must be supplied for those variables. Other variables may or may not be supplied at the discretion of the reporting department. In the list above, the categories: Equipment Involved, Power Source, Equipment Portability, Factors Contributing to Ignition, Human Factors Contributing to Ignition, and Age are not required fields. Variables that are not required are more likely to be missing from a given fire incident report in NFIRS than those that are required.[1]

Data Preparation—Addressing Different Types of Missing Data

There are four general types of missing data in NFIRS. These are as follows: (1) data where the value of the missing variable can be inferred logically, (2) missing data from exposure fires, (3) missing data from confined fires, and (4) other missing data. Standard practice in analysis of fire data over the last 20 years has been to fill in the missing values whenever possible.

Missing data that can be logically inferred

As mentioned above, only a few of the available fire incident characteristics were used to generate estimates in this report. Of these, only the variables Incident Type, Property Use, Cause of Ignition, Item First Ignited, Heat Source, and the Loss Variables are required to be filled out by the fire departments. Even less is required for confined fires, which will be discussed below. Tables 1, 3, 4, and 5 in this report rely heavily on the variables Equipment Involved and Equipment Power Source. To lessen the extent of missing data, CPSC staff has implemented some conventions, as necessary, following consultation with USFA technical staff.

Some examples illustrate this. If the heat source is known to be matches, lighters, or candles, and no equipment is reported, then it is likely that no equipment was involved, rather than equipment being unknown. Similarly, if the factor contributing to the ignition of a fire is reported to be an act of nature—such as an earthquake or a storm—and no equipment is reported, then it is likely that no equipment was involved.

Another scenario would be when the reported equipment code is one that can only be electrical but the equipment power source is missing. In this case, it is evident that the power source should have been reported as electrical. On the other hand, when it is known that there is no equipment involved, the power source should be reported as "none" instead of "unknown."

These changes are made before any other steps in data preparation.

[1] NFIRS Complete Reference Guide, January 2004.

Exposure fires

Some fires involved more than one residential structure. The initial structure is identified as "exposure zero" in the data file. Structure fires that spread from the initial fire are identified as "exposure fires" numbered from "zero" up to as many as are necessary. Typically, in exposure fires, most of the information on the variables listed above is not filled out for exposures beyond the initial home.

If the initial fire was a residential structure fire, CPSC staff transferred the fire cause values such as Cause of Ignition, Equipment Involved, or Heat Source, from the initial fire to the exposure fire. Thus, if a portable heater caused the initial fire, all exposures would be considered portable heater fires. All associated deaths, injuries, and property losses in these exposures also would be attributed to portable heaters. Any residential structure exposure fire that originated from a non-residential structure fire is also considered in-scope for this report. If the initial fire is not a residential structure fire, but the exposure fire is a residential structure fire, then the cause information is not passed down from the initial fire. For example, if a wildfire is started by a cigarette and then spreads to homes, the wildfire would not count as a residential structure fire, but the exposure home fires would. The cigarette as the heat source would not be passed on to the home fires in this case. The cause information for the exposure home fires would be left as is.

Confined fires

By far the biggest proportion of missing data was encountered among the confined fires. By NFIRS definition, a fire that is confined to a noncombustible container causing no flame damage beyond the container is considered to be confined.

In NFIRS version 5.0, the following Incident Type codes are used to identify the different types of confined fires.

Incident Type Code	*Definition*
113	Fire involving the contents of a cooking vessel without fire extension beyond the vessel.
114	Fire originating in and confined to a chimney or flue.
115	Fire caused by overload or malfunction of an incinerator, with no flame damage outside the incinerator.
116	Fire caused by delayed ignition or malfunction of a fuel or oil burner/boiler, with no flame damage outside the fire box.
117	Fire originating in and confined to contents of a trash compactor. Home trash compactors are excluded.
118	Fire involving a trash or rubbish fire in a structure with no flame damage to structure or its contents.

These Incident Type codes are unavailable in version 4.1 of NFIRS. It was believed that many of these cases were not being reported; so in version 5.0, these codes were created to simplify the coding of these fires. When reporting confined fires, the Cause of Ignition, Equipment Involved, Item First Ignited, or Power Source is not required to be reported.

Since 1999, more and more of the NFIRS data have been reported in version 5.0. With the opportunity to identify confined fires using the specific codes, more and more "confined" fires are also being reported to NFIRS. However, very little other useful information about them is available. With the proportion of reported confined fires increasing, the proportion of missing data also increases. However, imputation of unknowns based on the information from confined fires is not a viable option. From the definition of the Incident Type of confined fires, it is unclear that they are at all similar to the rest of the fires in terms of the equipment involved, the equipment power source, the heat source, or the item first ignited. As such, CPSC staff separates all confined fires from the data before the product-specific estimates are derived. The confined fire and fire loss counts were weighted up to the NFPA estimates, using the same weights as the rest of the data and presented at the aggregate levels (and sometimes at more specific levels as allowed by the Incident Type definitions). See the section on Estimation Procedure below for a discussion on the weights used. Tables 6a through 6c present all estimates related to confined fires. These estimates are also included in Tables 1a through 5d, as appropriate. Note that they do not appear in Tables 4a through 5d at any of the specific levels because there is no information available on equipment power source.

Table 6a: Estimated Residential Confined Fires: 2006–2008

Included in Table Categories:	Appear in Tables:	2006	2007	2008
Total Residential	1a, 2a, 3a, 4a, 5a	190,400	185,200	184,500
Total Heating and Cooling Equipment	1a, 3a	38,800	39,100	38,500
Fireplace, Chimney, Connector	*1a, 3a*	*24,300*	*24,600*	*24,800*
Other (Burner/Boiler)	*1a, 3a*	*14,600*	*14,500*	*13,700*
Cooking	1a, 2a	130,900	127,800	129,000
Trash, Rubbish	2a	18,200	16,300	15,100
Incinerator	-	800	700	600
Trash Compactor	-	1,700	1,300	1,300

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Fire estimates are rounded to nearest 100. Rounded estimates less than 100 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. No information was available on the intentionality of these fires.

In 2006 and 2008, there were no NFIRS confined fire deaths; and in 2007, there were fewer than 10 deaths estimated from all residential confined fires. No confined fire table is presented showing these death estimates.

Table 6b: Estimated Residential Confined Fire Injuries: 2006–2008

Included in Table Categories:	Appear in Tables:	2006	2007	2008
Total Residential	1c, 2c, 3c, 4c, 5c	1,670	1,900	1,900
Total Heating and Cooling Equipment	1c, 3c	110	140	90
Fireplace, Chimney, Connector	*1c, 3c*	*40*	*60*	*40*
Other (Burner/Boiler)	*1c, 3c*	*70*	*90*	*50*
Cooking	1c, 2c	1,510	1,700	1,750
Trash, Rubbish	2c	50	60	60
Incinerator	-	*	*	10
Trash Compactor	-	*	*	*

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Injury estimates rounded to nearest 10. Rounded estimates less than 10 are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. No information was available on the intentionality of these fires.

Table 6c: Estimated Residential Confined Fire Property Loss (In Millions): 2006–2008

Included in Table Categories:	Appear in Tables:	2006	2007	2008
Total Residential	1d, 2d, 3d, 4d, 5d	$33.5	$30.8	$39.1
Total Heating and Cooling Equipment	1d, 3d	$6.9	$7.4	$9.1
Fireplace, Chimney, Connector	*1d, 3d*	*$5.2*	*$5.1*	*$6.5*
Other (Burner/Boiler)	*1d, 3d*	*$1.7*	*$2.3*	*$2.6*
Cooking	1d, 2d	$23.7	$21.4	$25.6
Trash, Rubbish	2d	$2.2	$1.7	$4.1
Incinerator	-	$0.7	$0.3	$0.4
Trash Compactor	-	$0.1	*	*

Source: U.S. Consumer Product Safety Commission/EPHA, from data obtained from the USFA and NFPA.
Note: Property loss estimates are rounded to the nearest tenth of a million dollars. Rounded estimates less than $0.1m are denoted by an asterisk (*). Subtotals do not necessarily add to heading totals. No information was available on the intentionality of these fires.

Other missing data

Tables 7a–7c show the extent of data still missing after logically inferring missing data when appropriate and information transfer was completed for exposure fires. Since most of the data fields for confined fires (those that do not spread beyond the originating item) were not reported per NFIRS's version 5.0 reporting instructions, they have been excluded from the tabulations below. Confined fires are discussed later in this section.

Table 7a
Missing Data on Residential Structure Fires: 2006–2008

	2006	2007	2008
Cause of Ignition	29%	30%	32%
Heat Source	32%	34%	35%
Item First Ignited	32%	33%	34%
Equipment Involved	50%	52%	51%
Equipment Power	50%	52%	51%

Source: U.S. Consumer Product Safety Commission / EPHA, from NFIRS data obtained from the USFA. Table excludes confined fires. Table includes only version 5.0 component of total residential structure fires data (95 percent of the 2006 fires are coded in 5.0, 97 percent in 2007, and 99 percent in 2008).

Table 7b
Missing Data on Residential Structure Fire Deaths: 2006–2008

	2006	2007	2008
Cause of Ignition	49%	51%	56%
Heat Source	50%	51%	61%
Item First Ignited	52%	53%	59%
Equipment Involved	47%	55%	56%
Equipment Powe r	47%	55%	56%

Source: U.S. Consumer Product Safety Commission / EPHA, from NFIRS data obtained from the USFA. Table excludes deaths from confined fires. Table includes only version 5.0 component of total residential structure fire death data (92% of the fire deaths in 2006 were coded in 5.0, 96% in 2007, and 99% in 2008).

Table 7c
Missing Data on Residential Structure Fire Injuries: 2006–2008

	2006	2007	2008
Cause of Ignition	28%	27%	32%
Heat Source	26%	27%	32%
Item First Ignited	27%	28%	30%
Equipment Involved	43%	44%	44%
Equipment Power	44%	44%	43%

Source: U.S. Consumer Product Safety Commission / EPHA, from NFIRS data obtained from the USFA. Table excludes injuries from confined fires. Table includes only version 5.0 component of total residential structure fire injury data (93 percent of the fire injuries in 2006 were coded in 5.0, 95 percent in 2007, and 98 percent in 2008).

For these data, an assumption was made that the unknown values for a characteristic had the same distribution as the known values for that characteristic. To allocate these unknowns for the various characteristics, "raking" was used. A SAS® macro[1] performed the raking. The raking procedure maintains the marginal distributions for the known data, while allocating the unknown data for all characteristics involved.[2] For each year, the raking procedure was applied separately for fires, deaths, injuries, and property loss.

Quality Control Checks of NFIRS Data

In 2006, a California home fire was reported to NFIRS with a $100 million property loss. Since this was unusually high, CPSC staff decided to assign the fire to CPSC field staff to investigate and confirm this large property loss value. The actual fire department estimate of property loss for the fire was $100,000. The property loss was corrected, and the weight used for property loss estimates was changed accordingly.

In light of this, CPSC staff did more quality control checking of the NFIRS data, beginning with the 2007 data. In 2008, residential structure fires with reported property losses of $5 million or higher were assigned to CPSC field staff to confirm the high property loss estimate with the fire department. There were 21 such high property loss fires assigned for investigation. In nine of them, the property loss estimate was confirmed. In the remaining 12, a different property loss estimate was obtained, and the data were corrected.

[1] M. Battaglia, D. Hoaglin and D. Izrael, "To Rake or Not To Rake Is Not the Question Anymore with the Enhanced Raking Macro," SAS® Users Group International (SUGI) 29th Annual Conference, May 9–12, 2004, Paper #207-29.
[2] M.A. Greene, L.E. Smith, M.S. Levenson, S. Hiser, and J.H. Mah, "Raking Fire Data," Presented at the Federal Conference on Statistical Methodology, Arlington, VA, 2001.

