MANUFACTURED HOME FIRES

John R. Hall, Jr.

September 2013

National Fire Protection Association
Fire Analysis and Research Division

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Abstract

During the five-year period of 2007-2011, U.S. fire departments responded to an average of 11,400 structure fires in manufactured homes per year, with annual losses of 206 civilian deaths, 434 civilian injuries and $179 million in direct property damage. Because of changes in the National Fire Incident Reporting System (NFIRS) in 1999, fires and injuries are probably under-estimated. Manufactured homes built after the introduction of the HUD standards have lower rates of civilian deaths per hundred reported fires than those built before the HUD standards were introduced. The 2007-2011 death rate was 57% lower for post-standard manufactured home than for pre-standard manufactured homes. Manufactured homes had a 2007-2011 fire death rate per 100,000 housing units that was roughly the same as the rate for other one- or two-family homes, relative to occupied year-round units. The percentage of fires confined to room of origin was 15 percentage points higher for post-standard manufactured homes, compared to pre-standard manufactured homes, in 1989-1998. Smoke alarms reportedly are missing in half (51%) of all manufactured home fires where smoke alarm status was reported. Because all post-standard manufactured homes are required to be sold with smoke alarms installed, this implies a disturbingly high rate of smoke alarm removal by occupants.

Keywords: manufactured home fire, mobile home fire

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.

For more information about the National Fire Protection Association, visit www.nfpa.org or call 617-770-3000. To learn more about the One-Stop Data Shop go to www.nfpa.org/osds or call 617-984-7443.

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Executive Summary

During the five-year period of 2007-2011, U.S. fire departments responded to an average of 11,400 structure fires in manufactured homes per year, with annual losses of 206 civilian deaths, 434 civilian injuries and $179 million in direct property damage.
In 2011, 10,800 structure fires were reported in manufactured homes in the U.S.
These fires had associated losses of 161 civilian deaths, 490 civilian injuries, and $151 million in direct property damage.

Estimates of manufactured home fires and associated civilian injuries are under-estimated in 1999 and later years.
The national estimates in this report combine the National Fire Incident Reporting System (NFIRS) and the NFPA survey, as described in Appendix A. Prior to 1999, manufactured homes were identified in NFIRS as Mobile Property Type 17, used to identify mobile buildings; Specific Fixed Property Use 410-419, one- or two-family dwellings; and Type of Situation Found 11, used to identify structure fires. Manufactured homes in transit would be coded as Type of Situation Found 13 (vehicle fire) and should not be included.

Beginning in 1999 in NFIRS version 5.0, a manufactured home fire could be coded as a structure fire in a mobile or portable property (Incident Type 120-123), a non-confined structure fire (Incident Type 111-112, Property Use 410-419, Mobile Property Type 17), or a confined structure fire (Incident Type 113-118, Property Use 410-419, Mobile Property Type 17). However, if a fire is coded as a confined fire, many other details do not need to be coded, and in particular, Mobile Property Type need not be reported. Therefore, one cannot separate confined manufactured home fires coded with Incident Type 113-118 from confined fires in other types of homes. Confined fires account for a large share of total structure fires and associated injuries but for almost no civilian deaths and very little direct property damage.

The estimates of manufactured home fires do not include fires coded as confined fires, because such fires cannot be identified. This means fires will be significantly under-estimated and injuries will be somewhat under-estimated, but death and property damages can be compared to pre-1999 estimates.

Civilian fire deaths and direct damage, the two loss measures least affected by estimation problems have declined by about 60% since 1980. Civilian injuries, which are probably under-estimated, have declined by less than half. Fires, which are also probably under-estimated, have declined by nearly two-thirds.

Manufactured homes built after the introduction of the HUD standards have lower rates of civilian deaths per hundred reported fires than those built before the HUD standards were introduced. The 2007-2011 death rate was 57% lower for post-standard manufactured home

than for pre-standard manufactured homes. There are so few deaths in fires with year of manufacture reported among 2007-2011 fires that these estimates should be regarded with caution.

Looking at manufactured home fires by year of manufacture, the 2007-2011 average fire rate per 100,000 manufactured homes drops around the time when the HUD standards were introduced, but there is no statistical evidence that any change since then has produced enough risk reduction in enough units to produce a noticeable additional drop in the rate of fires per 100,000 units for recently manufactured units.

Manufactured homes had a 2007-2011 fire death rate per 100,000 housing units that was roughly the same as the rate for other one- or two-family homes, relative to occupied year-round units.

In 1999, six categories of fires were introduced under "incident type", each corresponding to a specific confined structure fire scenario. Fires reported as confined fires do not require detailed reporting and constitute a large share of fires in one- or two-family homes. At the same time, nearly all manufactured home fires were moved to four other "incident type" categories for mobile property used as a structure. It is believed that most confined fires in manufactured homes are coded as confined fires, because less detailed reporting is required, which means those fires usually cannot be identified as manufactured home fires. The estimates of civilian fire deaths and property damage are not significantly affected by this omission, but the estimated number of fires and the estimated number of civilian injuries are probably understated.

