

HOME STRUCTURE FIRES THAT BEGAN WITH MATTRESSES AND BEDDING

Ben Evarts

October 2011



**National Fire Protection Association
Fire Analysis and Research Division**

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Abstract

Based on data from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual fire department experience survey, NFPA estimates that during 2005-2009, a mattress or bedding was the item first ignited in an average of 10,260 reported home structure fires per year. These fires caused an estimated annual average of 371 civilian deaths, 1,340 civilian injuries, and \$382 million in direct property damage. One-fifth of these fires were started by smoking materials; another fifth were started by someone playing with fire. Mattresses and bedding ranked second among items first ignited in home fire deaths. Half (51%) of these deaths resulted from fires started by smoking materials.

Keywords: mattress; bedding small open flame; fires; home fires, fire causes, fire statistics; smoking materials, residential fires

Acknowledgements

The National Fire Protection Association thanks all the fire departments and state fire authorities who participate in the National Fire Incident Reporting System (NFIRS) and the annual NFPA fire experience survey. These firefighters are the original sources of the detailed data that make this analysis possible. Their contributions allow us to estimate the size of the fire problem.

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

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Executive Summary

NFPA estimates that during 2005-2009, a mattress or bedding was the item first ignited in an average of 10,260 reported home structure fires per year. These fires caused an estimated annual average of 371 civilian deaths, 1,340 civilian injuries, and \$382 million in direct property damage. These fires accounted for 3% of all home structure fires, 14% of deaths, 10% of injuries and 5% of property damage.

In 2009, there were 85% fewer fires that started with mattress or bedding than there were in 1980, and deaths associated with these fires were 61% lower. Some of the decrease in reported fires may be due to changes in reporting in the late 1990s.

Most (78%) of these fires begin in the bedroom. Fires beginning in the bedroom were associated with 84% of civilian deaths, 83% of injuries, and 80% of property damage. The 5% of fires that started in a living room, family room, or den caused 12% of the associated deaths.

Smoking materials are the leading cause of mattress and bedding fires and deaths (20% of fires and 51% of deaths). Playing with heat source caused 18% of fires and 8% of deaths. Candles started 12% of fires, and heating equipment caused 8% of fires, but 21% of deaths. One-third (35%) of fires started with lighters, candles, or matches.

A heat source being too close to the mattress or bedding was a factor in 27% of mattress or bedding fires, and 34% of the civilian deaths. Abandoned or discarded materials, (often used to describe discarded cigarettes) contributed to 16% of fires and 38% of civilian deaths.

Existing and proposed flammability requirements for mattresses and bedding focus

on fires started by either smoking materials or small open flames, so those two categories are singled out for additional analysis. Mattress and bedding fires started by smoking materials fell 92% from 1980 to 2009, deaths fell 67%. Drops in fires and deaths caused by lighters, candles or matches were not as pronounced.

Fires started by lighters candles and matches were less common in the early morning hours (midnight to 9:00 a.m.), while fires caused by smoking materials were more common during this timeframe than all fires that started with mattress or bedding.

Age was more likely to be a factor in deaths and injuries caused by mattress and bedding fires where a lighter, candle or match was the heat source, while sleeping was more likely to be a factor in smoking material fire deaths and injuries. Unsurprisingly, younger people were more likely to be the victims of fires with a lighter, candle or match as the heat source. People aged 55 and older were more likely to be victims of fires started by smoking materials.

The NFPA provides safety tips to follow in order to lessen the risk of fires that start with mattress or bedding, some of these are:

- Never smoke in bed, as you can easily fall asleep with a burning cigarette, igniting the mattress or bedding.
- Teach your children at the earliest possible age that matches and lighters are tools for adults only, not toys. Store matches and lighters up high, out of the reach of children, preferably in a locked cabinet.
- Turn off portable heaters when you leave the room or go to sleep.

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Fact Sheet

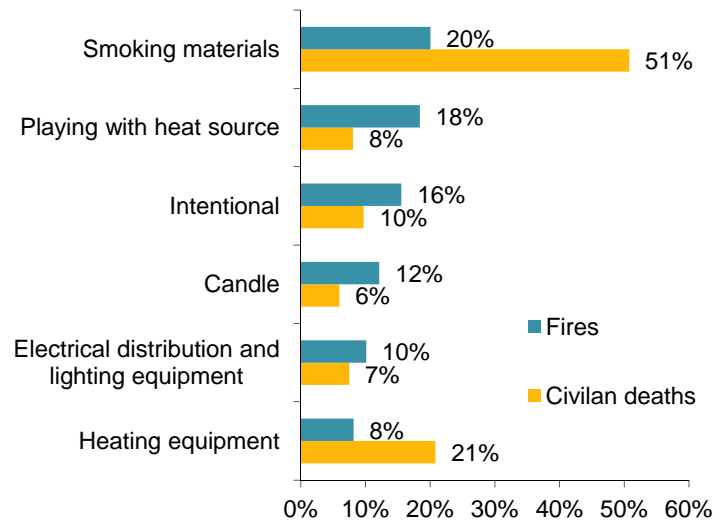
Home Structure Fires That Began With Mattresses and Bedding

Between 2005 and 2009, local fire departments responded to an average of 10,260 home structure fires per year that started with mattresses and bedding. These fires caused annual averages of:

- 371 civilian deaths
- 1,340 civilian injuries
- \$382 million in direct property damage
-

Major Causes of Home Structure Fires That Began With Mattresses And Bedding

- Smoking materials were the cause of 20% of these fires, and half (51%) of the associated civilian deaths
- Playing with a heat source and intentional accounted for 18% and 16% of fires respectively (though there is overlap between these two categories)
- Heating equipment caused 8% of fires but 21% of deaths

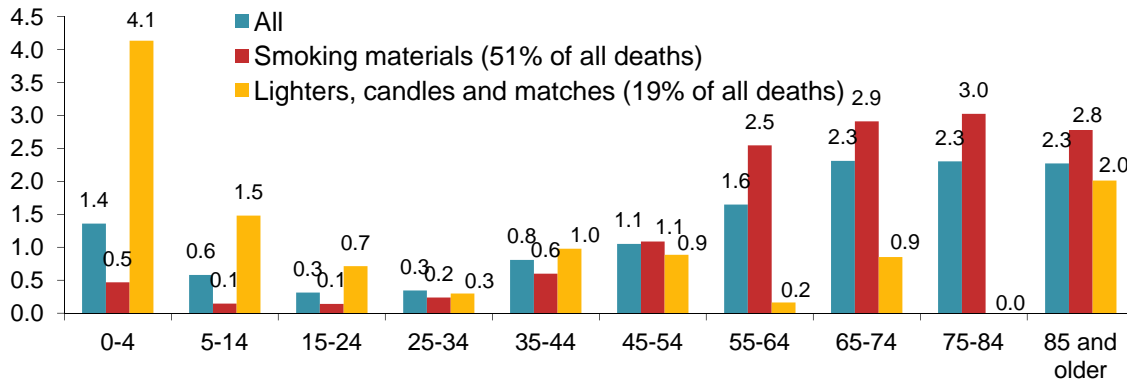


Relative Risk of Home Mattress and

Bedding Fire Death by Age Group

and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009

Children under 5 years old are at greater risk of fires started by lighters, candles and matches, while older adults are at greater risk from fires started by smoking materials



More information is available at www.nfpa.org

NFPA's Fire Safety Resources

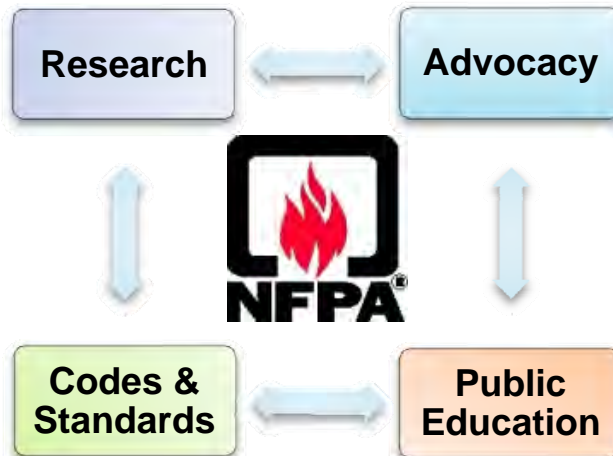
NFPA's wealth of fire-related research includes investigations of technically significant fire incidents, fire data analysis, and the Charles S. Morgan Technical Library, one of the most comprehensive fire literature collections in the world. In addition, NFPA's Fire Protection Research Foundation is a source of independent fire test data. Find out more at:

www.nfpa.org/research

Properly installed and maintained smoke alarms are necessary to provide a warning of any fire to all occupants. You can find out more information about smoke alarms here: [NFPA Smoke Alarm Information](#)

Home fire sprinkler systems provide even greater protection. These systems respond quickly to reduce the heat, flames, and smoke from a fire until help arrives. More information about home fire sprinklers may be found at www.firesprinklerinitiative.org

Simply put, smoke alarms and fire sprinklers save lives.



NFPA also develops, publishes, and disseminates more than 300 consensus codes and standards intended to minimize the possibility and effects of fire and other risks. Among these are:

[NFPA1: Fire Code:](#)

[NFPA 101: Life Safety Code®:](#)

[NFPA 267: Standard Method of Test for Fire Characteristics of Mattresses and Bedding Assemblies Exposed to Flaming Ignition Source:](#)

[For consumers:](#) NFPA has consumer safety information regarding causes, escape planning, fire & safety equipment, and many other topics.

[For Kids:](#) Sparky.org has important information for kids delivered via fun games, activities, and cartoons.

[For public educators:](#) Resources on fire safety education programs, educational messaging, grants & awards, and many other topics.

Home Fires Beginning with Mattresses and Bedding

Overview

In 2005-2009, an average of 10,260 home structure fires began with mattresses and bedding each year.

During the five-year period of 2005-2009, a mattress or bedding was the item first ignited in an estimated average of 10,260 reported home structure fires per year. These fires caused an annual average of 371 civilian deaths, 1,340 civilian fire injuries, and \$382 million in direct property damage. Because causal information, including item first ignited, is not required for six types of confined structure fires (incident types 113-118), these fires were excluded from the analysis.¹ It is unusual for fires beginning with mattresses or bedding to fall into the scenarios described by the confined fire incident types.

Homes include one- and two-family homes, manufactured housing, apartments, tenements, flats, townhouses and row houses, regardless of ownership. The term “civilian” is used to describe anyone who is not a member of the fire service.

Mattresses and bedding together ranked second among items first ignited in home fire deaths for years. (Upholstered furniture ranks first.) On average, one of every 28 fires starting with mattresses and bedding resulted in death.

Statistics are derived from NFIRS and NFPA’s annual fire department survey.

The national estimates in this analysis are projections based on fire department assessments of cause, circumstances, and occupancy. These estimates are derived from the U.S. Fire Administration’s (USFA’s) National Fire Incident Reporting System (NFIRS) and NFPA’s annual fire department survey. NFIRS item first ignited code 31 captures mattresses and pillows. Item first ignited code 32 captures bedding, including blankets, sheets, comforters, and heating pads.² Because mattresses and bedding are typically used together and often burn together, they are combined in this analysis. Only fires reported to public fire departments are included in these statistics. Only details from Version 5.0 of NFIRS were used in the 2005-2009 estimates. Data originally collected in earlier versions were used only in the trend tables for 1980-1998. The total number of home mattress and bedding structure fires was taken from NFPA’s report, *Home Structure Fires*.³ This estimate includes a proportional share of non-confined home structure fires in which the item first ignited was unknown or not reported. Percentages calculated from the details in NFIRS 5.0 were applied to the projections of home fires and losses derived from NFPA’s survey. In the analysis that follows, fires and losses with missing or unknown data were

¹ NFIRS 5.0 includes six categories of confined structure fires, identified by incident type. For cooking fires confined to the cooking vessel, confined chimney or flue fires, confined incinerator fires, confined fuel burner or boiler fires or delayed ignitions, confined commercial compactor fires, and trash or rubbish fires in a structure with no flame damage to the structure or contents, little more than basic dispatch data and property use is required by the NFIRS 5.0 system.

² U.S. Fire Administration National Fire Data Center. National Fire Incident Reporting System 5.0, Complete Reference Guide, January 2008.

³ Marty Ahrens. *Home Structure Fires*. Quincy, MA: National Fire Protection Association, May 2011.

allocated proportionally among fires with known data. Appendix A describes the methodology used. Tables supporting the text are provided at the end of this analysis.

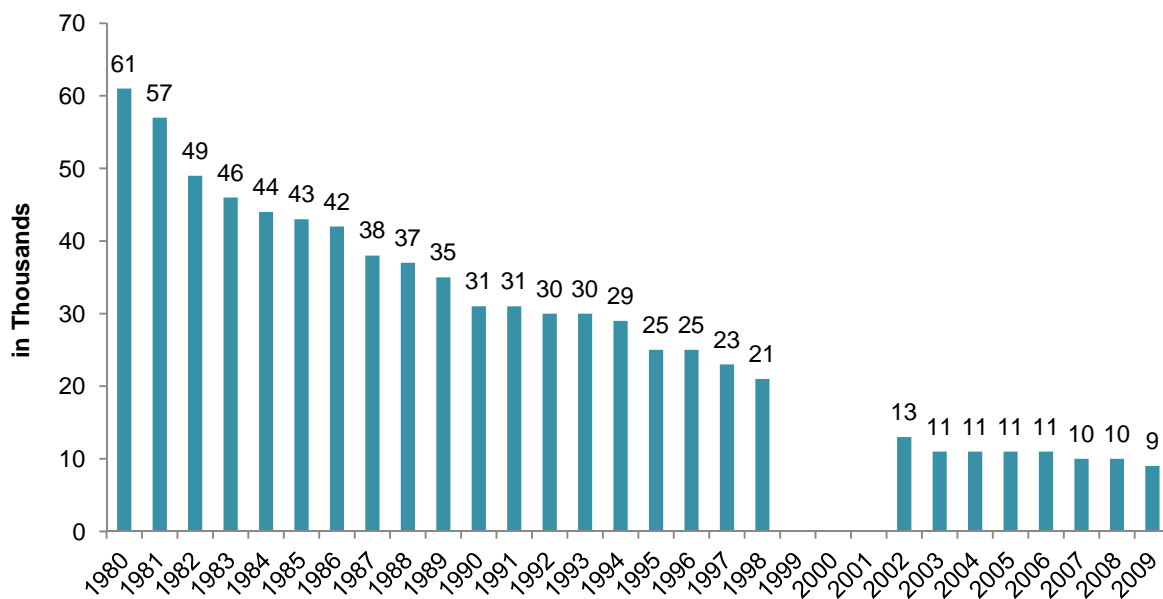
Mattress and bedding fires caused 14% of home structure fire deaths.

During 2005-2009, U.S. fire departments responded to an estimated average of 373,900 home structure fires per year. These incidents caused an average of 2,650 civilian deaths, 12,890 civilian fire injuries, and \$7.1 billion in direct property loss per year. The 10,260 (non-confined) home structure fires that began with mattresses and bedding accounted for an average of 3% of all reported home structure fires (including confined fires), 14% of all home civilian structure fire deaths, 10% of all reported civilian home structure fire injuries, and 5% of home structure fire direct property loss per year.

Since 1980, home fires starting with mattresses and bedding fell 85%.

As shown in Table 1 and Figure 1, home structure fires beginning with mattresses and bedding fell 82% from a high of 61,100 in 1980 to 8,900 in 2009, the lowest point in the 30 years of data. From 2008 to 2009, these fires fell 12%. Details collected in NFIRS 5.0 were used to derive the estimates from 1999 on. A small portion of the sharp decrease seen from 1998 to 2002 may be due to changes in NFIRS and the exclusion of confined fires from the analysis.