In addition to the quality control checking of high property loss fire reports, some checking was done of multiple-death fire incidents for the 2008 data. In cases with 3 or more civilian deaths reported, a search of the Internet was conducted to look for news articles and fire marshal reports to confirm (or add to) the fire cause information given in the NFIRS report. There were 18 cases where it appeared that there might be information to conflict with or add to the information from the NFIRS report. These cases were assigned to field staff to contact the fire department and reconcile the information. As a result of these investigations, 15 of these cases had fire cause information edited. A common scenario was a report that had the "Cause of Ignition" variable "missing" or "unknown" and then changed to "unintentional," as a result of a CPSC field staff investigation. In two different instances, one case involving four deaths and another case involving three deaths resulted in investigations establishing that the deaths were not fire deaths. In both cases, the fires were set after the deaths occurred.

Estimation Procedure

After applying the conventions and the raking procedure previously discussed, the estimation process was carried out. For each year, CPSC staff computed weights for residential fires, civilian deaths, civilian injuries, and property and content losses, respectively, by dividing the NFPA estimated totals for these losses by the corresponding NFIRS totals. These weights were multiplied by the NFIRS product-specific frequency counts, which then were used to produce the estimates in the tables. As already mentioned, the confined fires were separated, and the estimates were computed separately.

The estimates presented in this report pertain to unintentional fires and fire losses only. To this end, CPSC analysts excluded all incidents where the "Cause of Ignition" could be identified as intentional. While fires involving children playing with the source of heat have become more difficult to identify in the new NFIRS system (see discussion in the next section), whenever such a fire could be identified, the CPSC analysts designated it as "unintentional," even if the "Cause of Ignition" was coded as "intentional."

Estimated annual averages recorded in this report are arithmetic averages of the unrounded estimates from each of the three years. The reported annual averages are rounded to the nearest 100 for fires, nearest 10 for deaths and injuries, and nearest $0.1 million for property losses.

Other Issues

Child Play

When a fire is caused by the act of a child (under 10 years of age) playing with a source of heat, the cause of fire is considered "Child Play."

In version 4.1 of NFIRS data, the variable "Ignition Factor" had specific codes to indicate the cause of the fire. The codes allowed for the identification of "Child Play" fire losses, which were associated with matches and lighters. In version 5.0, there is no one variable reserved to identify "Child Play" cases. A combination of variables, such as "Factors Contributing to Ignition," "Human Factors Contributing to Ignition," and "Age" (of fire starter when age was considered a factor contributing to ignition of fire) provides the means to identify these scenarios. However, for data that are reported in version 5.0, fire departments are not required to fill in these three variable fields. Consequently, much of the data are missing, and because these extra variables used to identify child play are not included in the raking procedure, estimates of "Child Play" fires (which were presented in pre-1999 years) have become unreliable for post-1998 years. However, for cases where these variables are not missing and are coded in a way that indicates child play, the "Cause of Ignition" variable is classified "unintentional." This ensures that the fire and any associated losses will be counted and not excluded as an intentional fire.

Trend in Estimates

From 1999 to 2004, the proportion of the NFIRS residential structure fire records that were originally coded in 5.0 increased rapidly (from 5 percent in 1999, to 89 percent in 2004). Because fires only can be coded as confined fires in 5.0, this rapid increase also meant a rapid increase in the proportion of the data that were confined fires (from 2 percent in 1999, to 41 percent in 2004). If the proportion of confined fires reported to NFPA did not increase likewise during this period, then this would have a downward effect on the fire estimates for nonconfined fire products. Without knowing whether fires reported to NFPA were confined or nonconfined, looking at specific product fire estimates from 1999 to 2004, suggested that this downward effect was occurring. Because we do not know the change in the proportion of confined fires in the NFPA survey, we cannot be sure that this is indeed what was causing this decrease in fire estimates for specific products.

By 2005, 94 percent of the NFIRS residential structure fire records were originally coded in 5.0. As a result, the proportion of NFIRS structure fires that are confined fires did not increase much from 2005 to 2008 (42 percent to 46 percent). This small increase should have little effect on the fire estimates for specific products. There does not appear to be a clear, overall downward trend in the fire estimates. Now that the proportion of NFIRS residential structure fires that were originally coded in 5.0 has stabilized, the product-specific fire estimates have as well. This is more evidence in support of the hypothesis that the quickly increasing proportion of 5.0 cases from 1999 to 2004 may have had a downward effect on product-specific fire estimates.

Compiled Fire Sprinkler Responses

Contents

Newer Homes are Safer

Use the following as a general statement to highlight home builders' commitment to safety. The article, "Home Building and Fire Safety", which NAHB contributed to the Fire Protection Engineering magazine can also be used to promote the home builder's point of view.

The National Association of Home Builders is a firm believer in safe, affordable homes. Our members have a vested interest in the safety of their products both during the building process and after the house becomes someone's home.

For that reason, home builders are active participants in the codes and standards development process, helping to make sure that each advance in building science and technology is weighed for the appropriate balance of safety, efficiency and cost to help ensure that each code cycle results in advances that improve homes without pricing them out of reach.

The home builder acts as a consumer advocate, offering counterpoint to code change proposals that benefit particular brands or products.

And when it comes to advances in fire safety technology, our members are proud to produce homes built to building codes designed to keep their occupants safer than homes built in previous generations.

1) Age of Homes—What the Data Shows

Use the following to emphasize that the data collected shows that fire fatalities are highly concentrated in older homes.

The federal government's primary source of data on residential fires is the National Fire Incident Reporting System (NFIRS). The NFIRS is based on local fire departments voluntarily reporting information on fires in a standard format to the U.S. Department of Homeland Security. The NFIRS data, which members of the fire service often use to support their claims, does not distinguish the age of the home involved. This greatly reduces the value of NFIRS for analyzing policies like building codes that target new construction.

In states where the age of affected homes has been matched with national fire data, fatalities are heavily concentrated in those older homes.

2) Age of Homes—Correlation between Age and Fire Fatalities

Use the following to rebut comments denying there is a significant correlation between the age of a home and the probability of fire fatalities. The comments below were in response to the statement that older housing tends to have a disproportionate share of poorer, less educated households. You may see the following report cited:

- *NFPA "The Case for Fire Sprinklers in One- and Two-Family Dwellings" Revised 2014*

That any relationship between older housing and higher death rate is attributable to a disproportionate share of poorer, less educated households is merely an assertion with no evidence to support it. The

NFPA report neither presents nor cites any statistics relating characteristics of occupants to age of the home and differential fire death rates.

According to NFPA's U.S. Home Structure Fires Fact Sheet the leading causes of unintentional home structure fires are 1) cooking equipment, 2) heating equipment and then 3) electrical distribution and lighting equipment. As far as electrical fires are concerned: "A strong relationship between housing age and the rate of electrical fires has been observed, with housing over 40 years old having the strongest association with electrical distribution fires. As of 2013, the median age of one- and two-family housing was over 35 years. With more than half of the housing stock older than 35 years, electrical issues become an increasingly larger player in residential fires." (See FEMA's One- and Two-Family Residential Building Fires (2011-2013); P. 4.)

Newer homes are much less likely to experience heating equipment fires due to new homes having new appliances with safety features, clearances, vents and chimneys in accordance to current code. The reliability, lower cost of use along with balanced airflow providing adequate comfort also mean that supplemental heaters are not necessary in new homes. In light of these reasons, the heating equipment fires that accounted for more than twice the number of electrical fires can primarily be associated with older homes.

3) Comparison to Homes with Sprinklers—Fire Safety

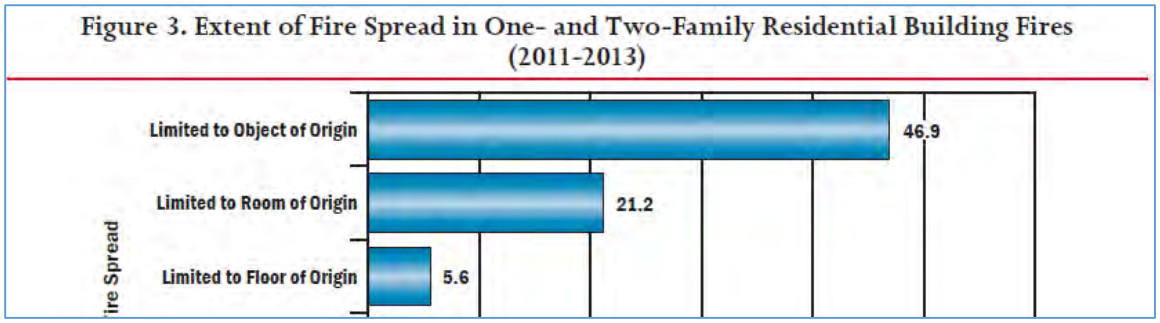
Use the following to rebut comments meant to show that jurisdictions which have enacted fire sprinkler mandates have a better fire safety record since they went into effect.

Data that shows newer homes are safer in jurisdictions where sprinkler mandates are in force agrees with the fire data that NAHB has matched with the age of affected homes. Fatalities are heavily concentrated in older homes whether or not these newer homes have fire sprinklers installed.

4) Comparison to Homes with Sprinklers—Fires Confined to One Room

Use the following to rebut comments stating that fires in sprinklered buildings are usually confined to the room of origin.

This is true for fires in all one- and two-family homes whether they are sprinkled or not:



Reproduced from One- and Two-Family Residential Building Fires (2011-2013), FEMA; P. 5

State Adoptions

Use the following to highlight how unpopular fire sprinkler mandates are across the country.

It's general knowledge that the mandate to install fire sprinkler systems is not being widely adopted across the U.S. In fact, 48 states currently do not have the fire sprinkler mandate in their state codes for one- and two-family detached homes, and the majority of states also do not allow local jurisdictions to adopt stricter requirements than those that were adopted at the state level.

Modern Homes Compared to Older Homes

Use the following to rebut comments which use UL reports to criticize "today's modern homes". You may see the following reports and websites cited:

- *"Structural Stability of Engineered Lumber in Fire Conditions" 2008*
- *http://newscience.ul.com/articles/modern-residential-fires*

See also Age of Home.

When listing factors that impact residential fires, the UL studies ignored the hundreds of code changes that have improved passive fire resistance, heating and electrical equipment since the 1970s. A better way to determine whether newer homes are safer is by evaluating national fire data in the real world. In states where NAHB has looked at such data and matched it with the age of affected homes, fatalities are heavily concentrated in older homes.

The UL studies either looked at the conditions mentioned individually, or used experimental rooms based on guesses about important differences between older and newer homes. Many of the differences were in room furnishings rather than in construction of the rooms themselves, so the results are not particularly informative about issues of construction.

1) Home Size and Geometry

Use the following to rebut comments stating that since homes built today are larger with floor plans that are more open, they are less safe in a fire.

The conclusions made in the UL study are pure conjecture and not based on any experiments or real world fire data. Since fire experts agree that most fatalities are caused not by the fire itself but by the toxic gases it emits, one could just as easily state that more volume in a house offers the occupants more breathable air and therefore more time to get out. The report in no way proves the opposite.

2) Lightweight Construction (Engineered Lumber)

Use the following to rebut comments stating lightweight wood components fail faster in a fire.

Wood I-joists are often mentioned in the context of "new homes" as if they are something not found in homes built a generation ago. However, they were first developed 50 years ago and have been used in home building since at least the early 1970s.

According to UL's report Analysis of Changing Residential Fire Dynamics and Its Implications on Firefighter Operational Timeframes, research demonstrated that a single layer of 1⁄2-inch gypsum wall board on the bottom of the unprotected floor assembly adds on average approximately 20 minutes to the time before collapse. This is a standard method of passive fire protection and applies to both legacy and modern construction.

The discussion on lightweight components is typically focused on unfinished basements, because the floor joists may be exposed while the home is occupied. Since most fire start in a finished space, unprotected floor joists rarely come into play with regards to fire spread. (See table below.)