Post-standard manufactured homes are more likely to have fires confined to room of origin, and this correlates with provisions of the standards that are designed to achieve such confinement. Sections 3280.203 – 3280.206 of the HUD standards provide requirements that are intended to slow or limit the spread of a fire by such means as:

- flame spread requirements for interior finish materials on
  - exposed walls,
  - columns,
  - partitions, and
  - ceilings;

- more targeted flame spread requirements for
  - wall and floor coverings near central heating units or water heaters,
  - interior finishes exposed to cooking ranges,
  - kitchen cabinet surfaces, and
  - plastic bathroom fixtures; and
- firestopping requirements.

The percentage of fires confined to room of origin was 15 percentage points higher for post-standard manufactured homes, compared to pre-standard manufactured homes, in 1989-1998. Smoke alarms are associated with a lower civilian death rate per 100 fires in post-standard manufactured homes and in all manufactured homes.

Smoke alarms reportedly are missing in half (51%) of all 2007-2011 manufactured home fires where smoke alarm status was reported. Because all post-standard manufactured homes are required to be sold with smoke alarms installed, this implies a disturbingly high rate of smoke alarm removal by occupants.

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NFPA Fire Analysis & Research

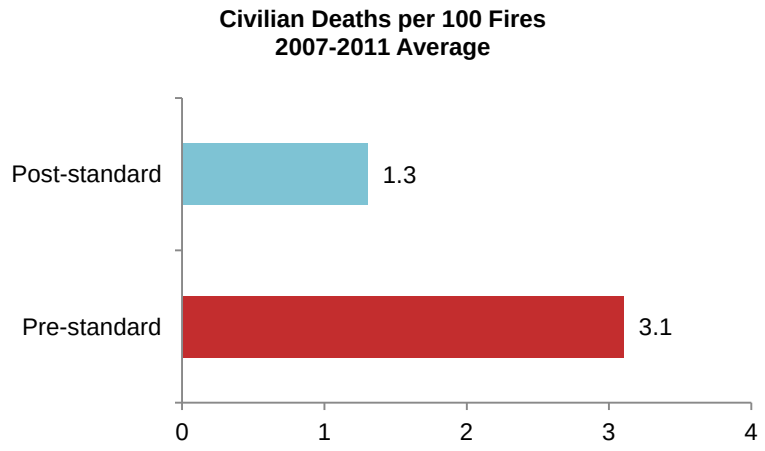
Manufactured Home Fires

In 2007-2011, 11,400 structure fires per year were reported in manufactured homes, with associated losses of:

- 206 civilian deaths,
- 434 civilian injuries, and
- $179 million in direct damage per year.

Because of changes in the way fires are reported since 1999, the manufactured home share of certain minor fires cannot be identified, which means estimated fires and associated injuries are probably under-estimated. Estimates of associated deaths and direct property damage are essentially unaffected.

Compared to pre-HUD-standard manufactured homes (built before 1976), post-standard homes had a 57% lower rates of civilian deaths per 100 fires in 2007-2011.



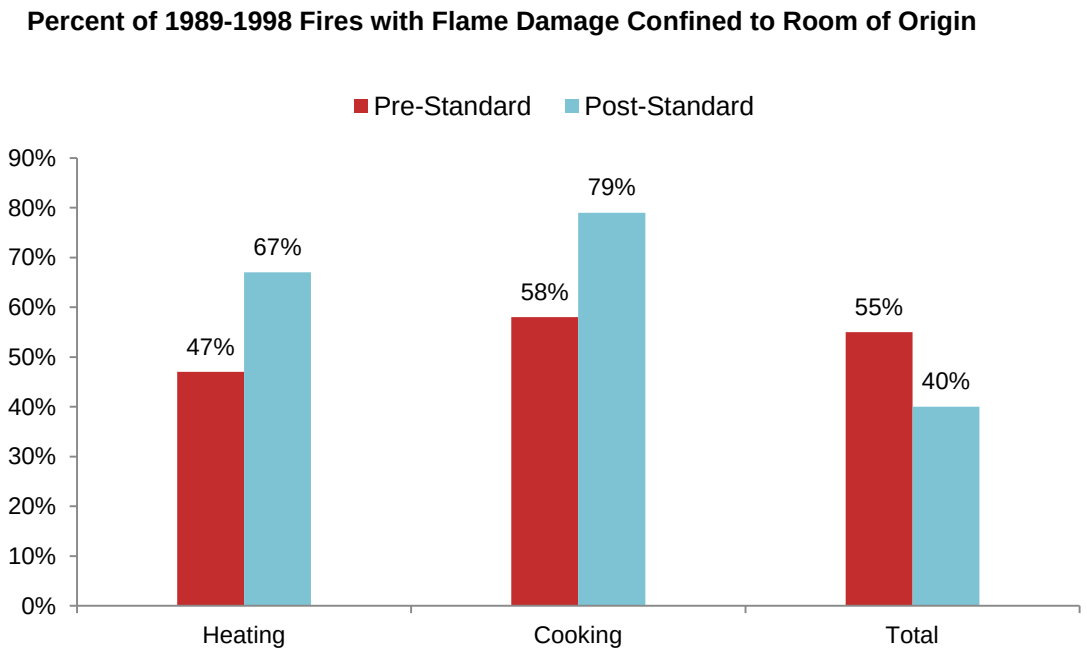
Manufactured homes (all ages combined) had roughly the same fire death rate per 100,000 occupied housing units as other one- or two-family homes in 2007-2011.