Figure 1. Home Structure Fires that Began with Mattresses and Bedding, by Year

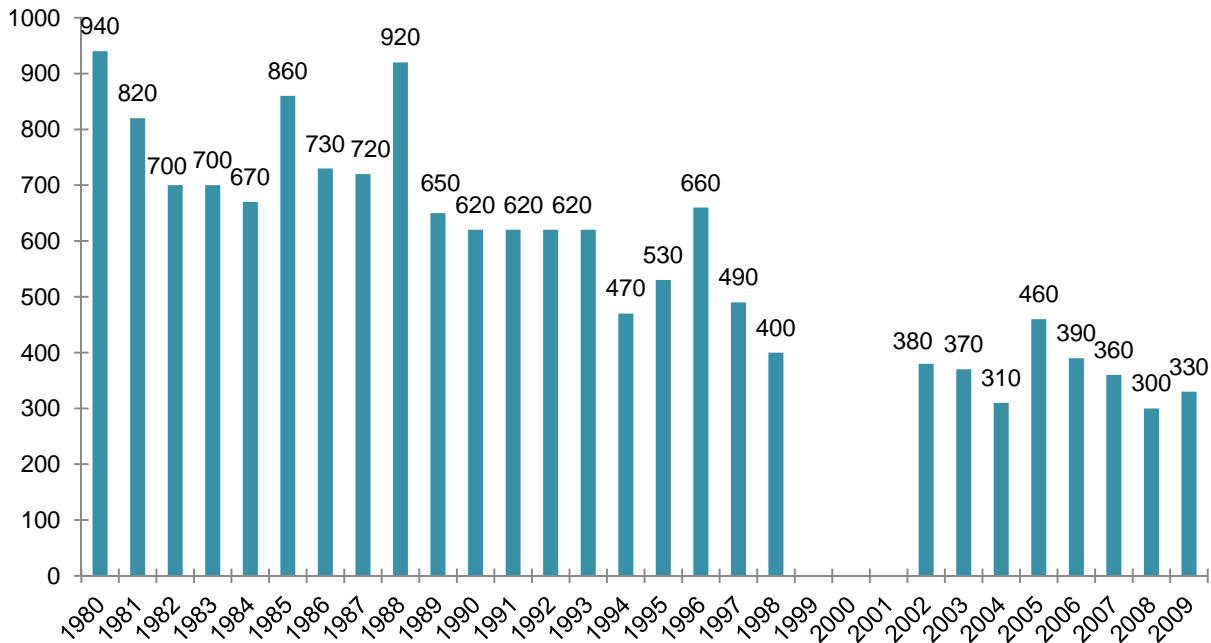


Source: NFIRS and NFPA survey. Due to the small portion of fires originally collected in NFIRS 5.0 during 1999-2001, estimates for these years are omitted from the trend graphs.

2005-2009 mattress and bedding fire death average is half the 1980-1984 average.

The 940 civilian deaths resulting from home structure fires beginning with mattresses and bedding in 1980 was the highest total reported in the 30 years studied. Figure 2 shows that through most of the 1980s, deaths hovered between 700 and 900 per year, dropping below 700 only twice in the decade. Mattress and bedding fire deaths have not exceeded 700 in any year since 1988, and have not exceeded 500 since 1996. The 2009 number (330 deaths) is 61% lower than in 1980. In comparison, the number of civilian fire deaths from all home structure fires in 2009 was 51% lower than in 1980.

Figure 2. Civilian Fire Deaths Resulting from Home Structure Fires that Began with Mattresses and Bedding, by Year



Source: NFIRS and NFPA survey. Due to the small portion of fires originally collected in NFIRS 5.0 during 1999-2001, estimates for these years are omitted from the trend graphs.

The vast majority of mattress and bedding fires began with fabric.

Table 2 shows that fabric, fiber or finished goods made of cotton, blends, rayon or wool was the type of material first ignited in 82% of these fires and 86% of deaths. In 9% of the fires and deaths, an unclassified fabric, textile or fur was first ignited.

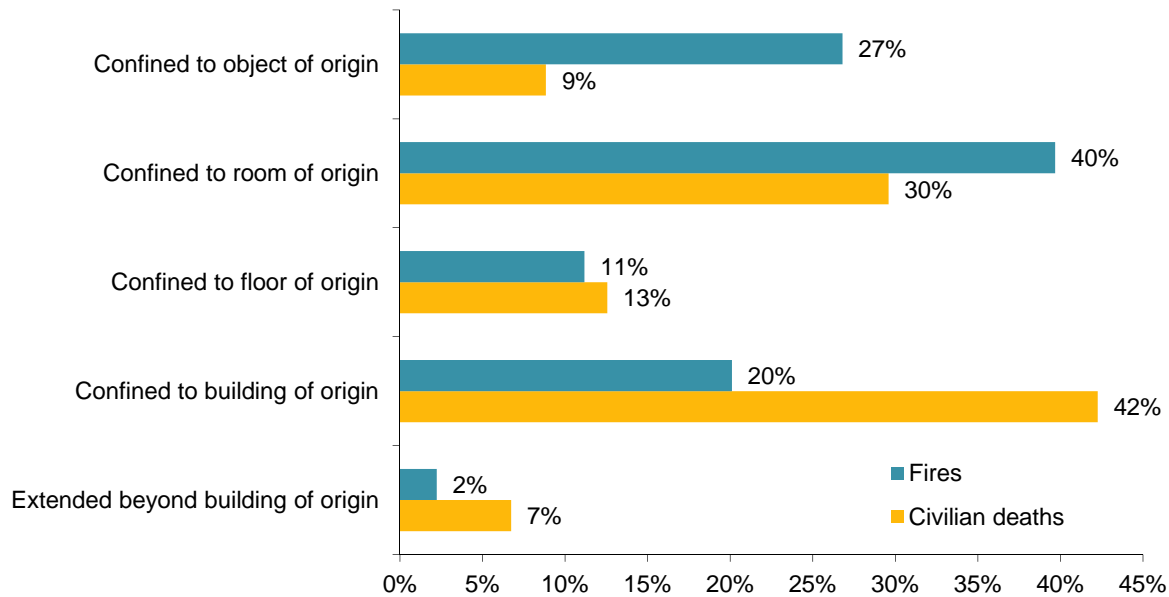
83% of mattress and bedding civilian fire deaths resulted from fires that began in the bedroom.

Table 3 shows that 78% of the home structure fires that began with mattresses and bedding started in the bedroom. These fires caused 83% of the associated civilian deaths, 84% of the civilian injuries, and 80% of the direct property damage. The 5% that started in the living room, family room, or den caused 12% of the deaths.

Flame damage was confined to the room of origin in more than one-third of home mattress and bedding fire deaths.

Figure 3 and Table 4 show that the 66% of home mattress and bedding fires with flame damage confined to the object or room of origin resulted in 38% of the associated civilian deaths.

Figure 3. Home Structure Fires that Began with Mattresses and Bedding By Extent of Flame Damage: 2005-2009



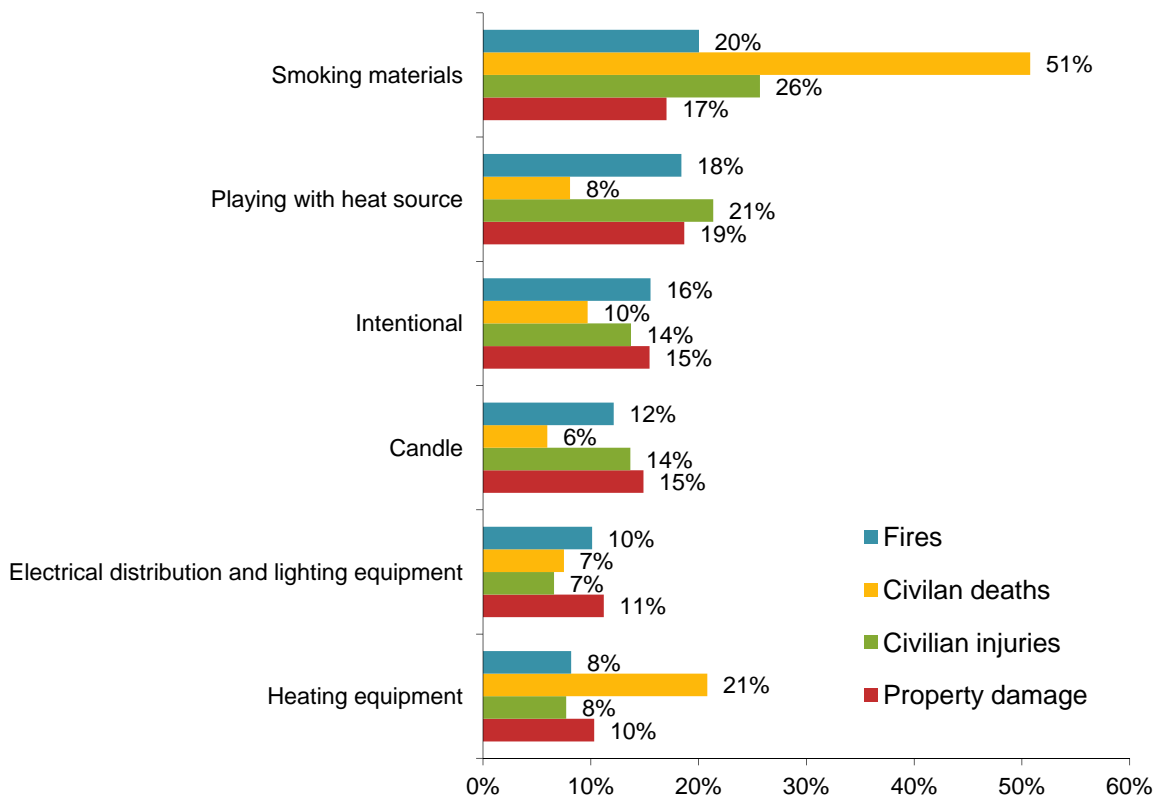
Source: NFIRS 5.0 and NFPA survey.

Leading Causes of Home Mattress and Bedding Fires

Smoking materials are the leading cause of mattress and bedding fires and deaths.

Smoking materials were the heat source in an average of 2,060 (20%) of the home structure fires that began with mattresses and bedding annually. These fires resulted in an average of 188 (51%) civilian deaths, 340 (26%) of the civilian injuries, and \$65 million (17%) in direct property damage.

Figure 4. Major Causes of Home Structure Fires that Began with Mattresses and Bedding: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Figure 4 and Table 5 show the leading causes of fires in these properties with data summarized from several NFIRS fields. In some cases, the equipment involved in ignition is most relevant; heat source, the field “cause,” and factor contributing to ignition also provide relevant information. The causes shown in this graph are not mutually exclusive when they have been pulled from different fields. Only causes that describe a scenario are shown. More detailed information from the cause of ignition field may be found in Table 6, factor contributing to ignition in Table 7, heat source is shown in Table 8, and additional information on equipment involved in ignition is found in Table 9. More detailed information on the definitions and methodology used to create this graph and table is found in Appendix B.

Someone playing with fire started 18% of the home mattress and bedding fires.

Playing with heat source was a contributing factor in an average of 1,890 (18%) fires beginning with mattresses and bedding per year. These incidents caused an average of 30 (8%) civilian deaths, 290 (21%) civilian injuries, and \$71 million (19%) in direct property damage.

As mentioned earlier, factors from different fields overlap. Mattress and bedding fires started by playing may also have been intentionally set.

Sixteen percent of the home mattress and bedding fires were intentionally set.

On average, 1,590 (16%) of the home mattress and bedding fires were intentionally set per year. These incidents caused an average of 36 (10%) of the associated civilian deaths, 180 (14%) of the civilian injuries, and \$59 million (15%) in direct property damage.

Candles started 12% of these fires.

Candles were the heat source in an average of 1,240 (12%) home mattress and bedding fires per year, resulting in an average of 22 (6%) civilian deaths, 180 (14%) of the civilian injuries, and \$57 million (15%) in direct property damage per year.

Electrical distribution and lighting equipment was involved in 10% of the home mattress and bedding fires.

Electrical distribution and lighting equipment was involved in an annual average of 1,040 (10%) reported home fires that began with mattresses and bedding. These fires caused an average of 28 (7%) civilian deaths, 90 (7%) civilian injuries, and \$43 million (11%) in direct property damage. Lamps, bulbs and other lighting equipment were involved in an average of 490 fires and 3 deaths per year. Wiring and related equipment were also involved in an average of 290 of these fires per year, as well as 13 deaths. Cords and plugs were involved in an average of 230 of these fires and 11 of the associated deaths per year.

Portable or fixed space heaters were involved in 7% of the home mattress and bedding fire deaths.

Heating equipment, including unclassified heating and ventilation equipment, was involved in an estimated average of 840 (8%) home mattress and bedding fires per year. These fires caused an average of 77 (21%) civilian deaths, 100 (8%) civilian injuries, and \$39 million (10%) in direct property damage. Portable and fixed space heaters, including wood stoves, were the most common type of heating equipment involved. These heaters were involved in an annual average of 720 (7%) of the mattress and bedding fires. These fires caused 74 deaths.

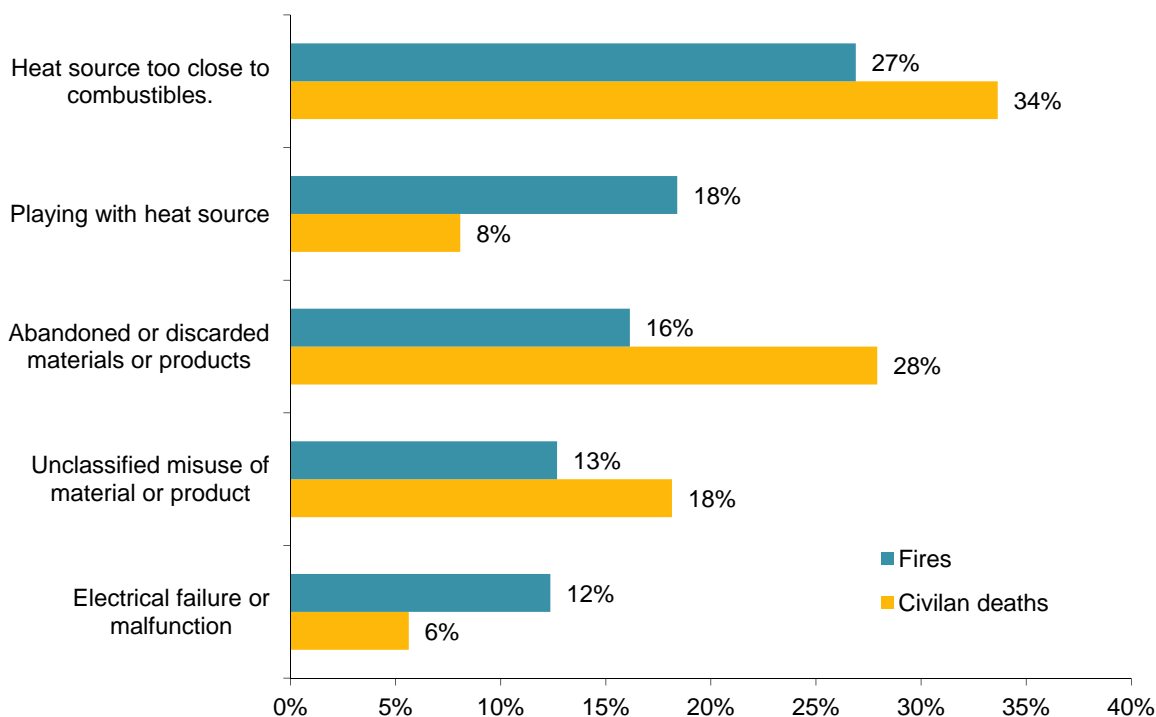
Factors Contributing to Ignition

“Heat source too close to combustibles” is the leading factor contributing to ignition.

The field “factor contributing to ignition” explains how the heat source interacted with the fuel source to start a fire. Figure 5 and Table 7 show that the leading factor for home mattress and bedding fires was a heat source (such as a candle, bulb, or heater) too close to combustibles. A heat source too close to the mattress or bedding was a factor in 27% of these fires, 34% of the deaths, 28% of the injuries, and 30% of the direct property damage.

Playing with heat source was already discussed as a major cause itself. The factor, abandoned or discarded material, often used to describe discarded cigarettes, contributed to 16% of the mattress and bedding fires, 28% of the civilian deaths, 16% of the civilian injuries, and 15% of the direct property damage. An unclassified misuse of a material or product was a factor in 13% of fires, 18% of deaths, 17% of injuries and 12% of direct property damage. Electrical failures or malfunctions from all types of equipment powered by electricity, not just electrical distribution or lighting equipment, were factors in 12% of home structure fires that began with mattress and bedding per year as well as 6% of the associated civilian deaths, 9% of the civilian injuries, and 13% of the direct property damage.

**Figure 5. Home Structure Fires that Began with Mattresses and Bedding
By Leading Factor Contributing to Ignition: 2005-2009**



Source: NFIRS 5.0 and NFPA survey.