Table 4. Leading Areas of Fire Origin in Nonconfined One- and Two-Family Residential Building Fires (2011-2013)

Areas of Fire Origin	Percent (Unknowns Apportioned)
Cooking area, kitchen	18.3
Bedrooms	12.7
Common room, den, family room, living room, lounge	6.7
Attic, vacant spaces	5.7
Exterior wall surfaces	5.5
Laundry area	5.1
Vehicle storage area: garage, carport	5.0

Source: NFIRS 5.0.

Reproduced from One- and Two-Family Residential Building Fires (2011-2013), FEMA

3) Furniture

Use the following to rebut comments stating that newer homes have furniture that burns faster than "legacy" furniture.

The UL research this claim is based on compares modern home configurations to "legacy" configurations from approximately 50 years ago. The same "modern" furniture is very likely found in older homes, because furniture gets replaced over time.

Pointing to the characteristics of a home that is "stuck in time" in all aspects, with the same furniture and without the floorplan being opened up or added on to, is deceiving. It would be more useful to compare new homes with the older housing stock as it exists today.

Thirty years ago, homes were already filled with furniture that was made from synthetic materials, and yet there have been significant improvements to the fire safety of homes over the past few decades leading to a dramatic and continued decrease in fire incidents, injury, death and property loss.

Smoke Alarms

Use the following to highlight the effectiveness of smoke alarms.

The effectiveness of smoke alarms cannot be underestimated. According to NFPA (see Michael J. Karter, Jr., *Fire Loss in the United States During 2014*, NFPA, Quincy, MA, September 2014), since the time that smoke alarms have been required in dwellings, there has been a significant drop in the number of reported fires, injuries and fatalities in the United States. Since 1980, the number of fires has dropped by 50 percent and fatalities have dropped by about the same margin, all during the same time period where the population increased and where smoke alarms were required in the model codes but sprinklers were not. And smoke alarms continue to become more effective with ongoing technical advances.

Such improvements include the proliferation of 10-year integral batteries, which substantially lengthen the interval between low-battery signals. Batteries in these units also cannot be used in other devices, which eliminates the possibility of the battery being removed to power other electronic devices. There is also continued research aimed at improving the detection logarithm to greatly reduce false alarms from cooking. All these improvements are still unfolding, and can be expected to further reduce the number of fatalities.

According to NFPA (see Marty Ahrens, *Smoke Alarms in U.S. Home Fires*, NFPA, Quincy, MA, September 2015), three out of five home fire deaths resulted from fires in properties without at least one working, battery-operated smoke alarm. Hardwired, interconnected smoke alarms are installed in new homes, which are more likely to operate and alert occupants to a fire. As for the remaining existing homes, ensuring every home in the U.S. had at least one working smoke alarm would save close to 900 lives each year.

Survivability/Risk of Fire Death

Use the following to rebut comments on the chances of surviving a home fire when smoke alarms are present. The comments below were in response to the statement that the chances of surviving a home fire when smoke alarms are present (99.45%) is based on "chances of survival," which is not the same as "risk of fire death".

See also Smoke Alarms.

The above argument simply highlights a different view of the issue. It is, in fact, correct to say that the survivability, when a large or small fire occurs is 99.45% with at least one operating smoke alarm. The difference highlighted by the SFC response is that its data is based on the number of *reported* fires. (See Table 4-1, John R. Hall, Jr., *U.S. Experience with Sprinklers*, NFPA, Quincy, MA, June 2013.) Furthermore,

this data includes fires that occurred in apartment buildings, so that it should not be considered for new, one- and two-family homes.

1) Number of Fire Deaths in the U.S.

Use the following to rebut the comments such as "In 2013 there were 2,800 civilian fire deaths."

There have been significant improvements to the fire safety of homes over the past few decades, leading to a dramatic, continued decrease in fires, injury, death and property loss. As fire safety professionals know, fire deaths have decreased by over 60% since 1960 (50% since 1978), while the death rate based on population size has decreased by well over 70%.

2) Percent of Fire Deaths That Occur in the Home

Use the following to rebut the comment that 80% of fire deaths occur in the home.

This is taken from NFPA's report Smoke Alarms in U.S. Home Fires. The figure of 80 percent is inaccurate and irrelevant to single-family homes. 1) The figure is based largely on multifamily properties. 2) NFPA artificially inflates the figure by throwing out cases where the sprinklers didn't operate (or where it's unknown if they operated), even if the sprinklers were installed rigorously to code.

Cost

Use the following to rebut comments on the cost of fire sprinkler systems. However, it is often more effective to have local data to quote in a response. The comments below were in response to the statement that claimed the cost of fire sprinklers makes up between 1% and 5% of a home's total cost.

The report Home Fire Sprinkler Cost Assessment from the Fire Protection Research Foundation shows that the average cost of a sprinkler to a builder is six thousand dollars (see table below showing national data). Thousands of dollars in extra cost is more than many home builders' customers can bear. In fact, just a $1,000 increase in home prices keeps more than 200,000 households out of the market nationally. The $1.60 per foot may sound low to the uninitiated who don't understand how many thousand square feet of space the code requires to be covered by sprinklers in the typical home.

	2008 Cost		2013 Cost	
	$/Sprinklered ft^2 [4]	Total Cost[5]	$/Sprinklered ft^2	Total Cost
Mean	$1.61	$6,316	$1.35	$6,026
Median	$1.42	$5,843	$1.22	$5,000
Minimum	$0.38	$2,386	$0.81	$1,695
Maximum	$3.66	$16,061	$2.47	$21,000

Reproduced from *Home Fire Sprinkler Cost Assessment*, Fire Protection Research Foundation, September 2013.

It is simply inaccurate to say this is about 1 percent of total construction cost. That would imply an average construction cost of $600,000 per home. Given that construction cost is about 62 percent of the final price of the home (see NAHB's Cost of Constructing a Home), this in turn implies a home priced at roughly $970,000. In other words, the cost of an average sprinkler system is about 1 percent of total construction cost *for a home priced at nearly $1,000,000*.

In the extreme, the report sponsored by the Fire Protection Research Foundation shows that the cost of a sprinkler system can be as high as twenty-one thousand dollars. This maximum cost undoubtedly represents an unusual case. But building codes, once adopted, apply to all new construction, even the unusual cases.

1) Property Damage Reduction

Use the following to rebut comments stating that fire sprinklers reduce property damage by 70% or more.

This is largely irrelevant, given how much sprinkler systems cost. Any conceivable reduction in property losses can at best go a small way to offsetting these costs (see Using NIST's New Web Tool to Compare Sprinkler Costs and Benefits). In addition, the 70 percent figure is inconsistent with NFIRS data. NAHB has tried tabulating these data and can't get close to 70 percent even by following NFPAs practice and basing it largely on multifamily properties. In fact, depending on the year, NFIRS data show slightly greater loss of property in homes that have sprinklers.

2) Insurance Discounts

Use the following to rebut comments stating that installing a fire sprinkler system saves on home insurance costs.

The 2008 Fire Protection Research Foundation Home Fire Sprinkler Cost Assessment report investigated insurance savings. It found that discount percentages ranged from 0 to 10% among all companies and agencies surveyed, with an average saving of $22 off the annual premium. This is small relative to the up-front cost of a sprinkler system.

3) Effect on Housing Market

Use the following to rebut comments on the effect of fire sprinkler mandates on housing demand. You may see the following reports cited:

- *NFPA, "Comparative Analysis of Housing Cost and Supply Impacts of Sprinkler Ordinances at the Community Level" 2009*
- *Fire Protection Research Foundation, "Home Fire Sprinkler Cost" 2013*

Undeniable economics dictates that increased cost for a product lowers demand. Higher cost housing means more people are removed from the marketplace of potential purchasers. On top of this economic fact, most buyers not only do not perceive sprinklers as a benefit but rather see them as a liability.

The comments below were in response to the statement that highlighted the experience of Prince George's and Montgomery Counties in Maryland.

This isn't particularly relevant or conclusive. The results are for two atypical counties in the Washington, D.C. metropolitan area where impacts of sprinklers were being obscured by many other things happening in the state of Maryland at about the same time: implementation of inclusionary zoning, seven-figure increments in impact fees, substantial new farmland protection legislation, the governor taking actions to stall large developments in the state, etc. With so many things in flux, it's not surprising that a study would find it difficult to tease out a significant impact of any one factor in the area.

The 2008 Fire Protection Research Foundation Home Fire Sprinkler Cost Assessment report investigated insurance savings. It found that discount percentages ranged from 0 to 10% among all companies and agencies surveyed, with an average saving of $22 off the annual premium. This is small relative to the up-front cost of a sprinkler system.

Accidental Fire Sprinkler Discharge

Use the following to rebut comments that the likelihood of an automatic sprinkler operating in the absence of a fire (and not due to freezing, mechanical damage, corrosion, or deliberate sabotage) is one per year per 16 million in use. You may see the following report cited:

- *NFPA Journal article, "Unexpected Discharge of Fire Sprinklers" 2000*

Unexpected water discharge due to defective sprinkler heads may be rare. However, as stated in the NFPA Journal article, "Unexpected Discharge of Fire Sprinklers," a fire sprinkler system is also subject to unexpected discharge due to freezing, mechanical damage, corrosion and deliberate sabotage. We don't know how often these problems which lead to water damage occur, so the "one per year per 16 million" statistic is irrelevant. The manufacturers of these systems may claim that they are not responsible for these types of unexpected discharge, but none of these problems could happen on a system that is not installed in the first place.

From the NFPA Journal article:

Freezing – Although special types of sprinkler systems are available for use in areas subject to freezing, most sprinkler systems are wet pipe systems, meaning that the piping is normally filled with water. If a system or even a small portion of a system is exposed to freezing temperatures, water in the piping can turn to ice, expanding in volume and producing thousands of pounds of pressure. Such pressures can break fittings, but can also force open the valve caps of sprinklers, resulting in apparent accidental discharge or leakage when the system subsequently thaws.

Mechanical Damage – The frame, the seat and the operating mechanism (solder link or glass bulb) of an automatic sprinkler together form a sealed unit that is expected to maintain its integrity, but also to operate efficiently if a fire ever threatens its protected area. The sprinkler parts are joined somewhat like a coiled spring, holding the energy needed to activate when released by heat from a fire. Mechanical impacts to sprinklers can result in damage and separation of parts. Although it is obvious that a large force can immediately open a sprinkler, it is less obvious that a smaller impact can do the same thing over time. For this reason, it is important that sprinklers be carefully handled during the installation process, and that the proper wrenches be used during their installation. Special wrenches are often required by the manufacturers' literature to reduce the possibility of slippage that can damage the sprinkler operating mechanism, potentially resulting in a release of parts weeks or months later. Building renovations can also result in impacts of sprinklers, leading to an inadvertent discharge or leakage at a later date.

Corrosion – Corrosion can result in a weakening of parts, and a subsequent release of water. This can occur among very old sprinklers, or sooner with sprinklers installed in a harsh environment. Many fire codes require enforcement of NFPA 25 - *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. This standard requires that the building owner replace sprinklers that exhibit corrosion, loading or other damage.

Deliberate Sabotage - Deliberate acts of sabotage must also be considered when investigating the reasons for sprinkler discharge. Vandalism and insurance fraud have been found in the past to be motivations for tampering with sprinklers.

Concluding Statement

Use the following as a general statement to conclude your response.

It is a sad irony when Americans cannot afford to be safe. Families who cannot qualify to purchase homes due to the increased costs from well-meant, but expensive and ultimately unnecessary safety features will remain in housing that is less safe, because it’s built to less stringent code requirements. These older homes can have outdated appliances, space heaters, faulty wiring, or other characteristics that might lead to a greater risk of a fire starting, or a lack of smoke alarms and egress windows installed to today’s codes which increase the chances of dying in that fire.