If all pre-standard manufactured homes were removed from the inventory of occupied units, it is estimated that the manufactured home fire death rate would be considerably lower than the rate in other one- or two-family homes.

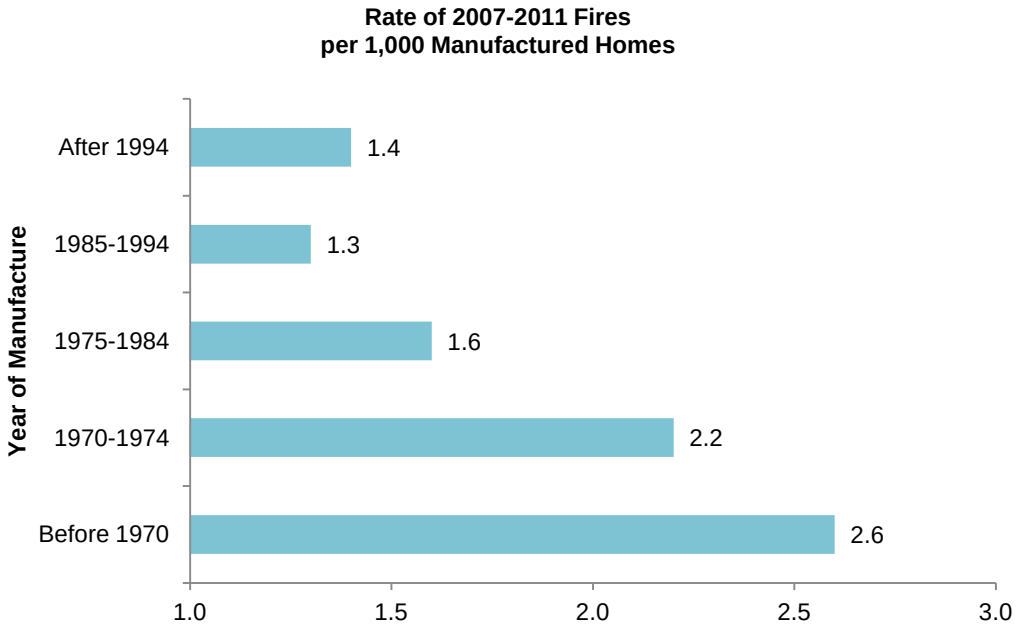
In 1989-1998, post-standard manufactured homes with smoke alarms had a 31% lower death rate per 100 fires than post-standard manufactured homes with no smoke alarms.

According to the *American Housing Survey*, in 2011, occupied manufactured homes were less likely to have working smoke alarms (91.8% vs. 94.6%) than all occupied housing units including multi-family. In the U.S. Consumer Product Safety Commission's 2004-2005 study of unreported fires, manufactured homes were less likely (91% vs. 97-98%) to have smoke alarms than either detached single-family homes, townhouses or row homes, or multi-family housing.

Post-standard manufactured home fires are more likely to have flame damage confined to room of origin, especially if the fires are started by heating or cooking equipment.



Fires per 1,000 occupied manufactured homes dropped sharply when the HUD standards were introduced but have not declined since then.



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

Research ⟷ **Advocacy**

Codes & Standards ⟷ **Public Education**

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:

NFPA 501: Standard on Manufactured Housing

NFPA 501A: Standard for Fire Safety Criteria for Manufactured Home Installations, Sites, and Communities

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.

Chapter 1. Manufactured Home Fire Problem

During the five year period of 2007-2011, U.S. fire departments responded to an average of 11,400 structure fires in manufactured homes per year, with annual losses of 206 civilian deaths, 434 civilian injuries and $179 million in direct property damage.
In 2011, 10,800 structure fires were reported in manufactured homes in the U.S. These fires had associated losses of 161 civilian deaths, 490 civilian injuries, and $151 million in direct property damage.

Estimates of manufactured home fires and associated civilian injuries are under-estimated in 1999 and later years.
The national estimates in this report combine the National Fire Incident Reporting System (NFIRS) and the NFPA survey, as described in Appendix A. Prior to 1999, manufactured homes were identified in NFIRS as Mobile Property Type 17, used to identify mobile buildings; Specific Fixed Property Use 410-419, one- or two-family dwellings; and Type of Situation Found 11, used to identify structure fires. Manufactured homes in transit would be coded as Type of Situation Found 13 (vehicle fire) and should not be included.