Heat Sources

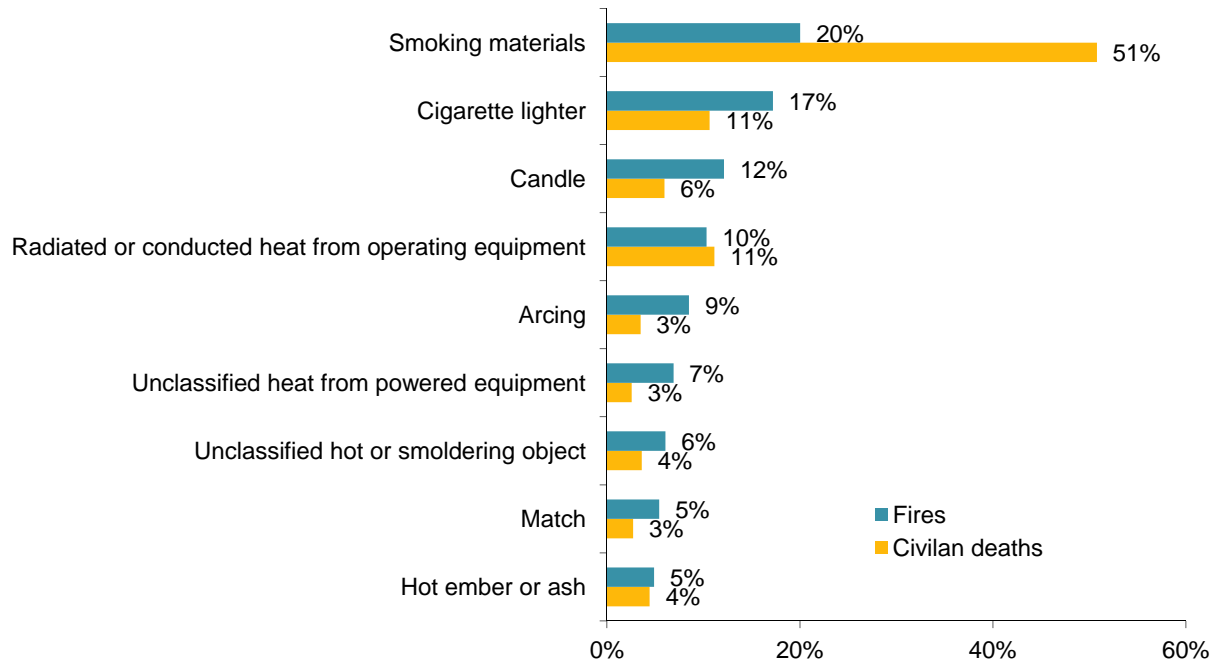
A wide variety of heat sources started these fires.

Figure 6 and Table 8 show that a wide variety of heat sources are involved in home mattress and bedding fires. Smoking materials and candles were already discussed. Cigarette lighters ignited 17% of the fires that resulted in 11% of the civilian deaths, 20% of the civilian injuries, and 18% of the direct property damage. Matches started 5% of the mattress and bedding fires, resulting in 3% of the associated deaths, 5% of the injuries, and 6% of the direct property damage. Lighters and matches are both often used by children playing and people setting intentional fires.

Candles, matches, and lighters are often grouped together as small open flame ignition sources. Together, these three heat sources were involved in 35% of the fires starting with mattresses and bedding, as well as 19% of the associated deaths, 39% of the injuries, and 38% of the direct property damage.

Other leading heat sources, such as radiated or conducted heat from operating equipment, unclassified heat from powered equipment, and arcing can be associated with a variety of types of equipment.

**Figure 6. Home Structure Fires that Began with Mattresses and Bedding
By Leading Heat Sources: 2005-2009**



Source: NFIRS 5.0 and NFPA survey.

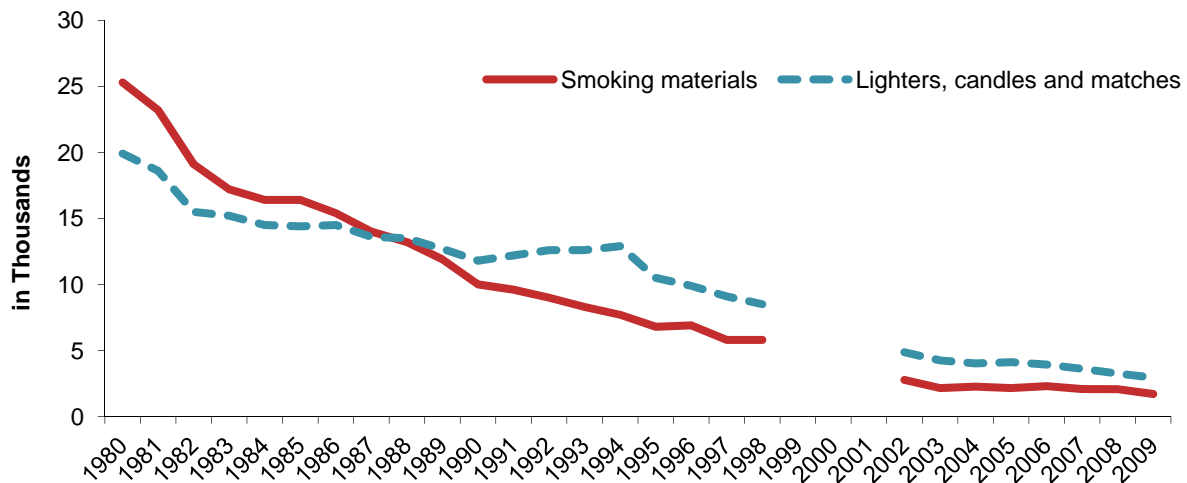
Fires Started by Smoking Materials vs. Lighters, Candles, or Matches

Existing and proposed flammability requirements for mattresses and bedding focus on fires started by either smoking materials or small open flames. This part of the analysis focuses on the circumstances of the two categories.

As mentioned earlier, the 2,060 home mattress and bedding fires started by smoking materials resulted in an annual average of 188 deaths. On average, one of every 11 such fires resulted in death.

In 2005-2009, lighters, candles, and matches started an estimated average of 3,560 home mattress and bedding fires annually, resulting in an average of 72 deaths per year. On average, one of every 50 such fires resulted in death.

Figure 7. Home Mattress and Bedding Fires Started by Smoking Materials and Lighters, Candles, and Matches, by Year: 1980-2009



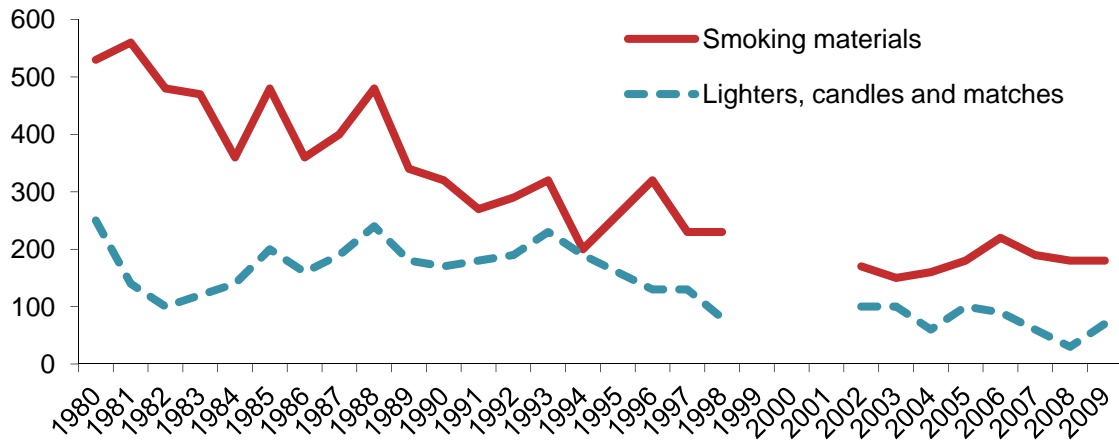
Source: NFIRS and NFPA survey.

Nearly fifteen times as many mattress and bedding fires were started by smoking materials in 1980 as in 2009.

Figure 7 and Table 10 show that home mattress and bedding fires started by smoking materials fell 92% from a high of 25,300 in 1980 to a low of 1,700 in 2009. Figure 7 and Table 11 shows that home mattress and bedding fires started by lighters, candles, and matches fell 79% from a high of 19,900 in 1980 to 2,900 in 2009. From 1980-1987, more mattress and bedding fires were started by smoking materials than by lighters, candles, and matches. Since 1988, lighters, candles, and matches have caused more of these fires than smoking materials caused.

Figure 8 shows that the 180 deaths resulting from home mattress and bedding fires started by smoking materials in 2009 was 67% lower than the 530 such deaths in 1980. The number of deaths resulting from mattress and bedding fires started by lighters, candles, and matches in recent years is generally lower than was seen in the 1980s, although the drop is not as pronounced.

Figure 8. Civilian Deaths Resulting from Home Mattress and Bedding Fires Started by Smoking Materials and Lighters, Candles, and Matches, by Year: 1980-2009

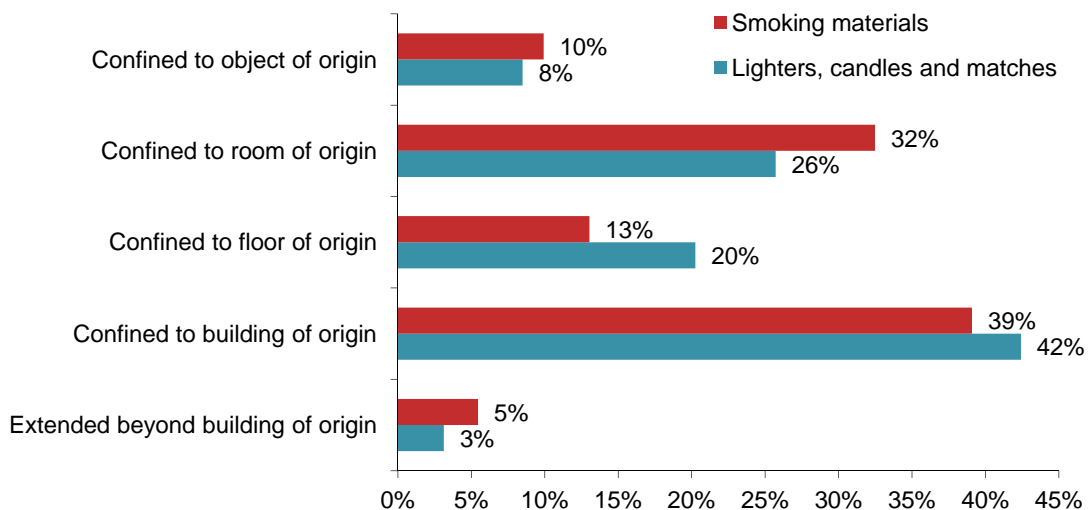


Source: NFIRS and NFPA survey.

Flame damage was limited to the room of origin in almost half of smoking material deaths from mattress and bedding fires.

Tables 12 and 13 show that there is relatively little difference in extent of flame damage extending beyond the room origin for the two different categories of heat source. However, Figure 9 shows a greater difference in the percentage of deaths resulting from these fires. Forty-two percent of the deaths from mattress and bedding fires started by smoking materials resulted from fires confined to the object or room of origin. Only 34% of the deaths from mattress and bedding fires started by lighters, candles, and matches resulted from fires with this limited flame damage.

Figure 9. Home Mattress and Bedding Fire Deaths by Extent of Flame Damage and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009

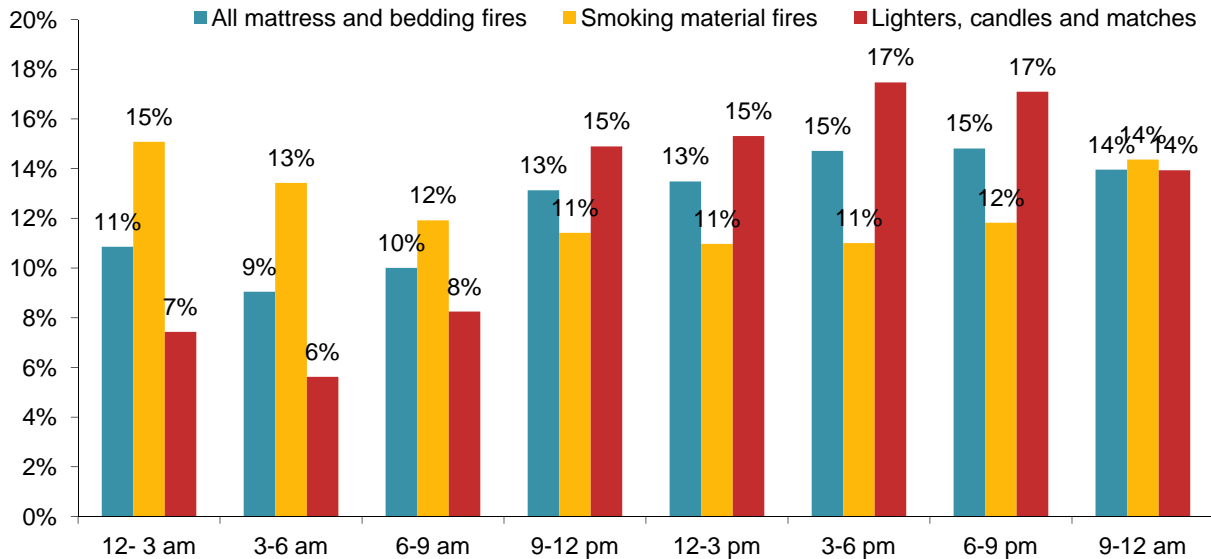


Source: NFIRS 5.0 and NFPA survey.

Time patterns differ by heat source.

Figure 10 shows that mattress and bedding fires started by smoking materials were more common late at night and in the early morning, while fires started by lighters, candles, and matches were more common from 9:00 a.m. through 9:00 p.m.

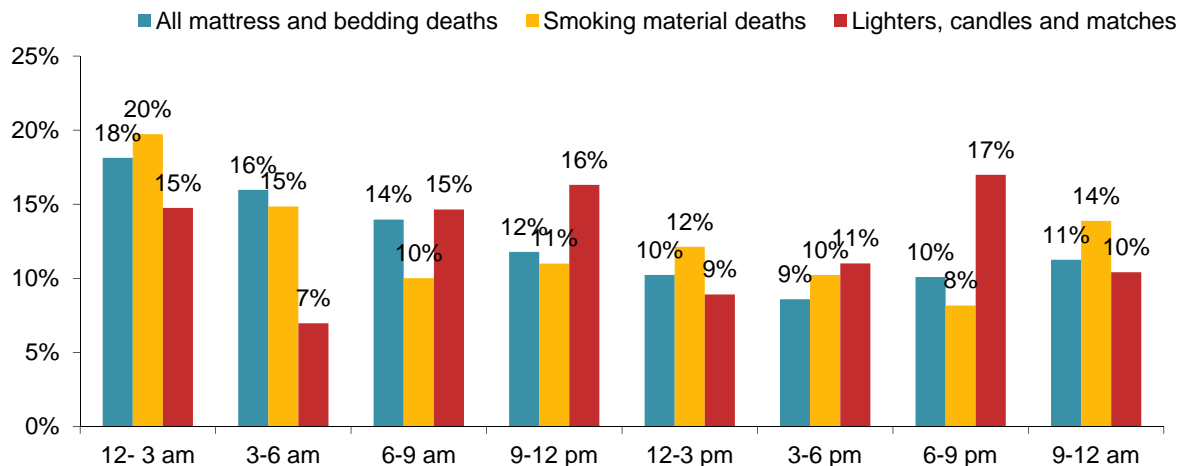
Figure 10. Home Mattress and Bedding Fires by Time of Alarm and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Deaths from mattress and bedding fires started by smoking materials peaked between midnight and 3:00 a.m. while deaths from fires started by lighters, candles, and matches did not show one peak time. (See Tables 14 and 15)

Figure 11. Home Mattress and Bedding Fire Deaths by Time of Alarm and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Playing with heat source was a factor in half of the mattress and bedding fires started by lighter, candles, and matches.

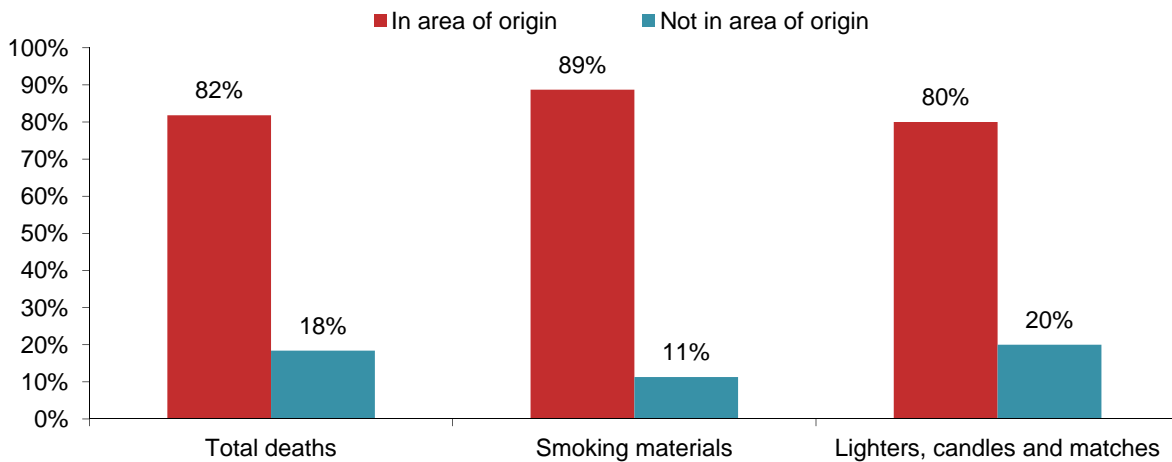
Table 16 shows that abandoned or discarded materials were contributing factors in half (52%) of the home mattress and bedding fires started by smoking materials. Table 17 shows that playing with heat source was a factor in 50% of the mattress and bedding started by lighters, candles, and matches, and 44% of the associated deaths. The heat source was too close to the mattress or bedding in 25% of the fires started by lighters, candles and matches. This was also a factor in 22% of the associated deaths.