Home Building and Fire Safety

BY DAN BUUCK

THE NATIONAL ASSOCIATION OF HOME BUILDERS *is a firm believer in safe, affordable homes. Our members have a vested interest in the safety of their products both during the building process and after the house becomes someone's home.*

For that reason, home builders are active participants in the codes and standards development process. They help make sure that each advance in building science and technology is weighed for the appropriate balance of safety, efficiency and cost to help guarantee that each code cycle results in advances that improve homes without pricing them out of reach.

The home builder acts as a consumer advocate, offering a counterpoint to code change proposals that benefit particular brands or products.

And when it comes to advances in fire safety technology, our members are proud to produce homes built to building codes designed to keep their occupants safer than homes built by previous generations.

There have been significant improvements in the fire safety of homes over the past few decades, leading to a dramatic, continued decrease in fires, injury, deaths and property loss. As fire safety professionals know, fire deaths have decreased by over 60 percent since 1960 (50 percent since 1978), while the death rate based on population size has decreased by well over 70 percent.

Technological innovations in building techniques include advanced heating and electrical systems, egress windows, hardwired, interconnected smoke alarm systems, and fire-resistant materials and features like the separation between the house and the garage and fireblocking in concealed spaces.

When homeowners combine these advances with proper maintenance, homes stay safer. And as more of the existing housing stock that doesn't include these improved fire safety features is replaced, this trend will continue.

Why Smoke Alarms Matter

Do not underestimate the effectiveness of smoke alarms. Since 1989, NFPA 72, National Fire Alarm and Signaling Code has required hardwired, interconnected smoke alarms. Fire alarms continue to become more effective with ongoing technical advances.

Such improvements include the proliferation of 10-year integral batteries, which substantially lengthen the interval between low-battery signals. Batteries in these units also cannot be used in other devices, which eliminates the possibility of anyone removing them to power other electronic devices.

There is also continued research aimed at improving the detection logarithm to reduce false alarms from cooking. All these improvements are still unfolding, and can be expected to reduce the number of fatalities. And throughout the country, local home building associations often work with community fire departments on fire safety campaigns and to ensure that consumers take advantage of this life-saving technology by conducting awareness campaigns and even donating new units.

This education and awareness are vital because the main causes of unintentional, non-confined home fires are heating equipment and electrical malfunction, both primarily associated with older homes. New homes are equipped with new heating appliances with clearances, vents and chimneys which follow current codes. Additional safety features also make heating appliances and chimneys more reliable and produce a more balanced airflow reducing the need for supplemental heaters, which are more likely to start a fire. And FEMA's report, One- and Two-Family Residential Building Fires (2011-

2013) finds “a strong relationship between housing age and the rate of electrical fires . . . with housing over 40 years old having the strongest association with electrical distribution fires. As of 2013, the median age of one- and two-family housing was over 35 years.”

The report also notes a 2008 study that found, “there are three major areas in older properties that contribute to compromised electrical systems: the effects of aging on the wiring itself, misuse and abuse of the electrical components, and non-code-compliant installations.”

There have been significant improvements in the fire safety of homes over the past few decades, leading to a dramatic, continued decrease in fires, injury, deaths and property loss.

Going forward, it is important to consider carefully any additional requirements so we don’t put safer new homes financially out of reach for those households now in older dwellings.

It is a sad irony when Americans cannot afford to be safe. Families who cannot qualify to purchase homes due to the increased costs from well-meant but expensive and ultimately unnecessary safety features will remain in housing that is less safe because it was built to less stringent code requirements. These older homes can have outdated appliances, space heaters, faulty wiring, or other characteristics that might lead to a greater risk of a fire starting, or a lack of smoke alarms and egress windows installed to today’s codes which increases the chances of dying in that fire.

For that reason, we take our code development responsibilities seriously. We must ensure that new homes are safe, but not just available to the wealthy.

DAN BUUCK *is with the National Association of Home Builders.*

FIRE SPRINKLER TALKING POINTS

Fire Incidents, injuries and deaths declined dramatically in the last 30 years without the installation of fire sprinklers or the need to mandate fire sprinklers in new homes. This trend continues and the decline is even more impressive given the significant population growth and growth in housing stock our nation continues to see. The decline in fires and fire deaths occurred without the installation of fire sprinklers but because of changes in residential construction technology, improved building code requirements - especially for electrical and smoke alarm systems – consumer behavior and the concerted efforts of fire fighters, home builders and other safety advocates.

- *The latest NFPA study "Home Structure Fires" (2013) reports that home structure fires dropped 50 percent from 734,000 in 1980 to 370,000 in 2011.*

- *The drop is even greater when population growth is taken onto account. The rate of reported home fires per million population fell 63 percent from 3,230 in 1980 to 1,187 in 2011.*

- *Home fire deaths hit a new low in 2011, when the estimated home fire death toll of 2,520 was 52 percent lower than 5,200 in 1980.*

- *Even more dramatic is the drop in the rate of home fire deaths per million population, falling 65 percent from 22.9 in 1980 to 8.1 in 2011.*

- *The same NFPA study also highlights that "the home fire problem is dominated by and resembles the fire experience of one- and two- family home fires". Home fires in these dwellings declined from 591,000 in 1980 to 275,000 in 2011.*

- *The data from the NFPA report "U.S. Experience with Sprinklers"* (2009) *documents the minimal usage of sprinklers in fires reported in one- and two-family dwellings during that time, suggesting that sprinklers were irrelevant in the sharp reduction of fire incidents, injuries and deaths that occurred since the late 70s. According to the 2009 report, the number of fires reported in one- and two-family dwellings equipped with sprinklers was 0.2 percent in 1980 and 1.2 percent in 2006.*

- *In fact, sprinkler usage in one- and two-family home fires is so low that the most recent report "U.S. Experience with Sprinklers"* (2012) *does not provide separate estimates for fires in one- and two-family sprinkler-equipped dwellings but rather combines them with the fire incidents in sprinkler-equipped apartments. Still, in 2006-2010 sprinklers were present in only 6% of home fires.*

USFA and NFPA data continue to show the life-saving effectiveness of fire alarms and affirm that the vast majority of home fire fatalities occur when there are no operational smoke alarms. The number of home fires and fire deaths will continue declining as the maintenance of smoke alarms by home occupants is improved.

- *The 2011 NFPA study "Smoke Alarms in U.S. Home Fires" documents how the home smoke alarm became the fire safety success story. From 1977 to 1984, the use of home smoke alarms skyrocketed. The share of homes with at least one smoke alarm increased from 22 percent in 1977 to 74 percent in 1984 and continued to rise to 95 percent in 2004. It has hit a plateau at 96% since then.*

- *In 2005-2009, almost two-thirds of home fire deaths resulted from fires in properties without working smoke alarms.* ***The problem is not homes without sprinklers, the problem is homes without working smoke alarms.***

- *The 2008 NFPA Report "Home Smoke Alarms- The Data as Context for Decision" documents that when all reported fires are taken into account, the chance of surviving a reported home fire when smoke alarms are present and operating is 99.45%, compared 98.87% when no smoke alarms are present or when smoke alarms are present but not operational. The report also concludes that an additional 890 lives could be saved annually if every home had a working smoke alarm.*

- *The International Residential Code requires hard-wired, interconnected smoke alarms to be installed in all bedrooms, outside of them and on each additional story, including basements. When one alarm activates, all other alarms are activated as well. This effective early warning system is the most important way to protect occupants from fire.*

- *Smoke alarm technology is always changing and improving. Innovations in wireless technology and alternate signal noises that are easier for children and for seniors to hear will further improve the already overwhelming success of smoke alarm systems.*

- *When the firm Public Opinion Strategies asked 800 likely voters if fire sprinklers should be required in new homes, an overwhelming 89 percent said that smoke detectors already do an adequate job of protecting them in their homes*

The number of home fires and fire deaths will continue declining as more new housing stock is constructed since new homes are safer than ever before.

- *Technological innovations introduced in the last 50 years make homes far safer. Even as today's homes get older, they continue to offer fire protection because of previous code provisions for fire separation, fire blocking and draft stopping, emergency escape and rescue openings, electrical circuit breakers, capacity and outlet spacing, reduced need for space heaters in energy efficient homes, and many other improvements.*

- *The fire safety features will protect the home and occupants for the life of the home, unlike older homes that were not constructed with these important design features. New homes do not become more hazardous as they age.*

- *Little data is collected on the age of homes experiencing a fire, although there is anecdotal evidence that age of the structure is an important factor. Existing fire data showing the continued decline in the rate of fire incidents and fatalities is consistent with the retirement of homes not built to today's stringent code requirements. This trend continues.*

Fire sprinklers are expensive and not cost effective. Any jurisdiction considering mandatory fire sprinklers needs to determine and thoroughly consider what the true total cost to home buyers will be in their community (including additional fees that may be charged to water purveyors, etc) and what the constituents will pay collectively, before making any decision to mandate sprinklers.

- *The latest National Fire Protection Research Foundation's study "Home Fire Sprinkler Cost Assessment" (2008) designed to provide a national prospective and comprehensive overview of the home fire sprinklers costs found that the total sprinkler system costs to the homebuilder ranged from $2,386 to $16,061 with an average of over $6,300. Costs vary significantly depending on the climate, a home's location, size, layout, number of stories, access to water, etc. In comparison, whole-house interconnected smoke alarm systems are now being installed for around $50 per alarm.*

- *NAHB used the Sprinkler Use Decisioning (SPUD) tool designed by the National Institute of Standards and Technology (NIST) to compare the costs and benefits of a residential fire sprinkler system under different assumptions. The results show that sprinklers are unlikely to be economical. To generate benefits great enough to cover the sprinkler costs requires a "value of statistical life" assumption greater than those currently being used by the federal agencies or unusually inexpensive sprinkler systems with up-front costs under $3,000*[1].

- ***Often cited average sprinkler costs of $1.61 per square foot are misleading**. This average comes from the 2008 NFPA study and is based on homes with average sprinklered space of 4,118 sq ft. The NAHB analysis of the NFPA data shows that sprinkler costs per square foot are higher in smaller homes and tend to decline as homes get larger*[2]*. In addition, sprinkler contractors do not typically quote prices on a per sq ft basis, and confusion may also arise because sprinklered square footage can be quite different from a home's living space, and ideas about what counts as living space and how to measure it vary.*

- ***Potential savings in infrastructure costs for local jurisdictions are not clear. Adding fires sprinklers to new homes will not reduce fire departments' staffing or equipment needs because in most jurisdictions, staff and facilities are necessary for quick response to emergency medical services (EMS) calls and other non-fire***

[1] See Paul Emrath, *"Using NIST's New Web Tool to Compare Sprinkler Costs and Benefits"*, Housing Economics Online, September 2011.
[2] See Paul Emrath, *"Using NIST's New Web Tool to Compare Sprinkler Costs and Benefits"*, Housing Economics Online, September 2011.

rescue. *The 2013 NFPA report "Trends and Patterns of U.S. Fire Losses in 2011" shows that fires accounted for only 5 percent of all fire department responses, and out of these, only 20 percent were fires in one- and two-family homes.*

- ***Some development tradeoffs in the form of relaxed standards for new subdivisions, like allowing narrower streets, cul-de-sacs and fewer fire hydrants, could reduce costs for buyers of new homes with sprinklers but are difficult to negotiate for****. However, allowing reductions in passive fire safety provisions if sprinklers are mandated is further evidence that fire safety provisions in building codes and planning are already adequate.*

Fire Sprinklers have a dramatic negative effect on housing affordability. Mandatory fire sprinklers will make new homes prohibitively expensive and disqualify thousands of home buyers from buying new homes that are generally safer than old existing homes, even without sprinklers.