Beginning in 1999 in NFIRS version 5.0, a manufactured home fire could be coded as a structure fire in a mobile or portable property (Incident Type 120-123), a non-confined structure fire (Incident Type 111-112, Property Use 410-419, Mobile Property Type 17), or a confined structure fire (Incident Type 113-118, Property Use 410-419, Mobile Property Type 17). If a fire is coded as a confined fire, many other details do not need to be coded, and in particular, Mobile Property Type need not be reported. Because of this reduced late burden, it is likely that most confined fires in manufactured homes are being coded as confined fires and are not identifiable as manufactured home fires. Confined fires account for a large share of total structure fires and associated injuries but for almost no civilian deaths and very little direct property damage.

The estimates of manufactured home fires probably are missing most fires coded as confined fires, because such fires cannot be identified as manufactured home fires. This means total manufactured home fires will be significantly under-estimated, injuries will be somewhat under-estimated, but deaths and property damages can be compared to pre-1999 estimates.

Civilian fire deaths and inflation-adjusted direct property damage, the two loss measures least affected by estimation problems, declined by about 60% from 1980 to 2011. Civilian injuries, which are probably under-estimated, declined by less than half. Fires, which are also probably under-estimated, declined by nearly two-thirds. (See Table 1-1.)

A manufactured home is not a motor home or trailer, and although it is often called a "mobile home," it is not that either.
A manufactured home is a structure built on a chassis and designed to be towed by a vehicle to a permanent or semi-permanent site, where it will be used as a single-family residence. (Similar structures can be used for other purposes, such as temporary offices, but such uses are excluded from the definitions and statistics here.)

Manufactured homes are no longer called "mobile homes" by the industry to avoid confusion with motor homes or travel or camping trailers, which are designed for routine relocation from place to place. These properties have their own codes in the national fire incident data bases. Manufactured homes also should not be confused with modular or prefabricated homes, where major components of a home are manufactured as units off-site, then assembled on-site, where they are subject to the regulations of the local authority.

Fires coded as Incident Type 120-123, structure fire in mobile or portable property, are treated as follows in this report:

Incident Type	How It Is Treated
121 – Mobile home used as fixed residence	Included.
120 – Unclassified mobile property used as a fixed property	Included if Property Use = 400-429, suggesting fixed residence is most likely property use.
122 – Motor home, camper, or recreational vehicle used as a structure.	Excluded because they are a different type of property.
123 – Portable building used at a fixed location, typically for commercial or educational purposes.	Excluded.

How many fires are missing from the estimates?
Table 1-A shows the base estimated annual average of 2007-2011 manufactured home fires and associated losses, along with estimates of other fires that might be relevant but are not included in the base estimate.

Table 1-A. Sensitivity Analysis of Estimates of Potential Components of 2007-2011 Manufactured Home Fire Problem, Annual Averages

	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Base estimate [Incident Type 121; and Incident Type 120 with Property Use 400-429]	11,400	206	434	$179
Estimated confined fires [Incident Type 113-118, Property Use 410-419; manufactured home percentage share of confined fires estimated as Base Estimate of manufactured home fires divided by estimated fires with Incident Type 111-112 or 120-123 and Property Use 400-429]	5,400	0	35	$1
Fires coded as Incident Type 111-112, Property Use 400-429, and Mobile Property Type 17 [analogous to coding used for manufactured home fires pre-1999]	200	3	14	$4
Fires coded as Incident Type 122, Property Use 400-429 [motor home or recreational vehicle]	800	19	26	$8
Fires coded as Incident Type 123, Property Use 400-429 [portable building at fixed location]	200	1	3	$1

Table 1-1. Overview of Manufactured Home Fires
Structure Fires Reported to Fire Departments

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions) Current Dollars	In 2011 Dollars
1980	29,800	413	863	$136	$370
1981	27,200	536	849	$142	$351
1982	28,400	460	1,020	$146	$339
1983	26,400	480	868	$167	$378
1984	26,100	382	815	$194	$418
1985	25,900	545	864	$175	$364
1986	25,500	409	837	$170	$348
1987	23,000	450	800	$140	$277
1988	23,700	507	959	$157	$299
1989	20,400	432	925	$140	$255
1990	19,200	380	750	$171	$294
1991	19,900	367	925	$191*	$315*
1992	19,400	391	856	$158	$253
1993	20,300	402	924	$202	$314
1994	19,400	347	876	$149	$226
1995	18,400	437	867	$156	$230
1996	18,100	450	814	$175	$250
1997	17,600	322	654	$159	$223
1998	15,700	200	653	$145	$200
1999	14,400	214	1,519	$130	$175
2000	17,100	336	777	$190	$248
2001	16,900	314	788	$183	$232
2002	16,400	216	546	$167	$209
2003	14,000	299	534	$168	$205
2004	14,500	291	527	$168	$200
2005	12,700	264	502	$165	$190
2006	13,300	205	498	$175	$195
2007	13,100	245	448	$155	$167
2008	12,700	250	420	$195	$203
2009	10,100	206	399	$241*	$252*
2010	10,400	168	416	$155	$159
2011	10,800	161	490	$151	$151

* All 1991 home property damage figures are inflated by estimation problems related to the handling of the Oakland fire storm. The 2009 total may be inflated by one fire apparently miscoded as $40 million.