Table 18 shows that only 2% of the mattress and bedding fires started by smoking materials were intentionally set. In contrast, Table 19 shows that 30% of the mattress and bedding fires started by lighters, candles, and matches were intentionally set. These incidents caused 24% of the associated fatalities.

Victims of mattress and bedding fires started by smoking materials were more likely to have been in the area of fire origin.

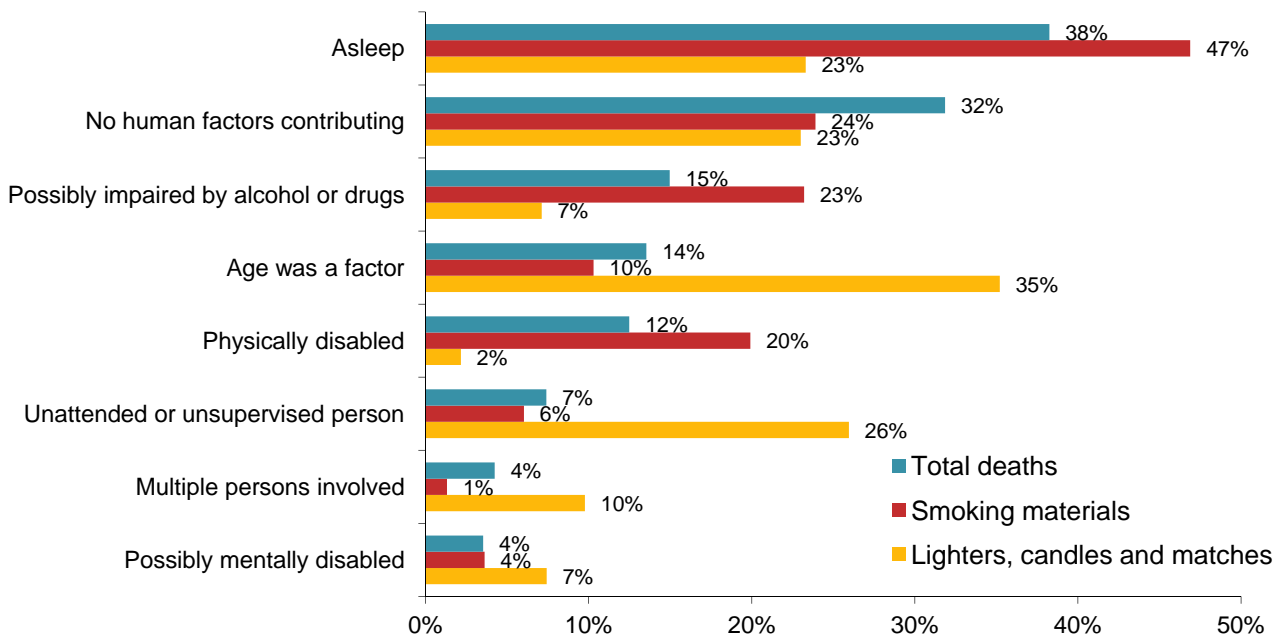
Figure 12 shows that 82% of all fatalities in mattress and bedding fires were in the area of origin when fatally injured compared to 89% of the victims of fires started by smoking materials.

Figure 12. Home Mattress and Bedding Fire Deaths by Victim's Location at Time of Fatal Injury and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009



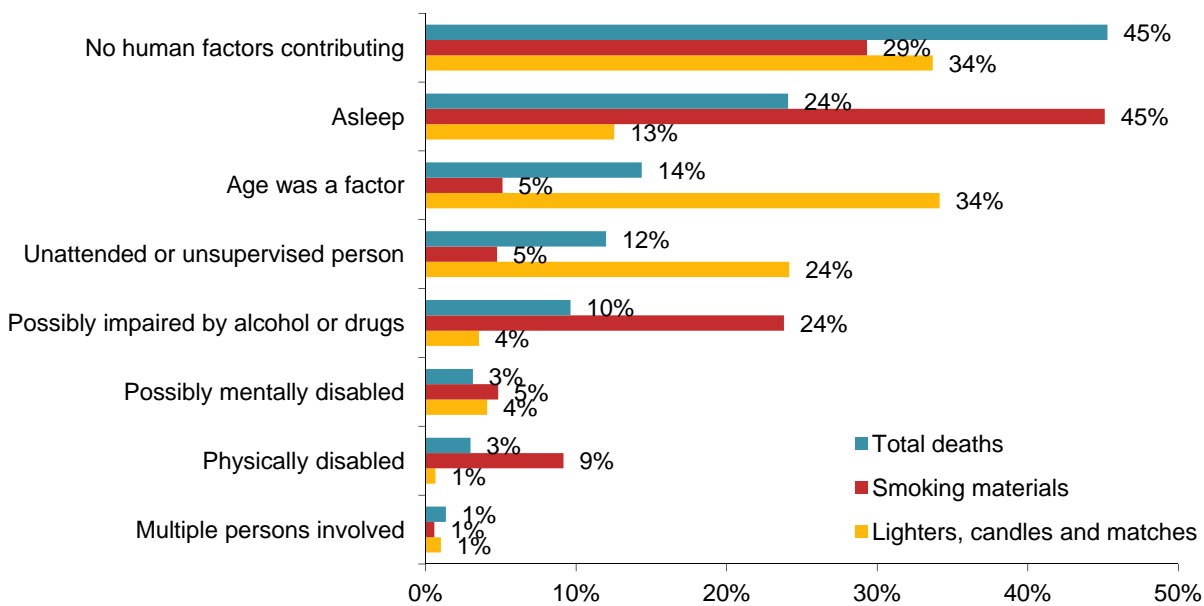
Source: NFIRS 5.0 and NFPA survey.

Figure 13. Home Mattress and Bedding Fire Deaths by Human Factors Contributing to Ignition and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Figure 14. Home Mattress and Bedding Fire Injuries by Human Factors Contributing to Ignition and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Unattended or unsupervised persons were common in mattress and bedding casualties associated with lighters, candles, and matches.

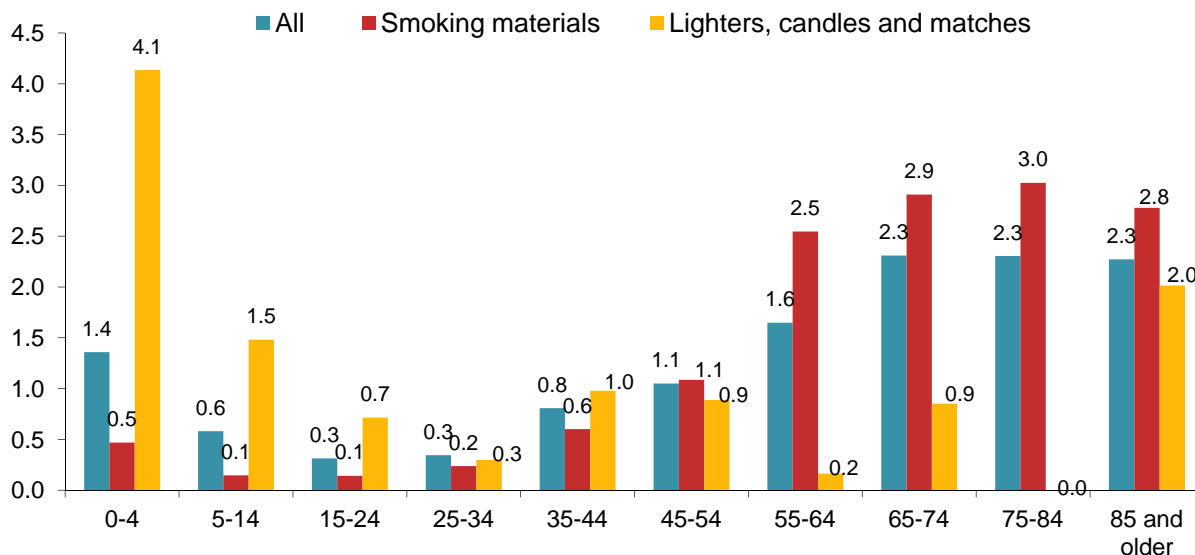
Figures 13 and 14 show that in 47% of the civilian deaths and 45% of civilian injuries resulting from home mattress and bedding fires started by smoking materials, “asleep” was a human factor contributing to ignition. Twenty-three percent of the associated deaths and 24% of the injuries from mattress and bedding smoking material fires resulted from fires in which possible impairment by alcohol or drugs was a contributing human factor.

In 26% of the civilian deaths and 24% of civilian injuries from mattress and bedding fires started by lighters, candles, and matches, unattended or unsupervised persons contributed to ignition. When mattresses or bedding fires were started by these open flames, age was a human factor contributing to ignition in 35% of the deaths and 34% of the injuries. More details on human factors contributing to ignition are shown in Tables 20, 21, and 22.

The risk of mattress or bedding fire death varies by age group and heat source.

Relative risk compares the risk of one group to the risk of the total population. In Figure 15 and Tables 23-25, relative risks of fire death are calculated by dividing the percentage of the fire deaths in each age group by the percentages of population in each age group. A relative risk of one means the percentage of deaths is equal to the percentage in the general population.

Figure 15. Relative Risk of Home Mattress and Bedding Fire Death by Age Group and Smoking Materials vs. Lighters, Candles, and Matches: 2005-2009



Source: NFIRS 5.0 and NFPA survey.

Children under five were four times as likely as the population at large to die in a mattress or bedding fire started by lighters, candles, and matches. Adults 65 and older faced the highest risk of mattress and bedding fires overall. When these fires were started by smoking materials, people between 75 and 84 had a risk three times as great as the general population. For those 65-74, the risk was 2.9 times as high.

Smoke alarms were present in almost two-thirds of home structure fires that started with mattress or bedding.

Table 26 shows that smoke alarms were present and operated in 47% of these fires, but in 40% of civilian deaths. Smoke alarms were present but failed to operate in 28% of deaths but only 14% of fires.

Mattress or bedding ranked second in item contributing most to flame spread for fire injuries resulting from fires that spread beyond the room of origin.

Mattress or bedding can be a secondary fuel source for fires that begin elsewhere. NFPA's report, *Home Structure Fires*, showed that from 2005 to 2009, mattress or bedding was the item contributing most to flame spread in annual averages of:

- 3,600 (4%) of the 88,600 fires per year that spread beyond the room of origin,
- 150 (7%) of the 2,080 associated deaths,
- 590 (10%) of the 65,680 associated civilian injuries, and
- \$196 (3%) million of the \$5.9 billion of associated direct property damage⁴

Additional Information

Vytenis Babrauskas' chapter "Upholstered Furniture and Mattresses" in the 20th edition of NFPA's *Fire Protection Handbook* provides information on flammability standards, smoldering vs. flaming heat sources, and testing.

Discussion

Reported fires beginning with mattresses and bedding in the home environment have decreased sharply. While fires and deaths started by both smoking materials and open flames (lighters, candles, and matches), have fallen since 1980, the drop was sharper for fires started by smoking materials. From 1980-1987, more mattress and bedding fires were started by smoking materials than by the combination of lighters, candles, and matches. The reverse has been true since 1988.

Mattresses and bedding rank second after upholstered furniture in leading items first ignited in home fire deaths. Smoking materials remain the leading heat source in mattress and bedding fire deaths, although the gap between deaths from smoking materials and open flames has narrowed considerably. The U.S. Consumer Product Safety Commission (CPSC) has two standards addressing mattress flammability.⁵ The older 16 CFR 1632 –*Standard for the Flammability of Mattresses and Mattress Pads* addresses cigarette ignitions regulation on open flame ignition of mattresses and has been in place for decades. In 2007, 16 CFR 1633- *Standard for the Flammability (Open Flame) of Mattress Sets*, took effect.

In addition to the standards, CPSC also educates the public with tips and information about mattress regulation (see this brochure: <http://www.cpsc.gov/cpsc/pub/pubs/560.pdf>). The Sleep Products Safety Council also educates the public, and has updated its hangtags (cards that can be attached or inserted with product related literature provided to customers) with new information. An example of the hangtag can be found at <http://www.sleepproducts.org/Products/docs/SPSCHangtags.pdf>.

⁴ Marty Ahrens. *Home Structure Fires*, Quincy, MA: NFPA, 2011, p. 46.

⁵ U.S. Consumer Product Safety Commission. "Mattress Flammability Information" accessed at <http://www.cpsc.gov/BUSINFO/mattress.aspx> on August 4, 2008.

Assessing the impact of such standards is challenging. Mattresses are durable products and seldom replaced but bedding types can change frequently. Newer products are more likely to meet current standards. Over time, the products may be damaged or wear out. It is important to remember that these statistics are based on all mattresses and bedding, ranging from very old and heavily used to newly purchased and never used.

Changes in the environment also complicate the issue. Homes are much more likely to have smoke alarms today than they were in 1980. This means that more fires may be discovered before fire department assistance is required. The CPSC required lighters to be child-resistant beginning in 1994. The increase in candle sales in the 1990s was accompanied by an increase in candle fires. New materials and products enter the marketplace. “Fire-safe” cigarettes that extinguish in minutes when not inhaled are now required in all 50 states.

Much of the discussion of mattress and bedding fires has focused on differences between smoldering and small flame ignition sources. Unfortunately, the data does not reveal where the heat sources were in relation to the bed or how ignition scenarios progressed. It is likely that most fires started by smoking materials began with a smoldering phase, but the situation may be different in homes in which medical oxygen is in use. Equipment such as heaters may be under or adjacent to the bed, while lamps may be next to or fall on top of the bed. The previously published incident descriptions found in Appendix C provide more details on how these fires can develop and progress. These descriptions show what *can* happen, not what typically does happen. The incidents selected for publication tend to be the most serious.

While playing with fire dominates the lighter, candle, and match scenarios for small open flames, a candle flame is likely to impinge on a bed differently than a match or lighter held by a child. Intentional fires are often excluded from the discussion, but the large number of intentional fires that had playing with heat source as a contributing factor suggest that these fires may be intentionally set by children, not determined arsonists.

Safety Tips

- Never smoke in bed.
- Teach young children to tell a grownup when they find matches or lighters, and to never touch them.
- Place portable heaters away from the bed, or the bed away from a fixed space heater. Leave enough room between the appliance and the bed, at least three feet (1 meter), so that the heat will not ignite the bedding.
- Turn portable heaters off when you go to bed or leave the room.
- Avoid putting electrical cords over or under the bed or between furniture and the wall, where they could become damaged or pinched. Avoid placing any other operating, heat-producing appliances (such as electric curling irons) on a bed.
- Use only electric blankets listed and labeled by a testing laboratory. Discontinue the use of electric blankets or heating pads when the cords become frayed or the wires are exposed.
- Avoid using candles in bedrooms and sleeping areas. Extinguish candles when you leave a room or the home, or go to bed.

Table 1.
Home Structure Fires that Began with Mattress and Bedding, by Year 2005-2009

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Adjusted Loss in Millions of 2009 Dollars
1980	61,100	940	2,990	\$237	\$618
1981	57,100	820	2,920	\$234	\$551
1982	48,900	700	2,990	\$223	\$495
1983	45,600	700	3,120	\$243	\$523
1984	43,700	670	2,830	\$251	\$518
1985	43,100	860	2,880	\$283	\$564
1986	41,600	730	2,780	\$275	\$539
1987	38,400	720	3,150	\$235	\$444
1988	37,400	920	3,270	\$290	\$526
1989	34,500	650	3,200	\$334	\$578
1990	30,700	620	2,930	\$287	\$472
1991	31,000	620	3,220	\$408	\$643
1992	30,100	620	3,410	\$258	\$395
1993	29,700	620	3,420	\$369	\$548
1994	28,700	470	3,010	\$316	\$458
1995	25,100	530	2,640	\$320	\$450
1996	24,600	660	2,500	\$339	\$464
1997	22,600	490	2,310	\$338	\$452
1998	21,400	400	2,310	\$292	\$385
1999*	19,400	210	2,710	\$342	\$441
2000	14,900	440	2,140	\$343	\$428
2001	13,900	460	1,870	\$385	\$466
2002	12,600	380	1,210	\$331	\$395
2003	11,300	370	1,470	\$359	\$420
2004	11,400	310	1,450	\$350	\$398
2005	11,200	460	1,390	\$399	\$438
2006	11,000	390	1,280	\$376	\$400
2007	10,400	360	1,290	\$378	\$391
2008	10,000	300	1,320	\$374	\$373
2009	8,900	330	1,400	\$368	\$368

* Estimates for 1999-2009 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution. These estimates do NOT include fires with incident type 113-118, which are “confined” fires and have limited reporting.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 723, “Purchasing Power of the Dollar: 1950 to 2009,” U.S. Census Bureau’s *Statistical Abstract of the United States: 2011*, 130th Edition, 2011.