- *The total sprinkler system costs incurred by the homebuilders are ultimately passed on to the new home buyers in the form of a higher home price. The final price of the home to the buyers will increase by additional 16 percent because other costs such as commissions and financing charges will automatically rise as well[3]. This suggests that the home buyers will have to pay from $2,768 to $18,631, with an average of $7,308, more for a new home with sprinklers, automatically disqualifying thousands of home buyers from buying a new home[4].*

- *Studies have shown those at greatest risk of residential fire injury or death include residents who live in substandard housing, where preventive maintenance is less likely. Poorer, less educated Americans are more likely to live in substandard housing than wealthier, educated Americans who are in a position to buy a new home.* ***Residential fire sprinklers mandated in wealthier communities are least likely to protect those who could benefit by them the most.***

Significant technical problems still exist.

- *The NFPA report "U.S. Experience with Sprinklers"* (2009) *lists situations when the sprinkler system will not be able to prevent the loss of life:*
    1. *When the victim is too close to the source of ignition.*
    2. *When the system is damaged by the fire or an accompanying explosion.*
    3. *When the fire originates in concealed combustible locations.*
    4. *When foreign objects shield the fire from the effective coverage area of the sprinkler.*

[3] See the notes to Table 3 and the Appendix in *"How Government Regulation Affects the Price of a New Home"* Housing Economics Online, July 2011

[4] *The NAHB Priced Out Model shows that that nationally just a $1,000 increase in the home price leads to pricing out about 232,447 households out of the market for a median-priced new home.*

- *Unlike smoke alarms, there is no way to test sprinklers other than applying heat. Occupants must press the test button or use products that simulate smoke to verify that the smoke alarm is properly functioning and ready to alert occupants. Sprinkler manufacturers must rely on test sampling to see if the sprinkler will react to the presence of heat and activate. Defects with the sprinkler will not be known until the sprinkler fails to activate in a fire and reports are issued later for the recall of the defective sprinkler.*

- *The fire sprinkler valves must be checked periodically to verify the system is activated. Sprinkler heads must be checked to make sure they are clear of obstacles. Homeowners must be careful not to block them or paint over them. Also, if a backflow prevention device is installed as can be required, an expensive annual inspection may be mandated by the local water purveyor.*

- *Standards also specify that sprinkler pipes in the antifreeze-type systems installed in colder climates should be emptied and then refilled with an antifreeze solution every winter, and that monthly inspections and tests of all the water flow devices, pumps, air pressure and water level be performed.*

- *Having sprinklers provides no guarantee that fire hoses will not be used, flooding even more water into the house. Sprinklers will discharge water until the fire department has been notified, arrives on the scene, evaluates and determines the structure is safe, and then locates and turns off the water supply. Claims that less damage will be caused by a sprinkler than a fire hose are unsubstantiated.*

- *Additional home flooding risks come from the vulnerability of the pressurized sprinkler heads.*

- *They can activate if they are dislodged or disturbed, when there's horseplay or other types of negligence. Local requirements for water storage tanks and additional plumbing in the home open up the specter of frozen, pressurized pipes in some parts of the country. Adequately protecting against these problems adds further to the cost of sprinkler systems.*

- *The reliability of residential fire sprinklers is also questionable. There is no study that shows how long sprinkler systems will last. After smaller recalls by other companies in 1998 and 1999, a major fire sprinkler manufacturer recalled 35 million fire sprinkler heads in 2001. By now, any requirements that the manufacturer notify owners of homes where these defective heads have been installed have expired.*

- *Accidental discharge of sprinkler systems is another major concern. While accidental discharge due to a manufactured defect is rare, there have been several reported incidents where sprinklers have discharged when fire was not present or the cause of the discharge. Typically the sprinkler activated due to overheating, freezing, mechanical damage, corrosion, and deliberate sabotage.*

- *Sprinkler systems are expected to work in the event of the fire, but like any system maintenance is required to ensure it will operate when a fire is detected. Proponents claim that a NFPA 13 D requires no maintenance and that the system can be installed and forgotten. The fact is that all sprinkler systems, whether they are commercial or residential, require routine maintenance and inspection. NFPA 13 D states that it is the responsibility of the installer to provide the owner all the maintenance information and educate the owner how the fire suppression system works.*

- *If homeowners are led to believe that no precautions are necessary and no preventive maintenance needs to be performed, this will lead to a false sense of security.*

Fire sprinklers mandates should remain an option for state and local jurisdictions. This option is already adequately provided for in the appendix of the IRC.

- *Should a jurisdiction wish to mandate residential sprinkler systems, a provision for them to do so is now available in the IRC via adoption of Appendix P. Allowing state and local jurisdictions to decide for themselves based on the specific needs and concerns of their communities is the most appropriate approach. That approach was overwhelmingly endorsed by the ICC at the previous Final Action Hearings, where inclusion of the appendix was approved for that very reason -- even by the building officials who do believe sprinklers should be mandated – and that action should be honored and upheld.*

- *The IRC clearly states, "The purpose of this code is to provide minimum requirements to safeguard life or limb, health and public welfare." The IRC Commentary states that the IRC is intended to provide reasonable minimum standards that reduce the factors of hazardous and substandard conditions that would otherwise put the public at risk to damaging their health, safety or welfare. Any imposition of a mandated sprinkler requirement is excessive and is not a reasonable minimum standard for meeting the "purpose" of the code. It is important to remember that the code is composed of many life-safety standards that have been proven to meet the "purpose" of the code. Proposals to mandate sprinklers as a requirement in the body of the IRC rather than an adoptable appendix exceed this "purpose" and should not approved.*

Mastering the 10-Minute Mini-Lesson

SAMPLE LESSON PLAN

Topic: Working Smoke Alarms Save Lives
Audience: Adult Attendees of a Rotary Club Meeting
Lesson Objective: By the end of the mini-lesson, attendees will be able to explain 3 behaviors necessary to ensure smoke alarms can serve as life-saving devices.

Educational Messages to Review:

1 Smoke Alarms

1.3.1 Test smoke alarms at least once a month using the test button.

1.5.1 Smoke alarms with non-replaceable (long-life batteries) are designed to remain effective for up to 10 years. If the alarm chirps, warning that the battery is low, replace the entire smoke alarm right away.

1.5.2 For smoke alarms with any other type of battery, replace batteries at least once a year. If that alarm chirps, replace only the battery.

1.6.1 Replace all smoke alarms when they are 10 years old.

Step 1: Introduction (2–3 Minutes)

- *Before you start:* Place a chirping smoke alarm with a low battery near the podium. Do not tell your audience it has a low battery.
- Greet the participants and thank them for allowing you to speak for 10 minutes. Let them know you are happy to be there.
- Introduce yourself and share your connection to the community.
- **HOOK:** Share a brief news article about a fire in which non-working smoke alarms were in place.

Ex.) From Firewatch in the NFPA Journal, March/April 2014

PENNSYLVANIA — Smoke from a small fire killed a 93-year-old woman and an 84-year-old man, who had a mobility disability, in a bedroom in their single-family. The fire began when a worn electrical cord arced and overheated, igniting health care supplies underneath the victim's hospital bed.

The fire occurred in a single-story, wood-frame house with an asphalt shingled roof that covered an area of approximately 930 square feet (86 square meters). A single smoke alarm had been installed in the kitchen pantry, but its battery was dead. There were no sprinklers.

One of the occupants noticed the fire and called 911 at 1:18 a.m. Arriving firefighters found that the fire had burned itself out, but not before the man and woman were both exposed to high levels of carbon monoxide.

- Ask audience members how they feel about the story. Folks will likely say things like sad, frustrated, could've been prevented, etc…
- Explain the purpose of your visit: "Each year, too many people die in home fires that could have been detected by working smoke alarms. It isn't enough to install the alarms. They must also be maintained. Let's spend a few minutes today talking about how to make sure your smoke alarms can keep you safe."

Step 2: Body of the Presentation (5–6 minutes)

- Share the following concept with the audience: (Use props and/or visuals to increase engagement)
  "A Rule to Live By: Once a month, Once a year, Once a decade"
- Inform the audience that the Once a month, Once a year, Once a decade rule will help them to keep their smoke alarms in working order.

  ASK: In reference to smoke alarms, what does "**Once a month**" refer to?
- Everyone should test home smoke alarms at least once a month using the test button.

ASK: What is the sound of a working smoke alarm?

Beep, Beep, Beep, pause Beep, Beep, Beep
Press the test button on a smoke alarm as a demonstration. Warn the crowd first.

ASK: What is your smoke alarm telling you if it "chirps"?

The battery is low. If you have a smoke alarm with standard batteries, install a new battery when the alarm chirps. If your smoke alarm has long-life, non-replaceable batteries, you must replace the entire smoke alarm if it chirps.

At this point, refer to the chirping smoke alarm you've placed near the podium if an audience member hasn't pointed it out already. Let folks know that this is the sound that tells them the battery is low.

ASK: How about "**Once a year**"? What must you do once a year with your smoke alarms?

Change the battery if your smoke alarm uses standard batteries.
If you have long-life, non-replaceable batteries in your smoke alarm, you can skip this step.

- Here's the big question! "**Once a decade!**" Ten Years!

  ASK: What must happen "Once a decade," every 10 years, in order to ensure you have working smoke alarms?

  Replace the smoke alarm. Smoke alarms have a shelf life. They are designed to be effective for up to 10 years. Replace all types of smoke alarms when they are 10 years old. When you install a new smoke alarm, write the date on the back of it to remind you when you will need a new one.

Step 3: Conclusion (1–2 minutes)

- Let's review! Ask the audience members to respond in unison: When you say "What's the Rule to Live By?" they respond with "**Once a month, Once a year, Once a decade!**" Do this a few times until you feel the group is responding energetically.
- Ask for volunteers to remind everyone what each time frame requires:

  Once a month: Test your smoke alarms using the test button
  Once a year: Change the battery if your smoke alarm uses standard batteries
  Once a decade: Replace the smoke alarm with a new one.

- Remind the audience that simple steps will help increase safety in the home.
- Share your contact information and encourage attendees to contact you if they have questions or concerns about other fire issues.
- Thank everyone for their time and for inviting you to speak.

Nearly 60% of U.S. Households Unable to Afford a $300K Home

Housing Affordability

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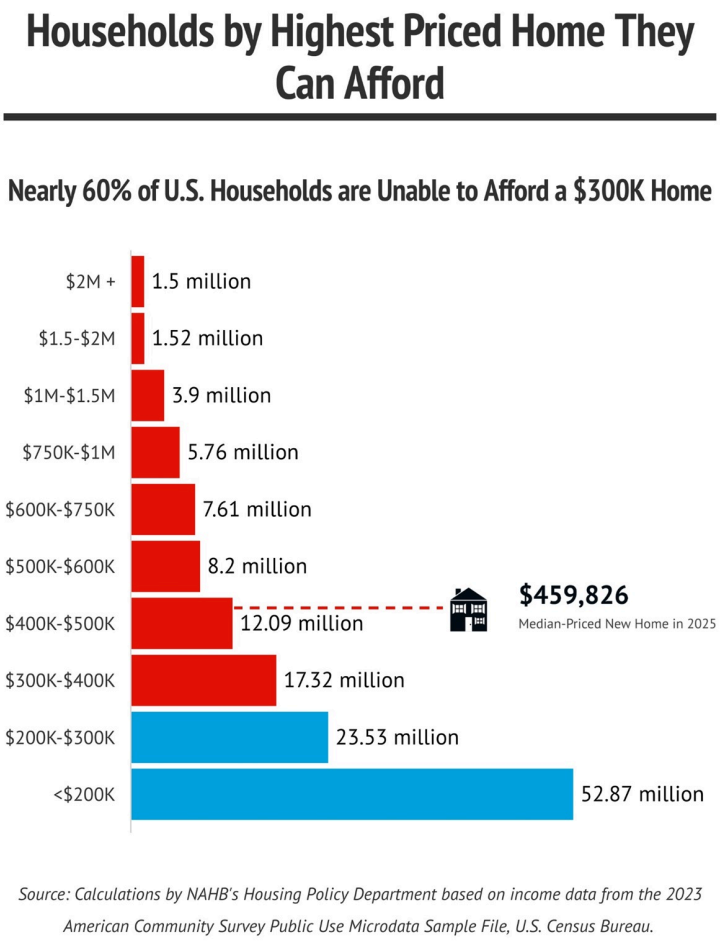
Contact:

Na Zhao
nzhao@nahb.org (mailto:nzhao@nahb.org)
Principal Economist
(202) 266-8398

NAHB has updated its housing affordability graph for 2025, and the latest data show that 76.4 million households — 57% out of a total of 134.3 million — are unable to afford a $300,000 home.