Note: These are national estimates of 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. Fires are rounded to the nearest hundred, civilian deaths and injuries are expressed to the nearest one, and property damage is rounded to the nearest million dollars. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Inflation adjustment to 2011 dollars is done using the consumer price index.

From 1999 on, manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in other one- or two-family dwellings.
Source: NFIRS and NFPA survey.

Effects of HUD Standards

In 1976, the U.S. Department of Housing and Urban Development (HUD) took jurisdiction over construction standards for manufactured homes. Therefore, pre-1976 and post-1976 manufactured homes are referred to as pre-standard and post-standard manufactured homes, respectively.

Most of the requirements of the HUD standards were part of NFPA's voluntary consensus standard for manufactured homes (NFPA 501B) prior to 1976. For this reason and the fact that some of these features (e.g., smoke alarms) are not difficult to retrofit, it cannot be assumed that all pre-1976 manufactured homes lack the features specified in the HUD standards.

The introduction of the HUD standards was associated with a drop in the rate of fires per 1,000 manufactured homes (from 2.3 for all pre-1975 manufactured home to 1.5 for all 1975 and newer manufactured homes). There is no evidence that unit age in general is associated with higher rates of fires per thousand manufactured homes.
Table 2-1 compares 2007-2011 reported fires by year of unit manufacture to number of units in the manufactured home inventory, from U.S. Census Bureau surveys conducted in odd-numbered years. There is little or no variation in these rates by age, except for the break between 1974 and 1975, which presumably reflects the effects of the HUD standards, introduced during 1976.

The same statistics that show no age-of-unit effect on fire rates, apart from the introduction of the HUD standards, also show no continued improvements that might be attributable to refinements in the HUD standards. The rates in Table 2.1 are roughly the same for 1975-1984, 1985-1994, and 1995 to present. (If the period 2000 to present is considered separately, there is a slight increase in the rate for the newest manufactured homes.)

Within the limits of the available data, it appears as if the decline in fire rates in manufactured homes is nearly all explainable in terms of the continued reduction in number and share of occupied manufactured homes built before the 1976 HUD standards became effective or in terms of the impact of changes that are not installed and affect all housing units, not just manufactured homes (e.g. child-resistant lighter, cigarette-resistant mattresses and upholstered furniture). Any other changes have had little or no measurable effect, either because they still affect only a small part of the manufactured home inventory or because their potential impact on fire rates is slight.

In 2007-2011, post-HUD-standard manufactured homes had a lower rate of civilian deaths per 100 fires (by 57%).

Because current analyses will tend to under-estimate the number of fires and injuries but not the number of deaths. This means death rates per 100 fires are likely to be over-estimated, but the net effect on injury rates per 100 fires is less clear. Also, because only 2% of

manufactured home fires are now reported with year of manufacture, there is much more uncertainty in all the estimates. (See Table 2-A.) This could mean that even a 57% reduction in death rates might not be statistically meaningful, but the estimated 2007-2011 percentage reduction in death rates associated with the HUD standards is similar to the percentage reduction estimated in 1989-1998 (54%), the last years before the changes to NFIRS that affected all estimates of manufactured home fires. This similarity is an encouraging sign that the estimated reduction is at least roughly correct.

Table 2-A. Civilian Deaths per 100 Fires in Pre-Standard vs. Post-Standard Manufactured Homes Annual Average Structure Fires Reported to U.S. Fire Departments

Year of Manufacture	Civilian Deaths per 100 Fires 2007-2011	Civilian Deaths per 100 Fires 1989-1998
Pre-standard (Pre-1976)	3.1	2.6
Post-standard (Post-1976)	1.3	1.2
All manufactured homes	1.8	2.0
Percent reduction in post-Standard units	57%	54%

Note: These are 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. All figures include fires with unknown year of manufacture, which accounted for roughly 98% of reported manufactured home fires in 2007-2011.

Source: NFIRS and NFPA survey.

Post-standard manufactured homes are more likely than pre-standard manufactured homes to have fires confined to room of origin.

Because data from 1999 on appears to miss a significant number of smaller fires, analyses of fire size cannot be done with confidence using recent data. Therefore, the statistics supporting this point are taken from 1989-1998, the latest period before the incident reporting rules changed. This correlates with provisions of the standards that are designed to achieve such confinement. Sections 3280.203 - 3280.206 of the HUD standards provide requirements that are intended to slow or limit the spread of a fire by such means as flame spread rating requirements for interior finish materials on exposed walls, columns, partitions, and ceilings; more targeted flame spread requirements for wall and floor coverings near central heating units or water heaters, interior finishes exposed to cooking ranges, kitchen cabinet surfaces, and plastic bathroom fixtures; and firestopping requirements. Table 2-2 shows these requirements are associated with a measurable difference in the percentage of fires confined to the room of origin.