Table 2.
Home Structure Fires that Began with Mattress and Bedding, by Type of Material First Ignited
2005-2009 Annual Averages

Type of Material	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Fabric, fiber, cotton, blends, rayon or wool	8,440	(82%)	318	(86%)	1,130	(84%)	\$315	(82%)
Fabric, textile, fur, other	960	(9%)	40	(11%)	120	(9%)	\$35	(9%)
Multiple types of material	230	(2%)	6	(2%)	30	(2%)	\$10	(3%)
Other known type of material first ignited	630	(6%)	7	(2%)	60	(4%)	\$22	(6%)
Total	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the type of material first ignited was unknown or not reported are allocated proportionally among fires with known type of material first ignited. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 3.
Home Structure Fires that Began with Mattress and Bedding, by Area of Origin
2005-2009 Annual Averages

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Bedroom	7,970	(78%)	306	(83%)	1,120	(84%)	\$305	(80%)
Living room, family room, or den	470	(5%)	43	(12%)	70	(5%)	\$20	(5%)
Unclassified function area	300	(3%)	7	(2%)	40	(3%)	\$9	(2%)
Laundry room or area	210	(2%)	0	(0%)	10	(1%)	\$4	(1%)
Other known area of origin	1,310	(13%)	15	(4%)	100	(7%)	\$43	(11%)
Total	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the area of origin was unknown or not reported are allocated proportionally among fires with known area of origin. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 4.
Home Structure Fires that Began with Mattress and Bedding, by Extent of Flame Damage
2005-2009 Annual Averages

Extent of Flame Damage	Fires		Civilian		Civilian		Direct	
			Deaths	Injuries	Injuries	Property Damage (in Millions)		
Confined to object of origin	2,750	(27%)	33	(9%)	200	(15%)	\$23	(6%)
Confined to room of origin	4,070	(40%)	110	(30%)	490	(37%)	\$81	(21%)
Confined to floor of origin	1,150	(11%)	47	(13%)	210	(16%)	\$73	(19%)
Confined to building of origin	2,060	(20%)	157	(42%)	380	(28%)	\$176	(46%)
Beyond building of origin	230	(2%)	25	(7%)	60	(4%)	\$28	(7%)
Total	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118).. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the extent of flame damage was undetermined or not reported were allocated proportionally among fires with known extent of flame damage. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 5.
Home Structure Fires that Began with Mattress and Bedding by Leading Cause
2005-2009 Annual Averages

Leading Cause	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Smoking materials	2,060	(20%)	188	(51%)	340	(26%)	\$65	(17%)
Playing with heat source	1,890	(18%)	30	(8%)	290	(21%)	\$71	(19%)
Intentional	1,590	(16%)	36	(10%)	180	(14%)	\$59	(15%)
Candle	1,240	(12%)	22	(6%)	180	(14%)	\$57	(15%)
Electrical distribution and lighting equipment	1,040	(10%)	28	(7%)	90	(7%)	\$43	(11%)
Heating equipment	840	(8%)	77	(21%)	100	(8%)	\$39	(10%)

Note: These are the leading causes, obtained from the following list: intentional (from the NFIRS field “cause”); playing with fire (from factor contributing to ignition); electrical distribution and lighting equipment, heating equipment, and clothes dryer or washer (from equipment involved in ignition); and smoking materials and candles (from heat source). The statistics on smoking materials and candles include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Equipment statistics include a proportional share of fires coded with no equipment involved in ignition but with heat source indicating equipment involvement or unknown heat source. The same fire can be listed under multiple causes, based on multiple data elements. Details on handling of unknowns, partial unknowns, and other underspecified codes may be found in the Appendix.

These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires with unknown data were allocated separately for each field pulled from.. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 6.
Home Structure Fires that Began with Mattresses and Bedding
by Cause of Ignition
2005-2009 Annual Averages

Cause of Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unintentional	7,500	(73%)	298	(80%)	1,040	(78%)	\$285	(75%)
Intentional	1,590	(16%)	36	(10%)	180	(14%)	\$59	(15%)
Failure of equipment or heat source	890	(9%)	26	(7%)	90	(7%)	\$31	(8%)
Unclassified cause	240	(2%)	10	(3%)	20	(1%)	\$6	(2%)
Act of nature	40	(0%)	0	(0%)	0	(0%)	\$1	(0%)
Total	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the extent of flame damage or cause was undetermined, under investigation or not reported were allocated proportionally among fires with known extent of flame damage or cause. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 7.
Home Structure Fires that Began with Mattresses and Bedding
by Factor Contributing to Ignition
2005-2009 Annual Averages

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heat source too close to combustibles	2,760	(27%)	125	(34%)	370	(28%)	\$114	(30%)
Playing with heat source	1,890	(18%)	30	(8%)	290	(21%)	\$71	(19%)
Abandoned or discarded materials or products	1,660	(16%)	104	(28%)	220	(16%)	\$58	(15%)
Unclassified misuse of material or product	1,300	(13%)	67	(18%)	220	(17%)	\$47	(12%)
Electrical failure or malfunction	1,270	(12%)	21	(6%)	120	(9%)	\$48	(13%)
Other factor contributed to ignition	630	(6%)	27	(7%)	80	(6%)	\$26	(7%)
Mechanical failure or malfunction	220	(2%)	4	(1%)	10	(1%)	\$5	(1%)
Equipment unattended	210	(2%)	2	(0%)	20	(1%)	\$8	(2%)
Other known factors contributing to ignition	870	(8%)	22	(6%)	90	(7%)	\$32	(8%)
Total fires	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)
Total entries*	10,800	(105%)	401	(108%)	1,410	(106%)	\$409	(107%)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the factor contributing to ignition was undetermined, coded as “none,” or not reported were allocated proportionally among fires with known factor contributing to ignition. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 8.
Home Structure Fires that Began with Mattresses and Bedding
by Heat Source
2005-2009 Annual Averages

Heat Source	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Smoking materials	2,060	(20%)	188	(51%)	340	(26%)	\$65	(17%)
Cigarette lighter	1,760	(17%)	39	(11%)	270	(20%)	\$67	(18%)
Candle	1,240	(12%)	22	(6%)	180	(14%)	\$57	(15%)
Radiated, conducted heat from operating equipment	1,060	(10%)	41	(11%)	110	(9%)	\$41	(11%)
Arcing	870	(9%)	13	(3%)	100	(7%)	\$32	(9%)
Unclassified heat from powered equipment	710	(7%)	10	(3%)	60	(4%)	\$25	(7%)
Unclassified hot or smoldering object	620	(6%)	13	(4%)	60	(4%)	\$20	(5%)
Match	560	(5%)	10	(3%)	70	(5%)	\$23	(6%)
Hot ember or ash	500	(5%)	16	(4%)	70	(5%)	\$16	(4%)
Unclassified heat source	290	(3%)	5	(1%)	20	(1%)	\$11	(3%)
Spark, ember or flame from operating equipment	170	(2%)	3	(1%)	20	(2%)	\$5	(1%)
Other known heat source	420	(4%)	9	(2%)	30	(2%)	\$18	(5%)
Total	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the heat source was undetermined or not reported were allocated proportionally among fires with known heat source. Sums may not equal totals due to rounding errors. The estimates of matches, lighters, smoking materials and candles include a proportional share of fires in which the heat source was heat from an unclassified open flame or smoking material. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 9.
Home Structure Fires that Began with Mattresses and Bedding
by Equipment Involved in Ignition
2005-2009 Annual Averages

Equipment Involved	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
No equipment involved in ignition	6,600	(64%)	234	(63%)	920	(69%)	\$237	(62%)
Electrical distribution or lighting equipment	1,040	(10%)	28	(7%)	90	(7%)	\$43	(11%)
Lamb, bulb or lighting	490	(5%)	3	(1%)	30	(2%)	\$20	(5%)
Wiring and related equipment	290	(3%)	13	(4%)	40	(3%)	\$13	(3%)
Cord or plug	230	(2%)	11	(3%)	20	(2%)	\$8	(2%)
Other known electrical distribution or lighting equipment	30	(0%)	0	(0%)	0	(0%)	\$1	(0%)
Heating equipment	840	(8%)	77	(21%)	100	(8%)	\$39	(10%)
Fixed or portable space heater	720	(7%)	74	(20%)	100	(7%)	\$34	(9%)
Other known heating equipment	110	(1%)	3	(1%)	0	(0%)	\$5	(1%)
Clothes dryer	360	(3%)	0	(0%)	10	(1%)	\$4	(1%)
Cigarette lighter, pipe lighter*	330	(3%)	8	(2%)	50	(4%)	\$14	(4%)
Electric blanket	250	(2%)	11	(3%)	40	(3%)	\$9	(2%)
Air conditioner	100	(1%)	0	(0%)	10	(1%)	\$4	(1%)
Unclassified portable appliance designed to produce heat	90	(1%)	0	(0%)	20	(1%)	\$4	(1%)
Heating pad	90	(1%)	0	(0%)	10	(1%)	\$4	(1%)
Fan	80	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Cooking equipment	70	(1%)	3	(1%)	10	(1%)	\$3	(1%)
Unclassified equipment involved in ignition	60	(1%)	5	(1%)	0	(0%)	\$1	(0%)
Other known equipment involved in ignition	360	(3%)	5	(1%)	50	(4%)	\$18	(5%)
Total	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)

Table 9.
Home Structure Fires that Began with Mattresses and Bedding
by Equipment Involved in Ignition
2005-2009 Annual Averages (continued)

*Most fires that list lighter as heat source do not show any equipment involved in ignition.

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which the equipment involved in ignition was undetermined or not reported were allocated proportionally among fires with known equipment involved in ignition. Fires in which the equipment involved in ignition was entered as none but the heat source indicated equipment involvement or the heat source was unknown were also treated as unknown and allocated proportionally among fires with known equipment involved. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 10.
Home Structure Fires that began with Mattress and Bedding and Started by Smoking Materials
by Year: 1980-2009

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Adjusted Loss in Millions of 2009 Dollars
1980	25,300	530	1,390	\$83	\$216
1981	23,200	560	1,420	\$88	\$207
1982	19,100	480	1,280	\$76	\$169
1983	17,200	470	1,400	\$80	\$172
1984	16,400	360	1,210	\$82	\$169
1985	16,400	480	1,210	\$97	\$193
1986	15,400	360	1,120	\$88	\$172
1987	14,000	400	1,180	\$69	\$130
1988	13,200	480	1,310	\$90	\$163
1989	11,900	340	1,090	\$83	\$144
1990	10,000	320	1,100	\$76	\$125
1991	9,600	270	1,000	\$107	\$169
1992	9,000	290	1,160	\$67	\$103
1993	8,300	320	1,020	\$94	\$140
1994	7,700	200	780	\$66	\$96
1995	6,800	260	710	\$73	\$103
1996	6,900	320	780	\$75	\$103
1997	5,800	230	730	\$67	\$90
1998	5,800	230	680	\$67	\$88
1999*	4,900	210	920	\$75	\$97
2000	2,900	250	780	\$115	\$144
2001	2,800	220	390	\$58	\$70
2002	2,800	170	320	\$75	\$90
2003	2,200	150	380	\$66	\$77
2004	2,300	160	380	\$78	\$89
2005	2,200	180	380	\$62	\$68
2006	2,300	220	310	\$77	\$82
2007	2,100	190	350	\$61	\$63
2008	2,100	180	330	\$57	\$57
2009	1,700	180	350	\$66	\$66

* Estimates for 1999-2005 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. These statistics include proportional shares of fires in which the item first ignited or heat source was undetermined or not reported. The 1999-2005, estimates also include proportional shares of fires in which the heat source was an unclassified open flame or smoking material.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 697, "Purchasing Power of the Dollar: 1950 to 2006," U.S. Census Bureau's *Statistical Abstract of the United States: 2008*, 127th Edition, 2007.

Table 11.
Home Structure Fires that began with Mattress and Bedding and
Started by Lighters, Candles, and Matches, by Year: 1980-2009

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	Adjusted Loss in Millions of 2009 Dollars
1980	19,900	250	940	\$77	\$201
1981	18,600	140	810	\$75	\$177
1982	15,500	100	980	\$72	\$160
1983	15,200	120	1,020	\$75	\$161
1984	14,500	140	1,000	\$87	\$179
1985	14,400	200	1,030	\$94	\$187
1986	14,500	160	970	\$105	\$206
1987	13,600	190	1,230	\$90	\$170
1988	13,500	240	1,220	\$103	\$187
1989	12,700	180	1,220	\$116	\$201
1990	11,800	170	1,210	\$109	\$179
1991	12,200	180	1,410	\$173	\$272
1992	12,600	190	1,520	\$115	\$176
1993	12,600	230	1,570	\$144	\$214
1994	12,900	190	1,560	\$151	\$219
1995	10,500	160	1,300	\$145	\$204
1996	9,900	130	1,180	\$156	\$214
1997	9,100	130	1,030	\$142	\$190
1998	8,500	80	1,090	\$130	\$171
1999*	8,000	0	850	\$153	\$197
2000	6,500	160	880	\$137	\$171
2001	5,400	120	890	\$153	\$185
2002	4,900	100	530	\$126	\$151
2003	4,200	100	690	\$152	\$178
2004	4,000	60	620	\$129	\$147
2005	4,100	100	550	\$164	\$180
2006	3,900	90	510	\$142	\$152
2007	3,600	60	470	\$137	\$142
2008	3,300	30	500	\$150	\$150
2009	2,900	70	580	\$132	\$132

* Estimates for 1999-2005 are based on data collected originally in NFIRS 5.0 only. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Note: These are national estimates of *non-confined* structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and injuries are rounded to the nearest ten, and direct property damage is rounded to the nearest million dollars. These statistics include proportional shares of fires in which the item first ignited or heat source was undetermined or not reported. These statistics include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported, as well as proportional shares of fires 1980-1998 in which the form of heat of ignition was an unclassified or unknown-type open flame or spark, and in 1999-2005, in which the heat source was an unclassified open flame or smoking material.

Sources: NFIRS and NFPA survey. Inflation adjustments were based on Table No. 697, "Purchasing Power of the Dollar: 1950 to 2006," *U.S. Census Bureau's Statistical Abstract of the United States: 2008*, 127th Edition, 2007.