The graph is based on conventional underwriting standards that assume the cost of a mortgage, property taxes and property insurance should not exceed 28% of household income. Based on this methodology, NAHB economists have calculated how many households have enough income to afford a home at various price thresholds.



Source: Calculations by NAHB's Housing Policy Department based on income data from the 2023 American Community Survey Public Use Microdata Sample File, U.S. Census Bureau.

For example, the minimum income required to purchase a $200,000 home with a mortgage rate of 6.5% is $61,487. At the base of the graph are 52.87 million U.S. households with insufficient incomes (below $61,487) to be able to afford a $200,000 home.

The graph's second step consists of 23.53 million with enough income to afford a top price somewhere between $200,000 and $300,000. Adding up the bottom two rungs shows that there are 76.4 million households who cannot afford a $300,000 home.

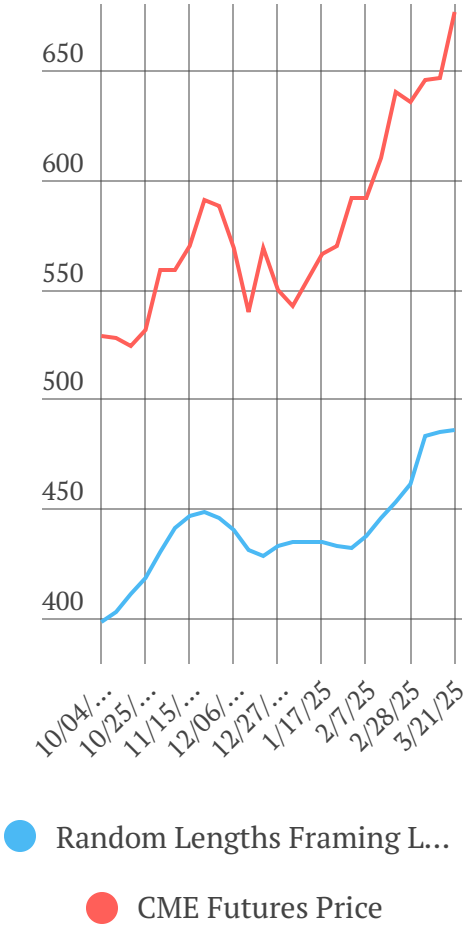
The nationwide median price of a new single-family home is $459,826, meaning half of all new homes sold in the U.S. cost more than this figure and half cost less. A total of 100.6 million households — roughly 75% of all U.S. households — cannot afford this median-priced new home based on a mortgage rate of 6.5%.

The top of the graph shows that 6.92 million households (adding up the top three rungs) have enough income to buy a $1 million home, and 1.5 million even have enough for a home priced above $2 million. But market analysts should never focus on this to the exclusion of the wider steps that support the graph's base.

This graph clearly illustrates the nation's housing affordability crisis. NAHB has put out a **10-point plan** (https://www.nahb.org/advocacy/top-priorities/solving-the-housing-affordability-crisis/housing-affordability-blueprint) to address this urgent issue. The plan outlines initiatives that can be taken at the local, state and federal levels to address the root of the problem — impediments to increasing the nation's housing supply.

See more details and read the full study here. (https://www.nahb.org/news-and-economics/housing-economics/housings-economic-impact/households-priced-out-by-higher-house-prices-and-interest-rates)

The Latest Framing Lumber Prices



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RESEARCH

US Fire Death Rates by State

Supporting Tables

December 2021

Marty Ahrens

US Fire Death Rate by State: Supporting Tables

This report uses death certificate data collected by the National Center for Health Statistics (NCHS) and accessible at the Centers for Disease Control and Prevention's (CDC's) Web-based Injury Statistics Query and Reporting System (WISQARS™) Fatal Injury Reports site to provide the average number of fire or flame deaths and the average fire or flame death rates per year by state for 2015–2019. Comparisons are made between the most recent period and 1981–1985 and 2010–2014. Correlated demographic factors are shown along with state rankings for fire death rates and specific factors.

Acknowledgments

The National Fire Protection Association thanks the NHCS for their compilation of death certificate data and the CDC for their online tools WISQARS™ and WONDER, which can be used to query the NCHS data, as well as for current smoker data from the CDC's Behavioral Risk Factor Surveillance System. Thanks are also due to the US Census Bureau and their American Community Survey.

To learn more about research at NFPA, visit nfpa.org/research.
Email: research@nfpa.org

NFPA No. USS15-ST

Table 1. Fire Deaths by State as Identified by National Center for Health Statistics Death Certificate
Data: 1981–1985, 2010–2014, and 2015–2019 Annual Averages

State	1981–1985		2010–2014		2015–2019		Percent Reduction	
	Deaths	Rank	Deaths	Rank	Deaths	Rank	1981–1985 to 2015–2019	2010–2014 to 2015–2019
Alabama	154	(14)	99	(12)	90	(13)	41%	9%
Alaska	20	(39)	14	(39)	15	(40)	26%	−6%
Arizona	43	(33)	47	(26)	49	(26)	−13%	−4%
Arkansas	86	(25)	56	(23)	65	(22)	25%	−16%
California	384	(2)	190	(2)	234	(1)	39%	−23%
Colorado	39	(34)	29	(33)	34	(33)	13%	−16%
Connecticut	48	(31)	25	(34)	22	(35)	55%	14%
Delaware	16	(44A)	9	(46)	10	(45)	37%	−9%
Florida	222	(8)	121	(6B)	134	(6)	40%	−11%
Georgia	223	(7)	121	(6A)	128	(8)	42%	−6%
Hawaii	8	(49)	6	(47B)	7	(47A)	8%	−19%
Idaho	17	(41A)	13	(40A)	14	(41)	13%	−7%
Illinois	296	(5)	117	(10)	132	(7)	55%	−13%
Indiana	143	(17)	88	(13A)	81	(16)	43%	7%
Iowa	49	(30)	35	(29A)	45	(29)	7%	−28%
Kansas	52	(29)	35	(29B)	41	(31)	20%	−18%
Kentucky	108	(22)	76	(18)	77	(17B)	29%	−1%
Louisiana	158	(13)	70	(20)	77	(17A)	51%	−10%
Maine	34	(35)	16	(38)	17	(37A)	49%	−6%
Maryland	120	(20)	55	(24)	57	(23)	53%	−3%
Massachusetts	119	(21)	32	(32)	47	(27)	60%	−48%
Michigan	246	(6)	125	(5)	108	(11)	56%	14%

Table 1. Fire Deaths by State as Identified by National Center for Health Statistics Death Certificate Data: 1981–1985, 2010–2014, and 2015–2019 Annual Averages (Continued)

State	1981–1985 Deaths	Rank	2010–2014 Deaths	Rank	2015–2019 Deaths	Rank	Percent Reduction 1981–1985 to 2015–2019	Percent Reduction 2010–2014 to 2015–2019
Minnesota	69	(27)	42	(27A)	46	(28)	33%	−9%
Mississippi	138	(18)	80	(17)	71	19B	49%	11%
Missouri	137	(19)	88	(13B)	94	(12)	32%	−7%
Montana	16	(44B)	13	(40B)	11	(43A)	28%	15%
Nebraska	27	(36)	17	(37)	17	(37B)	36%	−4%
Nevada	16	(44C)	21	(36)	21	(36)	−33%	−1%
New Hampshire	17	(41B)	11	(43B)	11	(43B)	34%	0%
New Jersey	190	(11)	63	(21)	53	(25)	72%	16%
New Mexico	22	(37)	23	(35)	25	(34)	−12%	−8%
New York	436	(1)	151	(4)	164	(3)	62%	−9%
North Carolina	210	(10)	118	(9)	123	(9)	41%	−4%
North Dakota	15	(47A)	5	(49)	6	(49)	60%	−11%
Ohio	221	(9)	119	(8)	149	(4)	33%	−25%
Oklahoma	100	(23)	72	(19)	71	(19A)	29%	1%
Oregon	47	(32)	35	(29C)	43	(30)	7%	−25%
Pennsylvania	297	(4)	155	(3)	144	(5)	51%	7%
Rhode Island	17	(41C)	11	(43C)	5	(50)	70%	53%
South Carolina	153	(15)	82	(15A)	87	(14)	43%	−6%
South Dakota	15	(47B)	13	(40C)	13	(42)	14%	0%
Tennessee	159	(12)	102	(11)	110	(10)	31%	−8%
Texas	376	(3)	208	(1)	205	(2)	46%	2%
Utah	20	(38)	11	(43A)	17	(37C)	18%	−46%
Vermont	18	(40)	5	(50)	8	(46)	54%	−68%

Table 1. Fire Deaths by State as Identified by National Center for Health Statistics Death Certificate Data: 1981–1985, 2010–2014, and 2015–2019 Annual Averages (Continued)

State	1981–1985 Deaths	Rank	2010–2014 Deaths	Rank	2015–2019 Deaths	Rank	Percent Reduction 1981–1985 to 2015–2019	Percent Reduction 2010–2014 to 2015–2019
Virginia	149	(16)	82	(15B)	86	(15)	42%	−5%
Washington	75	(26)	59	(22)	68	(21)	10%	−15%
West Virginia	69	(28)	42	(27B)	40	(32)	41%	5%
Wisconsin	88	(24)	51	(25)	55	(24)	37%	−8%
Wyoming	7	(50)	6	(47A)	7	(47B)	−3%	−9%
Total	5,712		3,071		3,241		43%	−6%
District of Columbia	25		8		6		78%	33%

Note: Estimates are five-year annual averages. An average of 5 deaths per year represents a total of 23–27 deaths over the five-year period. Because of different definitions and practices, these averages may differ somewhat from those of state fire agencies. When the percent reduction is a negative number, it means that the average number of deaths increased.

Source: NCHS death certificate data accessed through CDC's WISQARS™ in June 2019.