The percentage of fires confined to room of origin was 55% for post-standard manufactured homes and 40% for pre-standard manufactured homes, in 1989-1998.

Table 2-2 also shows that smaller fires have much lower average property damage per fires, and so a lower share of fires spreading beyond room of origin will mean a lower overall average loss per fire, all other things being equal. However, the overall average loss per fire

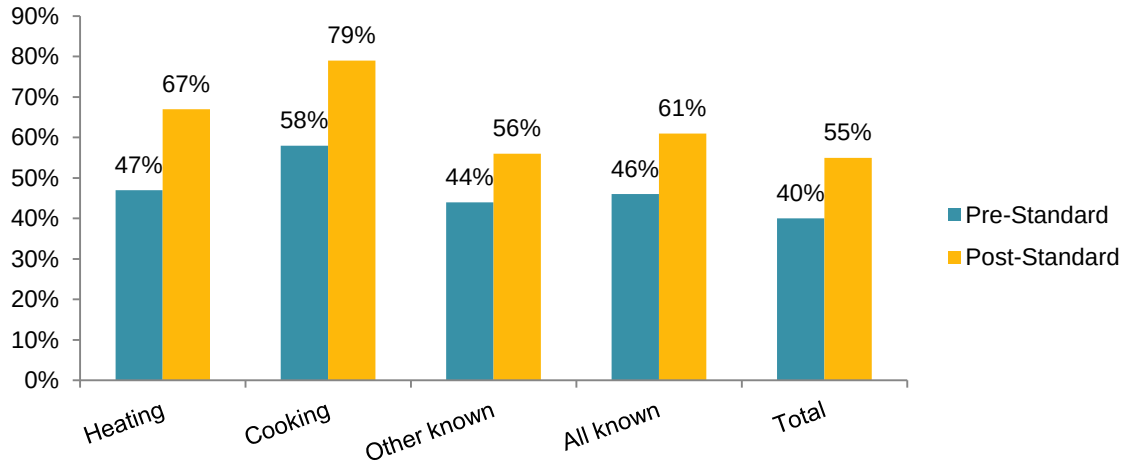
in post-standard manufactured homes is higher than in pre-standard manufactured homes, despite the fact that post-standard units have a smaller share of large fires. The reason is that the average loss per fire for any particular size of fire is higher for post-standard units than for pre-standard units, and these differences are large enough to more than offset the reduced fraction of fires having the larger sizes.

One way you can have higher average losses per fire for the same fire size (in area) is if the value per square foot is higher, in contents, furnishings and structure. Post-standard units are newer housing, which probably means, on average, wealthier occupants and more average value per square foot.

It is reasonable to assume that the value of the HUD standards in confining more fires to room of origin is still in place.

The HUD standards are particularly effective in confining heating and cooking fires to the room of origin.
Heating and cooking equipment are singled out for special attention in the HUD standards in the form of the flame spread ratings for surfaces near central heating units, water heaters, and cooking ranges. (The "heating equipment" category also includes fixed and portable space heaters, fireplaces, chimneys, and flues. The "cooking equipment" category also includes separate ovens, microwave ovens, toasters, and a number of other types of portable cooking or warming equipment.) These special provisions should mean that heating and cooking fires would tend to be smaller in post-standard homes.

Figure 2-1. Percent of Fires With Flame Damage Confined to Room of Origin by Cause, 1989-1998 U.S. Pre- vs. Post-Standard Manufactured Homes



Note: Each percent is based on a ten-year total of estimated fires, and all percentages are based on reported fires that number more than a thousand before projection from the NFIRS sample. "Total" percents are less than "all known" percents because percents are much lower for fires with unknown cause.

Source: NFIRS and NFPA survey.

Figure 2-1 shows that the HUD standards are associated with even more success in confining heating and cooking fires to room of origin than has already been shown for fires of all causes.

If certain flame spread requirements are applicable only to the surfaces near a particular hazard, and if use of those requirements leads to smaller fires for fire causes associated with that hazard, then the measure of smaller fire size would be the difference between post-standard and pre-standard manufactured homes in the proportion of fires confined to room of origin. In 1989-1998, this difference was 15 percentage points for all fires and for fires with known cause, and 12 percentage points for fires with known causes other than heating and cooking, which is the best baseline for comparison.

Based on this approach, the flame spread requirements for surfaces near heating and cooking equipment appear to be associated with greater success in keeping fires small. The 20 and 21 percentage-point differences, respectively, for these cause classes of fires in 1989-1998 are much larger than the 12 percentage-point difference for fires with other known cause.

Smaller fires could actually lead to fewer reported fires, if the smaller sizes allowed occupants to control more fires without needing to call the fire department. This appears to be true for heating equipment fires. Based on 1989-1998 fires, post-HUD-standard manufactured homes have *fewer* heating equipment fires per 1,000 housing units than pre-standard units, in that heating equipment has a smaller share (17% for post-standard units versus 20% for pre-standard units) of what was already shown to be a lower overall rate of fires per 1,000 housing units (1.2 versus 2.6, as shown in Table 2-A).