Table 12.
Home Structure Fires that began with Mattress and Bedding and Started by Smoking Materials
by Extent of Flame Damage
2005-2009 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined to object of origin	700	(34%)	19	(10%)	70	(20%)	\$5	(7%)
Confined to room of origin	760	(37%)	61	(32%)	130	(37%)	\$15	(23%)
Confined to floor of origin	210	(10%)	25	(13%)	60	(17%)	\$12	(18%)
Confined to building of origin	350	(17%)	74	(39%)	80	(25%)	\$28	(44%)
Beyond building of origin	30	(2%)	10	(5%)	10	(2%)	\$5	(8%)
Total	2,060	(100%)	188	(100%)	340	(100%)	\$65	(100%)

Table 13.
Home Structure Fires that began with Mattress and Bedding and Started by Lighters, Candles, and Matches,
by Extent of Flame Damage
2005-2009 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined to object of origin	860	(24%)	6	(8%)	80	(16%)	\$9	(6%)
Confined to room of origin	1,500	(42%)	18	(26%)	190	(36%)	\$29	(20%)
Confined to floor of origin	430	(12%)	15	(20%)	70	(14%)	\$33	(23%)
Confined to building of origin	700	(20%)	30	(42%)	150	(28%)	\$66	(45%)
Beyond building of origin	80	(2%)	2	(3%)	30	(6%)	\$10	(7%)
Total	3,560	(100%)	72	(100%)	520	(100%)	\$147	(100%)

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which the extent of flame damage was undetermined or not reported were allocated proportionally among fires with known extent of flame damage. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 14.
Home Structure Fires that began with Mattress and Bedding and Started by Smoking Materials
by Alarm Time
2005-2009 Annual Averages

Alarm Time	Fires		Civilian Deaths		Civilian Injuries		Direct	
							Property Damage (in Millions)	
Midnight - 3 a.m.	310	(15%)	37	(20%)	70	(20%)	\$11	(17%)
3 - 6 a.m.	280	(13%)	28	(15%)	50	(14%)	\$9	(14%)
6 - 9 a.m.	240	(12%)	19	(10%)	60	(17%)	\$7	(11%)
9 a.m. - Noon	230	(11%)	21	(11%)	30	(8%)	\$6	(10%)
Noon - 3 p.m.	230	(11%)	23	(12%)	30	(10%)	\$9	(14%)
3 - 6 p.m.	230	(11%)	19	(10%)	30	(8%)	\$7	(10%)
6 - 9 p.m.	240	(12%)	15	(8%)	40	(11%)	\$8	(13%)
9 p.m. - midnight	300	(14%)	26	(14%)	40	(12%)	\$9	(13%)
Total	2,060	(100%)	188	(100%)	340	(100%)	\$65	(100%)

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which the factor contributing to ignition was undetermined, coded as “none,” or not reported were allocated proportionally among fires with known factor contributing to ignition. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 15.
Home Structure Fires that began with Mattress and Bedding and
Started by Lighters, Candles, and Matches, by Alarm Time
2005-2009 Annual Averages

Alarm Time	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight - 3 a.m.	260	(7%)	11	(15%)	50	(10%)	\$13	(9%)
3 - 6 a.m.	200	(6%)	5	(7%)	50	(9%)	\$11	(7%)
6 - 9 a.m.	290	(8%)	10	(15%)	60	(12%)	\$12	(8%)
9 a.m. - Noon	530	(15%)	12	(16%)	100	(19%)	\$22	(15%)
Noon - 3 p.m.	550	(15%)	6	(9%)	70	(14%)	\$21	(14%)
3 - 6 p.m.	620	(17%)	8	(11%)	60	(12%)	\$22	(15%)
6 - 9 p.m.	610	(17%)	12	(17%)	70	(14%)	\$26	(18%)
9 p.m. - midnight	500	(14%)	7	(10%)	60	(11%)	\$19	(13%)
Total	3,560	(100%)	72	(100%)	520	(100%)	\$147	(100%)

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which the factor contributing to ignition was undetermined, coded as “none,” or not reported were allocated proportionally among fires with known factor contributing to ignition. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 16.
Home Structure Fires that began with Mattress and Bedding and Started by Smoking Materials
by Factor Contributing to Ignition
2005-2009 Annual Averages

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Abandoned or discarded materials or products	1,060	(52%)	95	(51%)	150	(43%)	\$35	(54%)
Unclassified misuse of material or product	470	(23%)	47	(25%)	100	(30%)	\$15	(22%)
Heat source too close to combustibles	410	(20%)	37	(19%)	70	(21%)	\$13	(20%)
Unclassified factor contributed to ignition	140	(7%)	21	(11%)	30	(9%)	\$6	(9%)
Other known factor contributing to ignition	80	(4%)	5	(3%)	10	(4%)	\$3	(4%)
Total fires	2,060	(100%)	188	(100%)	340	(100%)	\$65	(100%)
Total entries*	2,160	(105%)	205	(109%)	370	(106%)	\$71	(109%)

Table 17.
Home Structure Fires that began with Mattress and Bedding and Started by Lighters, Candles, and Matches, by Factor Contributing
2005-2009 Annual Averages

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Playing with heat source	1,790	(50%)	31	(44%)	280	(53%)	\$67	(46%)
Heat source too close to combustibles	910	(25%)	16	(22%)	140	(27%)	\$38	(26%)
Unclassified misuse of material or product	420	(12%)	17	(24%)	70	(13%)	\$21	(14%)
Abandoned or discarded materials or products	200	(6%)	6	(9%)	20	(3%)	\$10	(7%)
Unclassified factor contributed to ignition	180	(5%)	2	(2%)	20	(4%)	\$10	(7%)
Equipment unattended	50	(2%)	0	(0%)	10	(1%)	\$2	(1%)
Other known factor contributing to ignition	180	(5%)	7	(10%)	20	(4%)	\$6	(4%)
Total fires	3,560	(100%)	72	(100%)	520	(100%)	\$147	(100%)
Total entries*	3,720	(104%)	79	(110%)	550	(105%)	\$155	(106%)

Table 17.
Home Structure Fires that began with Mattress and Bedding
Started by Lighters, Candles, and Matches, by Factor Contributing
2005-2009 Annual Averages (continued)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which the cause was under investigation, undetermined after investigation, or not reported were allocated proportionally among fires with known cause. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 18.
Home Structure Fires that began with Mattress and Bedding, by Smoking Materials
by Cause of Ignition Ignition
2005-2009 Annual Averages

Cause of Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unintentional	1,960	(95%)	187	(99%)	330	(97%)	\$62	(95%)
Intentional	50	(2%)	0	(0%)	0	(1%)	\$2	(3%)
Unclassified cause	40	(2%)	1	(1%)	10	(2%)	\$1	(1%)
Other known cause	10	(0%)	0	(0%)	0	(0%)	\$0	(0%)
Totals	2,060	(100%)	188	(100%)	340	(100%)	\$65	(100%)

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which no human factors contributing to ignition were reported were allocated proportionally among fires with known human factor contributing to ignition, including “none.” Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 19.
Home Structure Fires that began with Mattress and Bedding and Started Lighters, Candles, and Matches
by Cause of Ignition
2005-2009 Annual Averages

Cause of Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unintentional	2,390	(67%)	54	(76%)	350	(68%)	\$107	(73%)
Intentional	1,080	(30%)	17	(24%)	150	(30%)	\$38	(26%)
Unclassified cause	80	(2%)	0	(0%)	10	(2%)	\$2	(1%)
Other known cause of ignition	20	(1%)	0	(0%)	0	(0%)	\$0	(0%)
Total	3,560	(100%)	72	(100%)	520	(100%)	\$147	(100%)

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which no human factors contributing to ignition were reported were allocated proportionally among fires with known human factor contributing to ignition, including “none.” Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 20.
Home Structure Fires that Began with Mattress and Bedding by Human Factors Contributing to Ignition
2005-2009 Annual Averages

Human Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
No human factors involved	6,130	(60%)	118	(32%)	600	(45%)	\$218	(57%)
Unattended or unsupervised person	1,380	(13%)	27	(7%)	160	(12%)	\$51	(13%)
Asleep	1,270	(12%)	142	(38%)	320	(24%)	\$54	(14%)
Age was a factor	1,140	(11%)	50	(14%)	190	(14%)	\$47	(12%)
Possibly impaired by alcohol or drugs	530	(5%)	56	(15%)	130	(10%)	\$25	(6%)
Possibly mentally disabled	250	(2%)	13	(4%)	40	(3%)	\$11	(3%)
Multiple persons involved	150	(1%)	16	(4%)	20	(1%)	\$6	(2%)
Physically disabled	100	(1%)	46	(12%)	40	(3%)	\$6	(2%)
Total fires	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)
Total entries*	10,940	(107%)	468	(126%)	1,510	(113%)	\$418	(110%)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries are rounded to the nearest one, and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. They also include a proportional share of fires in which the heat source or form of heat ignition was undetermined or not reported and in which the heat source was an unclassified open flame or smoking material. Fires in which no human factors contributing to ignition were reported were allocated proportionally among fires with known human factor contributing to ignition, including "none." Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Table 21.
Home Structure Fires that began with Mattress and Bedding and Started by Smoking Materials
by Human Factors Involved in Ignition
2005-2009 Annual Averages

Human Factors	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
No human factors involved	920	(45%)	45	(24%)	100	(29%)	\$27	(41%)
Asleep	640	(31%)	88	(47%)	150	(45%)	\$22	(34%)
Possibly impaired by alcohol or drugs	300	(15%)	44	(23%)	80	(24%)	\$11	(17%)
Unattended or unsupervised person	170	(8%)	11	(6%)	20	(5%)	\$5	(8%)
Possibly mentally disabled	80	(4%)	7	(4%)	20	(5%)	\$2	(4%)
Age was a factor	70	(3%)	19	(10%)	20	(5%)	\$3	(5%)
Physically disabled	60	(3%)	37	(20%)	30	(9%)	\$4	(7%)
Multiple persons involved	20	(1%)	2	(1%)	0	(1%)	\$1	(1%)
Total fires	2,060	(100%)	188	(100%)	340	(100%)	\$65	(100%)
Total entries*	2,260	(110%)	255	(135%)	420	(123%)	\$76	(117%)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of victims of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are rounded to the nearest one. All types of detection equipment are grouped together as “smoke alarms.” These statistics include a proportional share of fires in which the item first ignited, detection presence or detection operation was undetermined or not reported. Victims with unknown or unreported age were allocated proportionally among victims of known age. Relative risk was calculated by dividing the percent of casualties in each group by the percent of population in each age group. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Sources: NFIRS 5.0 and NFPA survey.

Table 22.
Home Structure Fires that began with Mattress and Bedding and Started by Lighters, Candles, and Matches
by Human Factors Contributing to Ignition
2005-2009 Annual Averages

Human Factors	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
No human factors involved	1,380	(39%)	16	(23%)	180	(34%)	\$56	(39%)
Age was a factor	1,090	(31%)	25	(35%)	180	(34%)	\$43	(29%)
Unattended or unsupervised person	930	(26%)	19	(26%)	130	(24%)	\$39	(27%)
Asleep	280	(8%)	17	(23%)	70	(13%)	\$14	(9%)
Possibly mentally disabled	120	(3%)	5	(7%)	20	(4%)	\$6	(4%)
Possibly impaired by alcohol or drugs	110	(3%)	5	(7%)	20	(4%)	\$5	(4%)
Multiple persons involved	60	(2%)	7	(10%)	10	(1%)	\$3	(2%)
Physically disabled	20	(0%)	2	(2%)	0	(1%)	\$0	(0%)
Total fires	3,560	(100%)	72	(100%)	520	(100%)	\$147	(100%)
Total factors	3,980	(112%)	96	(134%)	590	(114%)	\$166	(113%)

*Multiple entries are allowed, resulting in more factor entries than fires.

Note: These are national estimates of victims of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are rounded to the nearest one. All types of detection equipment are grouped together as “smoke alarms.” These statistics include a proportional share of fires in which the item first ignited, detection presence or detection operation was undetermined or not reported. Victims with unknown or unreported age were allocated proportionally among victims of known age. Relative risk was calculated by dividing the percent of casualties in each group by the percent of population in each age group. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Table 23.
Home Structure Fire Deaths and Injuries that began with Mattress and Bedding
by Age of Victim
2005-2009 Annual Averages

Age Group	Civilian Deaths		Relative Death Risk	Civilian Injuries		Relative Injury Risk	Population (in Millions)	
0-4	35	(9%)	1.4	80	(6%)	0.9	21.2	(7%)
5-14	28	(8%)	0.6	130	(9%)	0.7	40.4	(13%)
15-24	16	(4%)	0.3	190	(15%)	1.0	43.0	(14%)
25-34	17	(5%)	0.3	220	(17%)	1.2	41.0	(13%)
35-44	41	(11%)	0.8	200	(15%)	1.1	42.2	(14%)
45-54	56	(15%)	1.0	210	(16%)	1.1	44.2	(15%)
55-64	67	(18%)	1.6	150	(11%)	1.0	33.6	(11%)
65-74	57	(15%)	2.3	80	(6%)	1.0	20.1	(7%)
75-84	37	(10%)	2.3	50	(4%)	0.9	13.2	(4%)
85 and older	15	(4%)	2.3	20	(2%)	0.9	5.4	(2%)
Total	371	(100%)	1	1,340	(100%)	1	304.4	(100%)

Note: These are national estimates of victims of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are rounded to the nearest one. All types of detection equipment are grouped together as “smoke alarms.” These statistics include a proportional share of fires in which the item first ignited or detection presence was undetermined or not reported. Victims with unknown or unreported age were allocated proportionally among victims of known age. Relative risk was calculated by dividing the percent of casualties in each group by the percent of population in each age group. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Sources: NFIRS 5.0 and NFPA survey. Population estimates were based on Table No. 7, “Resident Population by Age and Sex: 1980 to 2009,” U.S. Census Bureau’s *Statistical Abstract of the United States: 2011*, 130th Edition, 2011.

Table 24.
Home Structure Fire Deaths and Injuries that began with Mattress and Bedding and Started
by Smoking Materials by Age of Victim
2005-2009 Annual Averages

Age Group	Civilian Deaths		Relative Death Risk	Civilian Injuries		Relative Injury Risk	Population (in Millions)	
0-4	6	(3%)	0.5	0	(1%)	0.1	21.2	(7%)
5-14	4	(2%)	0.1	10	(2%)	0.1	40.4	(13%)
15-24	4	(2%)	0.1	30	(9%)	0.6	43.0	(14%)
25-34	6	(3%)	0.2	50	(13%)	1.0	41.0	(13%)
35-44	16	(8%)	0.6	50	(15%)	1.0	42.2	(14%)
45-54	30	(16%)	1.1	80	(24%)	1.7	44.2	(15%)
55-64	53	(28%)	2.5	60	(18%)	1.7	33.6	(11%)
65-74	36	(19%)	2.9	40	(10%)	1.6	20.1	(7%)
75-84	25	(13%)	3.0	20	(6%)	1.3	13.2	(4%)
85 and older	9	(5%)	2.8	10	(2%)	0.9	5.4	(2%)
Total	188	(100%)	1	340	(100%)	1	304.4	(100%)

Table 25.
Home Structure Fire Deaths and Injuries that began with Mattress and Bedding and Started
by Lighters, Candles, and Matches by Age of Victim
2005-2009 Annual Averages

Age Group	Civilian Deaths		Relative Death Risk	Civilian Injuries		Relative Injury Risk	Population (in Millions)	
0-4	21	(29%)	4.1	60	(12%)	1.7	21.2	(7%)
5-14	14	(20%)	1.5	70	(14%)	1.0	40.4	(13%)
15-24	7	(10%)	0.7	90	(17%)	1.2	43.0	(14%)
25-34	3	(4%)	0.3	100	(19%)	1.4	41.0	(13%)
35-44	10	(14%)	1.0	70	(13%)	0.9	42.2	(14%)
45-54	9	(13%)	0.9	60	(12%)	0.8	44.2	(15%)
55-64	1	(2%)	0.2	40	(7%)	0.6	33.6	(11%)
65-74	4	(6%)	0.9	20	(3%)	0.5	20.1	(7%)
75-84	0	(0%)	0.0	10	(2%)	0.5	13.2	(4%)
85 and older	3	(4%)	2.0	0	(1%)	0.4	5.4	(2%)
Total	72	(100%)	1	520	(100%)	1	304.4	(100%)

Note: These are national estimates of victims of *non-confined* fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Civilian deaths and injuries are rounded to the nearest one. All types of detection equipment are grouped together as “smoke alarms.” These statistics include a proportional share of fires in which the item first ignited or detection presence was undetermined or not reported. Victims with unknown or unreported age were allocated proportionally among victims of known age. Relative risk was calculated by dividing the percent of casualties in each group by the percent of population in each age group. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Sources: NFIRS 5.0 and NFPA survey. Population estimates were based on Table No. 7, “Resident Population by Age and Sex: 1980 to 2009,” U.S. Census Bureau’s *Statistical Abstract of the United States: 2011*, 130th Edition, 2011.

Table 26.
Home Structure Fires that Began with Mattress and Bedding
by Smoke Alarm Presence, Operation, and Effectiveness
2005-2009 Annual Averages

Detector Present	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Present	6,600	(64%)	250	(67%)	980	(73%)	\$275	(72%)
Operated	4,770	(47%)	147	(40%)	690	(52%)	\$225	(59%)
Alerted occupants	3,970	(39%)	99	(27%)	610	(46%)	\$190	(50%)
Occupants failed to respond	200	(2%)	32	(9%)	50	(4%)	\$9	(2%)
No Occupants	450	(4%)	0	(0%)	10	(1%)	\$20	(5%)
Failed to alert occupants	150	(1%)	15	(4%)	20	(2%)	\$6	(2%)
Failed to operate	1,400	(14%)	104	(28%)	240	(18%)	\$47	(12%)
Fire too small to operate	420	(6%)	0	(0%)	40	(3%)	\$2	(1%)
Not Present	3,660	(36%)	121	(33%)	360	(27%)	\$107	(28%)
Total	10,260	(100%)	371	(100%)	1,340	(100%)	\$382	(100%)

Note: These are national estimates of non-confined structure fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades and confined fires (NFIRS 5.0 incident types 113-118). National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires, civilian deaths and civilian injuries are rounded to the nearest ten and direct property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation. All types of detection equipment are grouped together as “smoke alarms.” These statistics include a proportional share of fires in which the item first ignited was undetermined or not reported. Fires in which detection equipment presence or operation was undetermined or not reported were allocated proportionally among fires with known presence or operation. Sums may not equal totals due to rounding errors. Estimates of zero mean that the actual number rounded to zero – it may or may not actually be zero.