Table 2. Fire Death Rates per Million Population by State: 1981–1985, 2010–2014, and 2015–2019 Annual Averages

State	1981–1985 Rate	1981–1985 Rank	2010–2014 Rate	2010–2014 Rank	2015–2019 Rate	2015–2019 Rank	Percent Reduction 1981–1985 to 2015–2019	Percent Reduction 2010–2014 to 2015–2019
Alabama	39.0	(4)	20.5	(3)	18.5	(5)	53%	10%
Alaska	41.2	(3)	19.0	(5)	19.8	(4)	52%	–4%
Arizona	14.5	(46)	7.2	(42)	7.0	(40B)	52%	3%
Arkansas	37.4	(6)	19.1	(4)	21.7	(3)	42%	–14%
California	15.2	(45)	5.0	(47)	5.9	(46A)	61%	–19%
Colorado	12.5	(49)	5.6	(46)	6.1	(44)	52%	–8%
Connecticut	15.2	(44)	7.0	(44)	6.0	(45)	60%	14%
Delaware	26.7	(18)	10.3	(24A)	10.7	(26)	60%	–4%
Florida	20.6	(29)	6.3	(45)	6.4	(43)	69%	–3%
Georgia	38.7	(5)	12.3	(16B)	12.3	(18)	68%	–1%
Hawaii	7.9	(50)	4.5	(49)	5.2	(49)	34%	–17%
Idaho	16.9	(40)	8.4	(34)	8.4	(34B)	50%	0%
Illinois	26.0	(21)	9.1	(29)	10.3	(28)	60%	–14%
Indiana	26.2	(20)	13.4	(13)	12.2	(19)	53%	9%
Iowa	17.1	(39)	11.5	(21)	14.5	(13)	15%	–26%
Kansas	21.4	(27)	12.2	(18B)	14.2	(14)	34%	–16%
Kentucky	29.4	(14)	17.2	(8)	17.2	(8)	41%	0%
Louisiana	36.2	(7)	15.3	(11)	16.6	(9)	54%	–8%
Maine	29.8	(13)	12.3	(16A)	13.0	(16)	56%	–6%
Maryland	27.7	(15)	9.4	(28)	9.5	(30B)	66%	–1%
Massachusetts	20.4	(31)	4.8	(48)	6.9	(42)	66%	–43%
Michigan	27.1	(17)	12.6	(15)	10.8	(25)	60%	14%
Minnesota	16.7	(42)	7.9	(38)	8.3	(36)	50%	–5%

Table 2. Fire Death Rates per Million Population by State:
1981–1985, 2010–2014, and 2015–2019 Annual Averages (Continued)

State	1981–1985		2010–2014		2015–2019		Percent Reduction	
	Rate	Rank	Rate	Rank	Rate	Rank	1981–1985 to 2015–2019	2010–2014 to 2015–2019
Mississippi	53.8	(1)	26.7	(1)	23.7	(1)	56%	11%
Missouri	27.6	(16)	14.5	(12)	15.3	(11)	45%	–5%
Montana	19.5	(32)	13.3	(14)	10.9	(24)	44%	18.6%
Nebraska	16.9	(41)	9.0	(30)	9.0	(33)	47%	0%
Nevada	17.3	(37)	7.5	(41)	7.0	(40A)	60%	7%
New Hampshire	17.2	(38)	8.3	(35)	8.2	(37)	53%	2%
New Jersey	25.4	(22)	7.1	(43)	5.9	(46B)	77%	16%
New Mexico	15.8	(43)	11.0	(23)	11.8	(22)	26%	–7%
New York	24.7	(24)	7.7	(39A)	8.4	(34A)	66%	–9%
North Carolina	34.4	(10)	12.1	(20)	12.0	(20B)	65%	1%
North Dakota	22.3	(26)	7.7	(39B)	7.9	(38)	64%	–3%
Ohio	20.5	(30)	10.3	(24B)	12.7	(17)	38%	–24%
Oklahoma	31.0	(12)	18.8	(6)	18.1	(6)	42%	3%
Oregon	17.6	(34)	8.9	(31A)	10.5	(27)	40%	–18%
Pennsylvania	25.1	(23)	12.2	(18A)	11.3	(23)	55%	7%
Rhode Island	17.3	(36)	10.1	(26)	4.7	(50)	73%	53%
South Carolina	47.3	(2)	17.4	(7)	17.3	(7)	63%	0%
South Dakota	21.3	(28)	15.4	(10)	14.7	(12)	31%	4%
Tennessee	34.0	(11)	15.8	(9)	16.3	(10)	52%	–3%
Texas	24.1	(25)	8.0	(36B)	7.2	(39)	70%	9%
Utah	12.7	(48)	4.0	(50)	5.4	(48)	58%	–34%
Vermont	34.8	(9)	8.0	(36A)	13.5	(15)	61%	–68%
Virginia	26.7	(19)	10.0	(27)	10.2	(29)	62%	–2%

Table 2. Fire Death Rates per Million Population by State:
1981–1985, 2010–2014, and 2015–2019 Annual Averages (Continued)

State	1981–1985 Rate	1981–1985 Rank	2010–2014 Rate	2010–2014 Rank	2015–2019 Rate	2015–2019 Rank	Percent Reduction 1981–1985 to 2015–2019	Percent Reduction 2010–2014 to 2015–2019
Washington	17.5	(35)	8.5	(33)	9.1	(32)	48%	–7%
West Virginia	35.4	(8)	22.9	(2)	22.1	(2)	38%	3%
Wisconsin	18.5	(33)	8.9	(31B)	9.5	(30A)	49%	–7%
Wyoming	13.5	(47)	11.1	(22)	12.0	(20A)	11%	–8%
United States	24.4		11.1		9.7		60%	12%
District of Columbia	39.7		13.3		8.1		80%	39%

Note: Because of different definitions and practices, these rates may differ somewhat from those of state fire agencies. When the percent reduction is a negative number, it means that the average fire death rate increased. See appendix B for fire death rates by state for 1986–1990, 1991–1995, 1996–1998, 1999–2000, and 2001–2005.

Sources: NCHS death certificate data and US Census population data accessed through CDC's WISQARS™ in June 2019.

Table 3. Fire Death Rates per Million Population Compared to State Racial and Ethnic Composition: 2015–2019

State	Fire Deaths per Million Population Average	Rank	African American or Black Percent	Rank	Native American or Alaska Native Percent	Rank	Asian, Native Hawaiian, or Pacific Islander Percent	Rank	Hispanic or Latino Percent	Rank	White Non-Hispanic, Non-Latino Percent	Rank
Mississippi	23.7	(1)	38.3%	(1)	0.6%	(35A)	1.2%	(48)	3.2%	(47)	57%	(39A)
West Virginia	22.1	(2)	4.1%	(38)	0.3%	(49B)	0.9%	(50)	1.6%	(50)	93%	(3)
Arkansas	21.7	(3)	16.2%	(13)	1.1%	(22C)	2.1%	(35B)	7.5%	(28)	74%	(24A)
Alaska	19.8	(4)	4.9%	(36)	17.3%	(1)	8.5%	(7)	7.1%	(30)	64%	(33B)
Alabama	18.5	(5)	27.3%	(6)	0.8%	(27B)	1.7%	(44B)	4.3%	(39)	66%	(31)
Oklahoma	18.1	(6)	8.9%	(27)	10.7%	(3)	2.7%	(31)	10.6%	(20)	69%	(28B)
South Carolina	17.3	(7)	28.0%	(5)	0.6%	(35C)	2.0%	(38D)	5.7%	(34)	65%	(32)
Kentucky	17.2	(8)	9.0%	(26)	0.3%	(49A)	1.8%	(42A)	3.7%	(5B)	86%	(7)
Louisiana	16.6	(9)	33.3%	(2)	0.9%	(25B)	2.0%	(38A)	5.1%	(37A)	60%	(38)
Tennessee	16.3	(10)	17.7%	(11)	0.5%	(42B)	2.1%	(35C)	5.4%	(35A)	75%	(23)
Missouri	15.3	(11)	12.6%	(20B)	0.7%	(29B)	2.4%	(34)	4.2%	(40)	81%	(13B)
South Dakota	14.7	(12)	2.6%	(43)	9.7%	(4)	1.7%	(44A)	4.0%	(41)	83%	(10B)
Iowa	14.5	(13)	4.5%	(37)	0.6%	(35D)	2.8%	(30)	6.0%	(33)	87%	(6)
Kansas	14.2	(14)	7.1%	(31)	1.5%	(19)	3.4%	(24)	11.9%	(17)	77%	(20B)
Vermont	13.5	(15)	1.7%	(47A)	0.5%	(42A)	2.0%	(38C)	1.9%	(48)	94%	(2)
Maine	13.0	(16)	1.9%	(45)	0.8%	(27A)	1.4%	(46)	1.7%	(49)	94%	(1)
Ohio	12.7	(17)	13.8%	(17)	0.4%	(46C)	2.6%	(32B)	3.8%	(43A)	80%	(15C)

Table 3. Fire Death Rates per Million Population Compared to State Racial and Ethnic Composition: 2015–2019 (Continued)

State	Fire Deaths per Million Population Average	Rank	African American or Black Percent	Rank	Native American or Alaska Native Percent	Rank	Asian, Native Hawaiian, or Pacific Islander Percent	Rank	Hispanic or Latino Percent	Rank	White Non-Hispanic, Non-Latino Percent	Rank
Georgia	12.3	(18)	33.0%	(3)	0.6%	(35F)	4.5%	(16)	9.6%	(24)	54%	(44)
Indiana	12.2	(19)	10.6%	(23)	0.5%	(42C)	2.6%	(32A)	6.9%	(31)	80%	(15A)
Wyoming	12.0	(20A)	1.7%	(47B)	3.0%	(8)	1.3%	(47)	9.9%	(23)	85%	(9)
North Carolina	12.0	(20B)	23.0%	(8)	1.7%	(15B)	3.3%	(25A)	9.4%	(25A)	64%	(33A)
New Mexico	11.8	(22)	3.1%	(40)	11.5%	(2)	2.1%	(35A)	48.8%	(1)	38%	(49)
Pennsylvania	11.3	(23)	12.6%	(20A)	0.4%	(46A)	3.8%	(22)	7.3%	(29)	77%	(20A)
Montana	10.9	(24)	1.0%	(50)	7.3%	(5)	1.1%	(49)	3.9%	(42)	88%	(5)
Michigan	10.8	(25)	15.0%	(16)	0.9%	(25A)	3.5%	(23)	5.1%	(37B)	76%	(22)
Delaware	10.7	(26)	23.9%	(7)	0.7%	(29A)	4.3%	(17)	9.2%	(27)	64%	(33C)
Oregon	10.5	(27)	2.8%	(42)	2.2%	(10)	5.7%	(12)	13.0%	(14)	78%	(19)
Illinois	10.3	(28)	15.3%	(15)	0.7%	(29E)	6.0%	(11)	17.1%	(10)	62%	(37)
Virginia	10.2	(29)	20.8%	(9)	0.6%	(35B)	7.3%	(8)	9.4%	(25B)	63%	(36)
Wisconsin	9.5	(30A)	7.3%	(28B)	1.3%	(20)	3.1%	(27A)	6.8%	(32)	82%	(12)
Maryland	9.5	(30B)	31.9%	(4)	0.7%	(29D)	7.1%	(10)	10.1%	(22)	52%	(45)
Washington	9.1	(32)	5.3%	(34B)	2.3%	(9)	10.6%	(3)	12.7%	(15)	71%	(27)
Nebraska	9.0	(33)	5.8%	(32)	1.6%	(17A)	2.9%	(29)	10.9%	(19)	80%	(15B)
New York	8.4	(34A)	18.5%	(10)	1.1%	(22A)	9.3%	(6)	19.0%	(9)	57%	(39B)
Idaho	8.4	(34B)	1.2%	(49)	2.0%	(11A)	2.0%	(38B)	12.5%	(16)	83%	(10A
Minnesota	8.3	(36)	7.3%	(28A)	1.6%	(17B)	5.3%	(14)	5.4%	(35B)	81%	(13A)

Table 3. Fire Death Rates per Million Population Compared to State Racial and Ethnic Composition: 2015–2019 (Continued)

State	Fire Deaths per Million Population		African American or Black		Native American or Alaska Native		Asian, Native Hawaiian, or Pacific Islander		Hispanic or Latino		White Non-Hispanic, Non-Latino	
	Average	Rank	Percent	Rank	Percent	Rank	Percent	Rank	Percent	Rank	Percent	Rank
New Hampshire	8.2	(37)	2.0%	(44)	0.4%	(46B)	3.1%	(27B)	3.7%	(45A)	91%	(4)
North Dakota	7.9	(38)	3.5%	(39)	6.0%	(6)	1.8%	(42A)	3.8%	(43B)	86%	(8)
Texas	7.2	(39)	13.1%	(18)	1.1%	(22B)	5.4%	(13)	39.3%	(2)	43%	(47)
Nevada	7.0	(40A)	11.0%	(22)	1.9%	(13A)	10.2%	(4)	28.7%	(5)	51%	(46)
Arizona	7.0	(40B)	5.7%	(33)	5.7%	(7)	4.2%	(18)	31.3%	(4)	56%	(41B)
Massachusetts	6.9	(42)	9.5%	(24)	0.6%	(35E)	7.3%	(9)	11.8%	(18)	73%	(26)
Florida	6.4	(43)	17.5%	(12)	0.6%	(35G)	3.3%	(25B)	25.6%	(6)	55%	(43)
Colorado	6.1	(44)	5.3%	(34A)	1.9%	(13B)	4.0%	(19C)	21.5%	(7)	69%	(28A)
Connecticut	6.0	(45)	12.7%	(19)	0.7%	(29F)	5.1%	(15)	16.1%	(11)	68%	(30)
California	5.9	(46A)	7.2%	(30)	2.0%	(11B)	16.5%	(2)	39.0%	(3)	39%	(48)
New Jersey	5.9	(46B)	15.7%	(14)	0.7%	(29C)	10.1%	(5)	20.2%	(8)	56%	(41A)
Utah	5.4	(48)	1.8%	(46)	1.7%	(15A)	4.0%	(19B)	14.0%	(13)	80%	(15D)
Hawaii	5.2	(49)	3.0%	(41)	0.5%	(42D)	66.0%	(1)	10.5%	(21)	26%	(50)
Rhode Island	4.7	(50)	9.3%	(25)	1.2%	(21)	4.0%	(19A)	15.4%	(12)	74%	(24B)
US Overall	10.0		14.1%		1.4%		6.4%		18.0%		61.9%	
District of Columbia	8.1		48.6%		0.7%		4.8%		11.0%		37%	

Note: Numeric rank is from one to fifty, with one indicating the highest rate or percentage.