Smoke alarms mean a lower death rate per 100 fires in post-standard manufactured homes and, less consistently, in pre-standard manufactured homes.
Section 3280.208 of the HUD standards requires that at least one smoke alarm be provided in the living area, as well as each room designed for sleeping. This means that smoke alarms have been required in all new manufactured homes since 1976, years before the last states required smoke alarms in other one- or two-family homes. However, available national statistics suggest that a lower percentage of manufactured homes have smoke alarms. The 2011 *American Housing Survey* found 91.8% of occupied manufactured homes reported having working smoke alarms, compared to 94.6% of all occupied housing units (including multi-family).[1] Also, the 2004-2005 Consumer Product Safety Commission study of unreported fires found that only 91% of manufactured homes had smoke alarms, compared to 97-98% of either detached single family homes, townhouses or row houses, or multi-family housing with unreported fires.[2]

In 1989-1998, in post-standard manufactured homes the civilian death rate per 100 fires was 0.9 if smoke alarms were present, 31% less than the 1.3 rate if smoke alarms were not present. In pre-standard manufactured homes, the civilian death rate per 100 fires was 2.4 with smoke alarms in 1989-1998, roughly the same as the 2.3 rate if there were no smoke

[1] *American Housing Survey*, Washington: U.S. Bureau of the Census, 2011, Table 5-01-AO.
[2] Michael A. Greene and Craig Andres, *2004-2005 National Sample Survey of Unreported Residential Fires*, U.S. Consumer Product Safety Commission, July 2009.

alarms. The apparent absence of a smoke alarm effect in pre-standard manufactured homes is at least partly due to the fact that smoke alarms were less likely to operate, when present in a fire large enough to activate them, in pre-standard manufactured homes (62%) than in post-standard manufactured homes (70%).

It should be clear that it is important to install smoke alarms and to make sure they are working. Both steps – acquisition and regular maintenance, primarily testing and battery replacement – save lives. Since 1976, every manufactured home sold should have included installed, hard-wired smoke alarms. Roughly 20% of 2007-2011 occupied manufactured homes were constructed before 1976, and those units accounted for roughly 30% of 2007-2011 manufactured home fires. (See Table 2-1, which includes 1975-1976 with other post-1976 years, because the data on age of manufactured homes in use is grouped that way.) However, half of manufactured home fires (51% in 2007-2011) are consistently reported as having no smoke alarm present. Because 51% is much higher than 30%, this suggests a high rate of disabling and removal of smoke alarms in post-standard units. In the manufactured home fires where smoke alarms were present and the fire was large enough to activate an operational smoke alarm, smoke alarms operated 78% of the time.

Manufactured Homes vs. Other Homes

Manufactured homes have roughly the same civilian fire death rate per 100,000 occupied housing units as other one- or two-family homes.
Table 2-3 provides a comparison of 2007-2011 fire experience rates for manufactured homes and other one- or two-family homes, relative to occupied year-round units. The death rate for manufactured homes (3.0) is at the upper end of the range of estimated death rate for other one- or two-family homes (2.7-3.0). The range is necessary because readily available data on housing units combine all housing with 2-4 units in one-group. The range reflects exclusion or inclusion of these housing units in estimates of the total number of housing units in buildings with 1-2 housing units. Statistics on fires are not limited to occupied housing. The figures on numbers of manufactured homes may include some trailers.

There is a range for one- or two-family homes other than manufactured homes. The high end of this range includes and the low end excludes housing units in two- to four-family buildings, because two-family dwellings are not shown separately, and so one must either include or exclude all two- to four-family dwellings.

Manufactured homes show a lower rate of fires per 1,000 occupied housing units, offsetting a higher rate of deaths per 100 fires. Manufactured homes have a lower rate of civilian fire injuries per 100,000 occupied housing units than other one- or two-family homes, because manufactured homes have not only a lower fire rate per 1,000 housing units but also a lower injury rate per 100 fires.

If all pre-HUD-standard manufactured homes were removed from the inventory, the fire death rate per 100,000 occupied manufactured homes would be estimated at 1.9, or well below the range estimated for the rate for other one- or two-family homes.

Roughly one-fifth of the inventory is still of pre-standard age. Post-standard units have a roughly one-third lower fire rate per 1,000 occupied units (Table 2-1) than pre-standard units and a roughly one-half lower death rate per 100 fires (Table 2-A). These relationships yield a fire death rate for post-standard units of 1.9 deaths per 100,000 occupied manufactured homes (and a pre-standard unit death rate that is more than three times the rate for post-standard units).

In other words, the fire death rate per 100,000 housing units in manufactured homes is projected to decline to well below the rate in other one- or two-family homes when all pre-standard units leave the manufactured home inventory.