Source: NFIRS 5.0 and NFPA survey.

Appendix A. How National Estimates Statistics Are Calculated

The statistics in this analysis are estimates derived from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual survey of U.S. fire departments. NFIRS is a voluntary system by which participating fire departments report detailed factors about the fires to which they respond. Roughly two-thirds of U.S. fire departments participate, although not all of these departments provide data every year. Fires reported to federal or state fire departments or industrial fire brigades are not included in these estimates.

NFIRS provides the most detailed incident information of any national database not limited to large fires. NFIRS is the only database capable of addressing national patterns for fires of all sizes by specific property use and specific fire cause. NFIRS also captures information on the extent of flame spread, and automatic detection and suppression equipment. For more information about NFIRS visit <http://www.nfirs.fema.gov/>. Copies of the paper forms may be downloaded from http://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2008.pdf.

NFIRS has a wide variety of data elements and code choices. The NFIRS database contains coded information. Many code choices describe several conditions. These cannot be broken down further. For example, area of origin code 83 captures fires starting in vehicle engine areas, running gear areas or wheel areas. It is impossible to tell the portion of each from the coded data.

Methodology may change slightly from year to year.

NFPA is continually examining its methodology to provide the best possible answers to specific questions, methodological and definitional changes can occur. *Earlier editions of the same report may have used different methodologies to produce the same analysis, meaning that the estimates are not directly comparable from year to year.*

NFPA's fire department experience survey provides estimates of the big picture.

Each year, NFPA conducts an annual survey of fire departments which enables us to capture a summary of fire department experience on a larger scale. Surveys are sent to all municipal departments protecting populations of 50,000 or more and a random sample, stratified by community size, of the smaller departments. Typically, a total of roughly 3,000 surveys are returned, representing about one of every ten U.S. municipal fire departments and about one third of the U.S. population.

The survey is stratified by size of population protected to reduce the uncertainty of the final estimate. Small rural communities have fewer people protected per department and are less likely to respond to the survey. A larger number must be surveyed to obtain an adequate sample of those departments. (NFPA also makes follow-up calls to a sample of the smaller fire departments that do not respond, to confirm that those that did respond are truly representative of fire departments their size.) On the other hand, large city

departments are so few in number and protect such a large proportion of the total U.S. population that it makes sense to survey all of them. Most respond, resulting in excellent precision for their part of the final estimate.

The survey includes the following information: (1) the total number of fire incidents, civilian deaths, and civilian injuries, and the total estimated property damage (in dollars), for each of the major property use classes defined in NFIRS; (2) the number of on-duty firefighter injuries, by type of duty and nature of illness; (3) the number and nature of non-fire incidents; and (4) information on the type of community protected (e.g., county versus township versus city) and the size of the population protected, which is used in the statistical formula for projecting national totals from sample results. The results of the survey are published in the annual report *Fire Loss in the United States*. To download a free copy of the report, visit <http://www.nfpa.org/assets/files/PDF/OS.fireloss.pdf>.

Projecting NFIRS to National Estimates

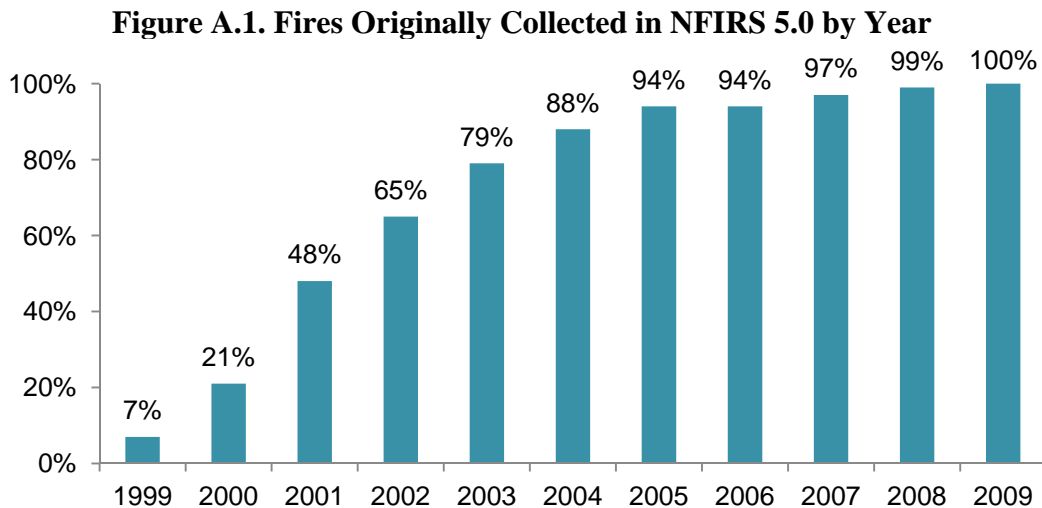
As noted, NFIRS is a voluntary system. Different states and jurisdictions have different reporting requirements and practices. Participation rates in NFIRS are not necessarily uniform across regions and community sizes, both factors correlated with frequency and severity of fires. This means NFIRS may be susceptible to systematic biases. No one at present can quantify the size of these deviations from the ideal, representative sample, so no one can say with confidence that they are or are not serious problems. But there is enough reason for concern so that a second database -- the NFPA survey -- is needed to project NFIRS to national estimates and to project different parts of NFIRS separately. This multiple calibration approach makes use of the annual NFPA survey where its statistical design advantages are strongest.

Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific fire problems and circumstances are obtained by multiplying the NFIRS data by the scaling ratios. Reports for incidents in which mutual aid was given are excluded from NFPA's analyses.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission developed the specific basic analytical rules used for this procedure. "The National Estimates Approach to U.S. Fire Statistics," by John R. Hall, Jr. and Beatrice Harwood, provides a more detailed explanation of national estimates. A copy of the article is available online at <http://www.nfpa.org/> or through NFPA's One-Stop Data Shop.

Version 5.0 of NFIRS, first introduced in 1999, used a different coding structure for many data elements, added some property use codes, and dropped others. The essentials of the approach described by Hall and Harwood are still used, but some modifications have been necessary to accommodate the changes in NFIRS 5.0.

Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.



From 1999 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

$$\frac{\text{NFPA survey projections}}{\text{NFIRS totals (Version 5.0)}}$$

For 1999 to 2001, the same rules may be applied, but estimates for these years in this form will be less reliable due to the smaller amount of data originally collected in NFIRS 5.0; they should be viewed with extreme caution.

NFIRS 5.0 introduced six categories of confined structure fires, including:

- cooking fires confined to the cooking vessel,
- confined chimney or flue fires,
- confined incinerator fire,
- confined fuel burner or boiler fire or delayed ignition,
- confined commercial compactor fire, and
- trash or rubbish fires in a structure with no flame damage to the structure or its contents.

Although causal and other detailed information is typically not required for these incidents, it is provided in some cases. Some analyses, particularly those that examine cooking equipment, heating equipment, fires caused by smoking materials, and fires started by playing with fire, may examine the confined fires in greater detail. Because the confined fire incident types describe certain scenarios, the distribution of unknown data differs from that of all fires. Consequently, allocation of unknowns must be done separately.

Some analyses of structure fires show only non-confined fires. In these tables, percentages shown are of non-confined structure fires rather than all structure fires. This approach has the advantage of showing the frequency of specific factors in fire causes, but the disadvantage of possibly overstating the percentage of factors that are seldom seen in the confined fire incident types and of understating the factors specifically associated with the confined fire incident types.

Other analyses include entries for confined fire incident types in the causal tables and show percentages based on total structure fires. In these cases, the confined fire incident type is treated as a general causal factor.

For most fields other than Property Use and Incident Type, NFPA allocates unknown data proportionally among known data. This approach assumes that if the missing data were known, it would be distributed in the same manner as the known data. NFPA makes additional adjustments to several fields. *Casualty and loss projections can be heavily influenced by the inclusion or exclusion of unusually serious fire.*

In the formulas that follow, the term “all fires” refers to all fires in NFIRS on the dimension studied. The percentages of fires with known or unknown data are provided for non-confined fires and associated losses, and for confined fires only.

Cause of Ignition: This field is used chiefly to identify intentional fires. “Unintentional” in this field is a specific entry and does not include other fires that were not intentionally set: failure of equipment or heat source, act of nature, or “other” (unclassified).” The last should be used for exposures but has been used for other situations as well. Fires that were coded as under investigation and those that were coded as undetermined after investigation were treated as unknown.

Factor Contributing to Ignition: In this field, the code “none” is treated as an unknown and allocated proportionally. For Human Factor Contributing to Ignition, NFPA enters a code for “not reported” when no factors are recorded. “Not reported” is treated as an unknown, but the code “none” is treated as a known code and not allocated. Multiple entries are allowed in both of these fields. Percentages are calculated on the total number of fires, not entries, resulting in sums greater than 100%. Although Factor Contributing to Ignition is only required when the cause of ignition was coded as: 2) unintentional, 3) failure of equipment or heat source; or 4) act of nature, data is often present when not required. Consequently, any fire in which no factor contributing to ignition was entered was treated as unknown.

In some analyses, all entries in the category of mechanical failure, malfunction (factor contributing to ignition 20-29) are combined and shown as one entry, “mechanical failure or malfunction.” This category includes:

21. Automatic control failure;
22. Manual control failure;
23. Leak or break. Includes leaks or breaks from containers or pipes. Excludes operational deficiencies and spill mishaps;
25. Worn out;

26. Backfire. Excludes fires originating as a result of hot catalytic converters;
27. Improper fuel used; Includes the use of gasoline in a kerosene heater and the like; and
20. Mechanical failure or malfunction, other.

Entries in “electrical failure, malfunction” (factor contributing to ignition 30-39) may also be combined into one entry, “electrical failure or malfunction.” This category includes:

31. Water-caused short circuit arc;
32. Short-circuit arc from mechanical damage;
33. Short-circuit arc from defective or worn insulation;
34. Unspecified short circuit arc;
35. Arc from faulty contact or broken connector, including broken power lines and loose connections;
36. Arc or spark from operating equipment, switch, or electric fence;
37. Fluorescent light ballast; and
30. Electrical failure or malfunction, other.

Heat Source. In NFIRS 5.0, one grouping of codes encompasses various types of open flames and smoking materials. In the past, these had been two separate groupings. A new code was added to NFIRS 5.0, which is code 60: “Heat from open flame or smoking material, other.” NFPA treats this code as a partial unknown and allocates it proportionally across the codes in the 61-69 range, shown below.

61. Cigarette;
62. Pipe or cigar;
63. Heat from undetermined smoking material;
64. Match;
65. Lighter: cigarette lighter, cigar lighter;
66. Candle;
67. Warning or road flare, fuse;
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11); and
69. Flame/torch used for lighting. Includes gas light and gas-/liquid-fueled lantern.

In addition to the conventional allocation of missing and undetermined fires, NFPA multiplies fires with codes in the 61-69 range by

$$\frac{\text{All fires in range 60-69}}{\text{All fires in range 61-69}}$$

The downside of this approach is that heat sources that are truly a different type of open flame or smoking material are erroneously assigned to other categories. The grouping “smoking materials” includes codes 61-63 (cigarettes, pipes or cigars, and heat from undetermined smoking material, with a proportional share of the code 60s and true unknown data.

Equipment Involved in Ignition (EII). NFIRS 5.0 originally defined EII as the piece of equipment that provided the principal heat source to cause ignition if the equipment malfunctioned or was used improperly. In 2006, the definition was modified to “the piece of equipment that provided the principal heat source to cause ignition.” However, much of the data predates the change. Individuals who have already been trained with the older definition may not change their practices. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

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

All fires

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

In addition, the partially unclassified codes for broad equipment groupings (i.e., code 100 - heating, ventilation, and air conditioning, other; code 200 - electrical distribution, lighting and power transfer, other; etc.) were allocated proportionally across the individual code choices in their respective broad groupings (heating, ventilation, and air conditioning; electrical distribution, lighting and power transfer, other; etc.). Equipment that is totally unclassified is not allocated further. This approach has the same downside as the allocation of heat source 60 described above. Equipment that is truly different is erroneously assigned to other categories.

In some analyses, various types of equipment are grouped together.

Code Grouping	EII Code	NFIRS definitions
Central heat	132	Furnace or central heating unit
	133	Boiler (power, process or heating)
Fixed or portable space heater	131	Furnace, local heating unit, built-in
	123	Fireplace with insert or stove
	124	Heating stove
	141	Heater, excluding catalytic and oil-filled
	142	Catalytic heater
	143	Oil-filled heater
Fireplace or chimney	120	Fireplace or chimney
	121	Fireplace, masonry
	122	Fireplace, factory-built
	125	Chimney connector or vent connector
	126	Chimney – brick, stone or masonry
	127	Chimney-metal, including stovepipe or flue
Fixed wiring and related equipment	210	Unclassified electrical wiring
	211	Electrical power or utility line
	212	Electrical service supply wires from utility

	213	Electric meter or meter box
	214	Wiring from meter box to circuit breaker
	215	Panel board, switch board or circuit breaker board
	216	Electrical branch circuit
	217	Outlet or receptacle
	218	Wall switch
	219	Ground fault interrupter
Transformers and power supplies	221	Distribution-type transformer
	222	Overcurrent, disconnect equipment
	223	Low-voltage transformer
	224	Generator
	225	Inverter
	226	Uninterrupted power supply (UPS)
	227	Surge protector
	228	Battery charger or rectifier
	229	Battery (all types)
Lamp, bulb or lighting	230	Unclassified lamp or lighting
	231	Lamp-tabletop, floor or desk
	232	Lantern or flashlight
	233	Incandescent lighting fixture
	234	Fluorescent light fixture or ballast
	235	Halogen light fixture or lamp
	236	Sodium or mercury vapor light fixture or lamp
	237	Work or trouble light
	238	Light bulb
	241	Nightlight
	242	Decorative lights – line voltage
	243	Decorative or landscape lighting – low voltage
	244	Sign
Cord or plug	260	Unclassified cord or plug
	261	Power cord or plug, detachable from appliance
	262	Power cord or plug- permanently attached
	263	Extension cord
Torch, burner or soldering iron	331	Welding torch
	332	Cutting torch
	333	Burner, including Bunsen burners
	334	Soldering equipment

Portable cooking or warming equipment	631	Coffee maker or teapot
	632	Food warmer or hot plate
	633	Kettle
	634	Popcorn popper
	635	Pressure cooker or canner
	636	Slow cooker
	637	Toaster, toaster oven, counter-top broiler
	638	Waffle iron, griddle
	639	Wok, frying pan, skillet
	641	Breadmaking machine

Equipment was not analyzed separately for confined fires. Instead, each confined fire incident type was listed with the equipment or as other known equipment.

Item First Ignited. In most analyses, mattress and pillows (item first ignited 31) and bedding, blankets, sheets, and comforters (item first ignited 32) are combined and shown as “mattresses and bedding.” In many analyses, wearing apparel not on a person (code 34) and wearing apparel on a person (code 35) are combined and shown as “clothing.” In some analyses, flammable and combustible liquids and gases, piping and filters (item first ignited 60-69) are combined and shown together.

Area of Origin. Two areas of origin: bedroom for more than five people (code 21) and bedroom for less than five people (code 22) are combined and shown as simply “bedroom.” Chimney is no longer a valid area of origin code for non-confined fires.

Rounding and percentages. The data shown are estimates and generally rounded. An entry of zero may be a true zero or it may mean that the value rounds to zero. Percentages are calculated from unrounded values. It is quite possible to have a percentage entry of up to 100% even if the rounded number entry is zero. The same rounded value may account for a slightly different percentage share. Because percentages are expressed in integers and not carried out to several decimal places, percentages that appear identical may be associated with slightly different values.

Appendix B.

Methodology and Definitions Used in “Leading Cause” Tables

The cause table reflects relevant causal factors that accounted for at least 2% of the fires in a given occupancy. Only those causes that seemed to describe a scenario are included. Because the causal factors are taken from different fields, some double counting is possible. Percentages are calculated against the total number of structure fires, including both confined and non-confined fires. Bear in mind that every fire has at least three “causes” in the sense that it could have been prevented by changing behavior, heat source, or ignitability of first fuel, the last an aspect not reflected in any of the major cause categories. For example, several of the cause categories in this system refer to types of equipment (cooking, heating, electrical distribution and lighting, clothes dryers and washers, torches). However, the problem may be not with the equipment but with the way it is used. The details in national estimates are derived from the Version 5.0 of the U.S. Fire Administration’s National Fire Incident Reporting System (NFIRS 5.0). This methodology is based on the coding system used in Version 5.0 of NFIRS. The *NFIRS 5.0 Reference Guide*, containing all of the codes, can be downloaded from <http://www.nfirs.fema.gov/documentation/reference/>. Actual estimates are projections based derived from NFPA’s annual fire department experience survey and the procedures below.