Sources: NCHS death certificate data accessed through CDC's WISQARS™ and the American Community Survey 2015–2019 five-year estimates from ACS Table ID: DP05, "Demographic and Housing Characteristics: 2019 Five-Year Estimates Data Profiles." Both were accessed in the summer of 2021.

Table 4. Average Fire Death Rates per Million Population in 2015–2019 Versus Potentially Related Characteristics Other Than Race or Ethnicity by State

	Fire Deaths per Million Population 2015–2019		People with Income Below the Poverty Line 2015–2019		People Living in a Poverty Area* 2015–2019		Community Residents with a Disability 2015–2019		Current Adult Smokers 2015–2019		People Living in Rural Communities 2010	
State	**Average**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**
Mississippi	23.7	(1)	20.3%	(1)	42.4%	(1)	16.4%	(4)	21.7%	(5)	50.7%	(4)
West Virginia	22.1	(2)	17.6%	(4)	33.4%	(4B)	19.5%	(1)	25.1%	(1)	51.3%	(3)
Arkansas	21.7	(3)	17.0%	(6)	31.6%	(6)	17.3%	(3)	22.7%	(3)	43.8%	(6)
Alaska	19.8	(4)	10.7%	(39A)	10.3%	(42A)	12.2%	(31B)	19.1%	(13)	34.0%	(14)
Alabama	18.5	(5)	16.7%	(7)	31.2%	(7)	16.3%	(5)	20.7%	(10)	41.0%	(9)
Oklahoma	18.1	(6)	15.7%	(8)	27.0%	(10)	16.1%	(6)	20.1%	(11)	33.8%	(16)
South Carolina	17.3	(7)	15.2%	(9A)	26.9%	(11)	14.5%	(12A)	18.8%	(15A)	33.7%	(17)
Kentucky	17.2	(8)	17.3%	(5)	35.4%	(4A)	17.5%	(2)	24.4%	(2)	41.6%	(8)
Louisiana	16.6	(9)	19.2%	(2)	38.7%	(3)	15.3%	(9A)	22.0%	(4)	26.8%	(24)
Tennessee	16.3	(10)	15.2%	9B	26.6%	(12)	15.4%	(8)	21.4%	(6)	33.6%	(18)
Missouri	15.3	(11)	13.7%	(19)	20.3%	(23)	14.6%	(11)	20.8%	(8A)	29.6%	(20)
South Dakota	14.7	(12)	13.1%	(23D)	16.8%	(27)	12.0%	(33)	19.0%	(14)	43.4%	(7)
Iowa	14.5	(13)	11.5%	(33)	12.3%	(38)	11.7%	(35A)	17.0%	(24)	36.0%	(12)
Kansas	14.2	(14)	12.0%	(30)	16.2%	(29)	13.0%	(25B)	17.2%	(22)	25.8%	(26)
Vermont	13.5	(15)	10.9%	(37)	7.9%	(48)	14.5%	(12B)	15.5%	(32)	61.1%	(2)
Maine	13.0	(16)	11.8%	(31B)	13.1%	(35)	16.0%	(7)	18.4%	(18)	61.3%	(1)
Ohio	12.7	(17)	14.0%	(17B)	22.2%	(17)	14.0%	(16A)	21.3%	(7)	22.1%	(31)
Georgia	12.3	(18)	15.1%	(11B)	27.5%	(9)	12.4%	(31A)	17.1%	(23)	24.9%	(28)
Indiana	12.2	(19)	13.4%	(20B)	21.2%	(21)	13.7%	(18)	20.8%	(8A)	27.6%	(22)
Wyoming	12.0	(20A)	11.0%	(36)	9.8%	(44B)	13.1%	(24)	18.8%	(15A)	35.2%	(13)
North Carolina	12.0	(20B)	14.7%	(13A)	24.4%	(14)	13.4%	(21B)	18.0%	(19)	33.9%	(15)
New Mexico	11.8	(22)	19.1%	(3)	41.0%	(2)	15.3%	(9B)	16.6%	(26B)	22.6%	(30)

Table 4. Average Fire Death Rates per Million Population in 2015–2019 Versus Potentially Related Characteristics Other Than Race or Ethnicity by State (Continued)

	Fire Deaths per Million Population 2015–2019		People with Income Below the Poverty Line 2015–2019		People Living in a Poverty Area* 2015–2019		Community Residents with a Disability 2015–2019		Current Adult Smokers 2015–2019		People Living in Rural Communities 2010	
State	**Average**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**
Pennsylvania	11.3	(23)	12.4%	(28A)	17.6%	(26)	14.0%	(16B)	17.8%	(20A)	21.3%	(32)
Montana	10.9	(24)	13.1%	(23B)	18.1%	(25)	13.6%	(19)	17.8%	(20A)	44.1%	(5)
Michigan	10.8	(25)	14.4%	(15)	21.5%	(19A)	14.2%	(15)	19.6%	(12)	25.4%	(27)
Delaware	10.7	(26)	11.8%	(31A)	15.0%	(31)	12.7%	(28A)	16.9%	(25)	16.7%	(34)
Oregon	10.5	(27)	13.2%	(22)	15.8%	(30)	14.4%	(14)	15.9%	(31)	19.0%	(33)
Illinois	10.3	(28)	12.5%	(27)	18.8%	(24)	11.0%	(43A)	15.3%	(34B)	11.5%	(41)
Virginia	10.2	(29)	10.6%	(41)	13.0%	(36)	11.8%	(34)	15.4%	(33)	24.6%	(29)
Wisconsin	9.5	(30A)	11.3%	(34)	12.4%	(37)	11.7%	(35B)	16.4%	(28)	29.9%	(19)
Maryland	9.5	(30B)	9.2%	(49)	8.4%	(47)	11.0%	(43B)	13.6%	(43A)	12.8%	(38)
Washington	9.1	(32)	10.8%	(38)	10.3%	(42B)	12.7%	(28A)	13.4%	(45A)	16.0%	(35)
Nebraska	9.0	(33)	11.1%	(35)	11.8%	(39B)	11.6%	(37B)	16.0%	(30)	26.9%	(23)
New York	8.4	(34A)	14.1%	(16)	23.2%	(15)	11.5%	(39A)	13.8%	(42)	12.1%	(39)
Idaho	8.4	(34B)	13.1%	(23A)	16.4%	(28)	13.5%	(20)	14.5%	(40B)	29.4%	(21)
Minnesota	8.3	(36)	9.7%	(47)	10.5%	(41)	10.8%	(46)	15.1%	(36)	26.7%	(25)
New Hampshire	8.2	(37)	7.6%	(50)	5.2%	(50)	12.8%	(27)	16.2%	(29)	39.7%	(11)
North Dakota	7.9	(38)	10.7%	(39B)	9.4%	(46)	11.0%	(43C)	18.6%	(17)	40.1%	(10)
Texas	7.2	(39)	14.7%	(13B)	26.3%	(13)	11.5%	(39B)	14.9%	(37)	15.3%	(36)
Nevada	7.0	(40A)	13.1%	(23C)	21.8%	(18)	12.6%	(30)	16.6%	(26A)	5.8%	(48)
Arizona	7.0	(40B)	15.1%	(11A)	28.4%	(8)	13.0%	(25A)	14.6%	(39)	10.2%	(42)
Massachusetts	6.9	(42)	10.3%	(42B)	13.8%	(32)	11.6%	(37A)	13.4%	(45B)	8.0%	(47)
Florida	6.4	(43)	14.0%	(17A)	22.3%	(16)	13.4%	(21A)	15.3%	(34A)	8.8%	(45)
Colorado	6.1	(44)	10.3%	(42A)	11.8%	(39A)	10.6%	(47B)	14.8%	(38)	13.9%	(37)
Connecticut	6.0	(45)	9.9%	(45)	13.3%	(34)	11.2%	(41A)	12.8%	(48)	12.0%	(40)

Table 4. Average Fire Death Rates per Million Population in 2015–2019 Versus Potentially Related Characteristics Other Than Race or Ethnicity by State (Continued)

	Fire Deaths per Million Population 2015–2019		People with Income Below the Poverty Line 2015–2019		People Living in a Poverty Area* 2015–2019		Community Residents with a Disability 2015–2019		Current Adult Smokers 2015–2019		People Living in Rural Communities 2010	
State	**Average**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**	**Percent**	**Rank**
California	5.9	(46A)	13.4%	(20A)	20.9%	(22)	10.6%	(47A)	11.0%	(49)	5.1%	(50)
New Jersey	5.9	(46B)	10.0%	(44)	13.6%	(33)	10.3%	(49)	13.6%	(43B)	5.3%	(49)
Utah	5.4	(48)	9.8%	(46)	9.8%	(44A)	9.6%	(50)	8.7%	(50)	9.4%	(43)
Hawaii	5.2	(49)	9.4%	(48)	7.7%	(49)	11.2%	(41B)	13.1%	(47)	8.1%	(46)
Rhode Island	4.7	(50)	12.4%	(28B)	21.5%	(19B)	13.4%	(23)	14.5%	(40A)	9.3%	(44)
US Overall	10.0		13.40%		21.1%		12.60%		16.7%		19.3%	
District of Columbia	8.1		16.2%		35.6%		11.7%		14.9%		0.0%	

Sources: The percentage of a state's population with incomes below the poverty line was taken from the American Community Survey (ACS) Table ID: S1701, "Poverty Status in the Past 12 Months: 2019 Five-Year Estimate Subject Tables." The percentage of adults who are current smokers was obtained from the CDC's Behavioral Risk Factor Surveillance System: 2015–2019. The percentage of people with disabilities living in communities was obtained from the ACS Table ID: S1810, "Disability Characteristics: 2019 Five-Year Estimate Subject Tables." The percentage of each state's population living in rural communities in 2010 was obtained from the US Census Bureau's 2010 Decennial Census Table ID: PCT2 "Urban and Rural Total Population." The percentage of people living in areas in which at least 20 percent of the population had incomes below the poverty line was obtained from *Changes in Poverty Rates and Poverty Areas Over Time: 2005 to 2019 — American Community Survey Briefs* (2020) by Alemayehu Bishaw, Craig Benson, Emily Shrider, and Brian Glassman.