Cooking equipment and heating equipment are calculated by summing non-confined fires identified by equipment involved in ignition and relevant confined fires. Confined fires will be shown if they account for at least 1% of the incidents. **Confined cooking fires** (cooking fires involving the contents of a cooking vessel without fire extension beyond the vessel) are identified by NFIRS incident type 113;

Confined heating equipment fires include **confined chimney or flue fires** (incident type 114) and **confined fuel burner or boiler** fires (incident type 116). The latter includes delayed ignitions and incidents where flames caused no damage outside the fire box. The two types of confined heating fires may be combined or listed separately, depending on the numbers involved.

Contained trash or rubbish fires with no flame damage to structure or its contents are identified by incident type 118. No cause can be ascertained for these incidents, but they account for a substantial share of the incidents in some occupancies. When appropriate, these fires are generally shown at the bottom of a cause table.

Confined or contained fires (incident type 113-118) are excluded from the remaining estimates. Unknown data is allocated proportionally among non-confined fires. Reports on specific causal factors may include analysis of confined fires and consequently have higher estimates of specific causes,

Intentional fires are identified by fires with a “1” (intentional) in the field “cause.” The estimate includes a proportional share of fires in which the cause was undetermined after investigation, under investigation, or not reported. All fires with intentional causes are included in this category regardless of the age of the person involved. Intentional include those of an incendiary

nature and those resulting from a deliberate misuse of the heat source. No age restriction is applied.

Fires caused by **playing with heat source** (typically matches or lighters) are identified by code 19 in the field “factor contributing to ignition.” It appears that “none” is often being used in place of “unknown.” Fires in which the factor contribution to ignition was undetermined (UU), entered as none (NN) or left blank are considered unknown and allocated proportionally. Because factor contributing to ignition is not required for intentional fires, the share unknown, by these definitions, is somewhat larger than it should be.

The heat source field is used to identify fires started by: **smoking materials** (cigarette, code 61; pipe or cigar, code 62; and heat from undetermined smoking material, code 63); **candles** (code 66), **lightning** (code 73); and **spontaneous combustion or chemical reaction** (code 72). Fires started by heat from unclassified open flame or smoking materials (code 60) are allocated proportionally among the “other open flame or smoking material” codes (codes 61-69) in an allocation of partial unknown data. This includes smoking materials and candles. This approach results in any true unclassified smoking or open flame heat sources such as incense being inappropriately allocated. However, in many fires, this code was used as an unknown.

The equipment involved in ignition field is used to find several cause categories. This category includes equipment that functioned properly and equipment that malfunctioned.

Identified cooking equipment refers to equipment used to cook, heat or warm food (codes 620-649 and 654). Fire in which ranges, ovens or microwave ovens, food warming appliances, fixed or portable cooking appliances, deep fat fryers, open fired charcoal or gas grills, grease hoods or ducts, or other cooking appliances) were involved in the ignition are said to be caused by cooking equipment. Food preparation devices that do not involve heating, such as can openers or food processors, are not included here. A proportional share of fires involving unclassified cooking kitchen and cooking equipment (code 600) are included here.

Identified heating equipment (codes 120-199) includes central heat, portable and fixed heaters (including wood stoves), fireplaces, chimneys, hot water heaters, and heat transfer equipment such as hot air ducts or hot water pipes. Heat pumps are not included. Unclassified heating, ventilation and air condition equipment (code 100) is included here because a larger share of the whole category involved heating rather than air conditioning or ventilation equipment. A proportional share of fires involving unclassified heating, ventilation, and air conditioning equipment (code 100) are included here.

Electrical distribution and lighting equipment (codes 200-299) include: fixed wiring; transformers; associated overcurrent or disconnect equipment such as fuses or circuit breakers; meters; meter boxes; power switch gear; switches, receptacles and outlets; light fixtures, lamps, bulbs or lighting; signs; cords and plugs; generators, transformers, inverters, batteries and battery charges.

Torch, burner or soldering iron (codes 331-334) includes welding torches, cutting torches, Bunsen burners, plumber furnaces, blowtorches, and soldering equipment.

Clothes dryer or washer (codes 811, 813 and 814) includes clothes dryers alone, washer and dryer combinations within one frame, and washing machines for clothes.

Electronic, office or entertainment equipment (codes 700-799) includes: computers and related equipment; calculators and adding machines; telephones or answering machines; copiers; fax machines; paper shredders; typewriters; postage meters; other office equipment; musical instruments; stereo systems and/or components; televisions and cable TV converter boxes; cameras, excluding professional television studio cameras, video equipment and other electronic equipment. Older versions of NFIRS had a code for electronic equipment that included radar, X-rays, computers, telephones, and transmitter equipment. Because this code was so broad, it unfortunately converts to equipment involved undetermined.

Shop tools and industrial equipment excluding torches, burners or soldering irons (codes 300-330, 335-399) includes power tools; painting equipment; compressors; atomizing equipment; pumps; wet/dry vacuums; hoists, lifts or cranes; powered jacking equipment; water or gas drilling equipment; unclassified hydraulic equipment; heat-treating equipment; incinerators, industrial furnaces, ovens or kilns; pumps; compressors; internal combustion engines; conveyors; printing presses; casting, molding; or forging equipment; heat treating equipment; tar kettles; working or shaping machines; coating machines; chemical process equipment; waste recovery equipment; power transfer equipment; power takeoff; powered valves; bearings or brakes; picking, carding or weaving machines; testing equipment; gas regulators; separate motors; non-vehicular internal combustion engines; and unclassified shop tools and industrial equipment.

Medical equipment (codes 410-419) includes: dental, medical or other powered bed, chair or wheelchair; dental equipment; dialysis equipment; medical monitoring and imaging equipment; oxygen administration equipment; radiological equipment; medical sterilizers, therapeutic equipment and unclassified medical equipment.

Mobile property (vehicle) describes fires in which some type of mobile property was involved in ignition, regardless of whether the mobile property itself burned. Mobile property includes: highway-type vehicles such as cars, trucks, recreational vehicles, and motorcycles; trains, trolleys and subways; boats and ships; aircraft; industrial, agricultural and construction vehicles; and riding lawn mowers, snow removal vehicles and tractors.

Exposures are fires that are caused by the spread of or from another fire. These fires are identified by factor contributing to ignition 71. This code is automatically applied for all fires with exposure numbers greater than zero. As with playing with fire, Fires in which the factor contribution to ignition was undetermined (UU), entered as none (NN) or left blank are considered unknown and allocated proportionally.

Appendix C.

Previously Published Mattress and Bedding Fire Incidents

Published incidents provide information about what can happen, not what is typical.

Articles from NFPA publications about specific incidents illustrate some of the ways in which mattresses and bedding catch or are involved in fire. These incidents were taken from the “Firewatch” column in *NFPA Journal* and annual studies of catastrophic fires. Published incidents tend to be more serious than the typical fire and should not be considered representative.

Electric Blanket Starts Fire in Bedroom, Nevada

While extinguishing a fire at a manufactured home, firefighters discovered the body of a 73-year-old man who had been dead for several days before the blaze started.

Firefighters responding to the fire at 10:47 a.m. found smoke coming from the dwelling and forced their way inside, where they saw that the fire was confined to a mattress. As they extinguished the blaze, they saw the body of the victim on the floor, partially under the bed and covered by loose clothing.

Shortly after they discovered his body, they noticed signs that he had been dead for some time.

Investigators found the remains of an electrical cord running under the mattress from the foot of the bed up to the headboard. The cord was plugged into a control unit for a heating blanket, and investigators believed the blanket operated continuously between the mattress and the bedsprings from the time the man died until the fire broke out. The heat, which could not escape, apparently degraded the wire insulation, and the wire arced, igniting the mattress.

The fire department turned the investigation into the victim’s death over to homicide detectives. Kenneth J. Tremblay, 2010, "Firewatch", *NFPA Journal*, November/December, 26.

Heater Ignites Bedding, North Carolina

A 45-year-old woman died in a fire started by a portable electric heater in her bedroom in her single-family home. The portable unit was the woman's only source of heat and had been left on all night because of the low temperatures.

A smoke alarm had been installed in the hallway outside the bedrooms, but investigators could not determine whether it operated. The wood-frame house had no sprinklers.

A passerby discovered the fire and asked a neighbor to call 911 before trying unsuccessfully to rescue the victim. Investigators learned that the woman, who had been drinking alcohol, was

asleep when the heater next to the bed ignited her bedding.

The victim died of smoke inhalation, and the passerby was burned during the rescue attempt.

The house, valued at \$45,000, and its contents, valued at \$5,000, were completely destroyed. Kenneth J. Tremblay, 2010, "Firewatch", *NFPA Journal*, January/February, 21.

Man Dies Trying to Remove Burning Mattress, Wisconsin

A 27-year-old man suffered third-degree burns over 90 percent of his body when he tried to remove his burning mattress from his third-floor apartment.

The three-story, three-unit, wood-frame building had one apartment on each floor. Battery-operated smoke alarms on the first and second floors failed to operate during the fire, and no smoke alarm was found on the third floor. The building was unsprinklered.

An occupant of an apartment on a lower floor heard screaming from the apartment above and called 911 at 6:46 a.m. Firefighters arrived minutes later to find heavy smoke coming from the third-floor unit. When they tried to enter the apartment, they found the doorway blocked by a burning mattress that lay on the kitchen floor.

They quickly extinguished the fire and found the unconscious victim in the bathroom. He was taken to the hospital and later airlifted to a burn unit, where he died.

Investigators determined that the man's bedding had come into contact with the electric baseboard heating unit and ignited. The fire then spread to the mattress and to other combustibles as he tried to drag it out of the unit. He managed to get the mattress into the kitchen but no further before he had to retreat to the bathroom.

The home, which was valued at \$150,000, and its contents, which were valued at \$8,000, sustained property damage of \$25,000 and \$5,000, respectively. None of the occupants of the two lower floors were injured.

Kenneth J. Tremblay, 2009, "Firewatch", *NFPA Journal*, January/February, 17-18.

Portable Electric Heater Blamed in Deadly Fire, Michigan

A 19-year-old died in a fire that began when a portable electric heater next to the bed in her manufactured home ignited the bedding. Alcohol intoxication was also a factor in her death.

The exterior walls and roof of the wood-frame home, which was 50 feet (15 meters) long and 14 feet (4 meters) wide, were constructed of metal. A local single-station smoke alarm in the hallway had no battery, and the home was not sprinklered.

The fire was discovered by neighbors, who called 911 at 2:33 p.m. They initially delayed calling the fire department because they believed the blaze was a brush fire.

Firefighters arrived within four minutes of the alarm to find heavy fire coming from the rear of the building. The roof had partially collapsed, and live power lines had fallen to the ground, limiting firefighters' access.

During the suppression operation, the victim's mother arrived on the scene and told the incident commander that her daughter was probably inside the home. Firefighters then entered the structure and found the young woman in the bathroom. The house and its contents, valued at \$4,500, were destroyed.

Ken Tremblay, 2009, "Firewatch", *NFPA Journal*, November/December, 24.

Sprinklers control hotel fire, Illinois

Sprinklers operated to control a fire that began when a hotel guest fell asleep while smoking and her cigarette ignited the bedding.

The two-story hotel, constructed of concrete, was 100 feet (30 meters) long and 40 feet (12 meters) wide. It had a pitched roof covered with asphalt shingles. A dry-pipe sprinkler system and fire detection system were both monitored by an off-site fire alarm company.

Smoke from the fire caused the room's smoke alarm to activate, and this was followed by the activation of a sprinkler, which controlled the blaze until firefighters arrived at 1:11 a.m. The fire department completed extinguishment using a 134-inch (4-centimeter) hose line.

By the time firefighters arrived, the hotel staff and guests had evacuated, and all were accounted for except the occupant of the room of origin. She had been seen by either staff or other guests after she self-evacuated, but she left the scene shortly thereafter. When she was eventually located, she admitted to falling asleep while smoking, causing the mattress and bedding to ignite. Investigators determined that she was under the influence of alcohol and had stayed at the hotel so as not to drive home.

Fire damage was limited to the room of origin, although there was some smoke damage on the second floor and water damage in the room of origin, an adjacent room, and the room directly below the fire. The building, valued at \$2 million, sustained \$10,000 worth of damage. The contents of the room of origin, valued at \$5,000, were a total loss. There were no injuries.

Ken Tremblay, 2009, "Firewatch", *NFPA Journal*, September/October, 26-27.

Mattress Fire Wasn't Really Out, Alabama

A man who worked during the evening and slept during the day dropped a cigarette while smoking in bed. When he saw that his old, cotton-lined mattress was on fire, he poured a glass of water on it. Thinking he had extinguished the fire, he left for work. However, the fire continued to smolder until it reached open flame.

The one-story, single-family, wood-frame house, which was 50 feet (15 meters) long and 35 feet (11 meters) wide, had no smoke alarms or sprinklers. The fire was discovered by a neighbor, who called 911 at 4:15 p.m. Firefighters arrived four minutes later and put out the blaze with a

single hoseline.

The fire, which consumed the mattress and box spring, significantly damaged the contents of his bedroom and spread smoke throughout the house.

The home, valued at \$150,000, sustained \$10,000 in property damage. Its contents, valued at \$10,000, sustained a \$5,000 loss.

Kenneth J. Tremblay, 2008, "Firewatch", *NFPA Journal*, November/December, 20-21.

Candle is Cause of Fatal Fire, Illinois

A 47-year old woman died when an unattended bedroom candle sparked a fire that spread to other areas of the home before being detected.

The fire occurred in a single-story ranch constructed of wood framing with an asphalt shingle roof. A battery-operated smoke alarm was installed in the hallway by the bedroom and operated during the fire. There were no sprinklers. A passerby called 911 at 12:33 a.m. to report the fire. Firefighters arrived a minute later and found the home well involved. Investigators determined that a candle left burning on a nightstand fell over and ignited bedding. A fan may have spread the fire from the bedroom to the hallway and living rooms where the victim was located.

The victim was medicated and sleeping in a sitting position just outside the room of origin. The victim died of smoke inhalation. The building valued at \$30,000 was a total loss and \$10,000 worth of contents suffered \$8,000 in loss. There were no other injuries.

Kenneth J. Tremblay, 2007, "Firewatch", *NFPA Journal*, May/June 26.

Baby Succumbs to Heat and Smoke Exposure, Virginia

Despite attempts by a police officer, two civilians, and an off-duty firefighter, a 19-month-old baby sleeping in a crib died of exposure to heat and smoke. A juvenile playing with a lighter ignited a twin bed in the baby's room, left, and closed the door after the fire was ignited. The fire consumed bedding and a foam mattress, producing heat and smoke, but extinguished itself by the time firefighters arrived.

The apartment was within a building having eight units with construction details not reported. The fire was started on the second floor where a smoke alarm was outside the bedrooms and bathroom. Another alarm was in the living room and kitchen but their operation was not reported.

The juvenile who started the fire called 911 at 10:20 a.m. to report the fire. Firefighters quickly responded and arrived within four minutes.

Before firefighters arrived, an off-duty firefighter went to the second floor but was turned back from the burning room. After taking off his shirt and wetting it, he reentered the room and vented the window. He was unable to find the baby, and he exited the home.

When firefighters arrived, they found black smoke coming from the bedroom window and a

ladder placed against the home. Firefighters entered the dwelling wearing full-protective gear, rescued the baby, and extinguished a few hot spots still burning within the room.

Investigators found that after the bedding was ignited, it spread to a foam mattress. The fire spread vertically and horizontally as smoke filled the room. The closed bedroom door delayed detection and limited heat and smoke damage to the remainder of the floor. One firefighter suffered burns. The baby died of thermal burns and smoke inhalation. Losses were estimated at \$1,300.

Kenneth J. Tremblay, 2007, "Firewatch", *NFPA Journal*, September/October 26-28.

Dorm smoke alarm alerts occupants, Connecticut

Smoke from a bedroom fire at a college dormitory room activated the smoke detection system in the dorm's hallway and common areas, alerting the fire department and the occupants, all of whom evacuated without incident.

The four-story building had concrete floors and walls, and a brick exterior. A fire detection system with smoke detectors in the corridors and common areas was monitored by a central station alarm company. There were no sprinklers.

The 8:30 p.m. fire began when an electric appliance cord that was touching a metal bed frame failed and ignited the bedding in one of the bedrooms of a first-floor suite.

There was no estimate of the damage. Although the fire, which was initially limited to the bedroom, spread when an investigating campus police officer left a bedroom door open, damage was limited to the suite where the fire started.

Kenneth J. Tremblay, 2005, "Firewatch", *NFPA Journal*, November/December, 18.