Manufactured homes tend to be smaller, which could support more rapid fire growth to flashover.
In 2011, the median size for occupied manufactured homes was 1,120 square feet, compared to 1,800 square feet for all occupied housing units.[3] Manufactured homes therefore averaged nearly two-thirds the space of an average occupied housing unit but 90% of the average number of rooms (5.1 vs. 5.7). This implies the average room sizes were smaller in manufactured homes, which can mean that flashover can occur more rapidly in manufactured homes than in other housing units. The HUD standards affect some of the paths for rapid fire growth through restrictions on the type of interior finishes, but early involvement of some major fuel items, such as upholstered furniture or mattresses and bedding, can support fire growth to flashover even without involvement of the room interior finishes.

Occupants of manufactured homes are more likely to have risk factors for fire than households in general.
In 2011, for example, the percentage of households falling below the poverty line was 25% for occupied manufactured homes compared to 16% for all occupied housing units.[4] Also 28% of households occupying manufactured homes included at least one person aged 65 or older, compared to 25% of households in general. In 28% of occupied manufactured homes, the householder did not have a high school diploma, compared to 13% of all households combined.

In 2007-2011 manufactured home fires, the heating equipment share is higher and the cooking equipment share is lower than for non-confined fires in one- or two-family homes.
Tables 2-4 to 2-7 show 2007-2011 leading causes, for manufactured home fires and non-confined structure fires in all types of one- or two-family homes. The category of all one- or two-family homes includes most but not all fires coded as manufactured home fires.

Heating and cooking equipment are by far the top two major causes for fires, but their relative importance is slightly different. The manufactured home heating equipment share (19%) is higher than the heating equipment share for one- or two-family homes (14%). Note that the heating equipment shares and especially the cooking equipment shares are much higher for one- or two-family homes when confined fires are included. The same might be

[3] *American Housing Survey for the United States*: 2011, U.S. Census Bureau website, Table C-02-AO.
[4] *American Housing Survey for the United States*: 2011, U.S. Census Bureau website, Table C-01-AO.

true for manufactured homes if it were possible to identify confined fires in manufactured homes.

The case for fire sprinklers is as strong for manufactured homes as it is for other one- or two-family homes.

Manufactured homes currently have roughly the same fire death rate per 100,000 occupied housing units as other one- or two-family homes. With comparable risk in both types of homes, the case for sprinklers as a proven strategy for additional risk reduction is as strong for manufactured homes as for other homes, and model codes have already concluded that the case for sprinklers in other homes is strong enough that they have required that sprinklers be installed in all new homes.

Table 2-1. Rates of U.S. Manufactured Home Fires per 1,000 Occupied Manufactured Homes, by Year of Manufacture, 2007-2011

Year of Manufacture	Fires		Occupied Manufactured Homes (in Thousands)		Rate
1995-present	3,700	(33%)	2,600	(37%)	1.5
1985-1994	2,100	(18%)	1,600	(22%)	1.3
1975-1984	2,400	(21%)	1,500	(21%)	1.6
1970-1974	1,800	(16%)	800	(11%)	2.2
Before 1970	1,400	(13%)	600	(8%)	2.5
Total	11,400	(100%)	7,000	(100%)	1.6

Note: These are based on national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. Sums may not equal totals because of rounding error. Fires are not limited to occupied units.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in other one- or two-family homes.

The average number of occupied manufactured homes in 2007-2011 is calculated as a weighted average of available numbers in 2007, 2009, and 2011. This calculation assumes that the average number of manufactured homes in 2007 and 2009 is a good estimate of the number in 2008, and the average number in 2009 and 2011 is a good estimate of the number in 2010. This will be roughly true if the annual change in the number of new units introduced is steady, except for the newest units, where this approach will slightly underestimate the size of the inventory and so slightly overestimate the fire rate per thousand units for the range with the most current year.

Sources: NFIRS and NFPA Survey; *American Housing Survey for the United States in, 2007, 2009, 2011,* U.S. Census Bureau website.

Table 2-2. 1989-1998 Loss per Fire, by Extent of Flame Damage
Pre-Standard vs. Post-Standard Manufactured Homes
Structure Fires Reported to U.S. Fire Departments

Extent of Flame Damage	Pre-Standard (Pre-1976) Fires		Pre-Standard (Pre-1976) Loss per Fire (in Thousands)	Post-Standard (Post-1976) Fires		Post-Standard (Post-1976) Loss per Fire (in Thousands)
Confined to room of origin	1,040	(40%)	$2.9	1,210	(55%)	$5.8
Confined to building of origin but extended beyond room of origin	1,310	(51%)	$12.4	880	(40%)	$20.3
Extended beyond building of origin	230	(9%)	$13.4	110	(5%)	$20.4
All fires with known extent of flame damage and known year of manufacture	2,670	(100%)	$8.5	2,300	(100%)	$12.4

Note: These are 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. Fires are estimated to the nearest ten, and direct property damage is estimated to the nearest million dollars. Property damage has not been adjusted for inflation. *Statistics do not include any proportional allocation of fires with unknown year of manufacture*. Totals may not equal sums because of rounding.

Source: NFIRS and NFPA survey.

Table 2-3. U.S. Manufactured Homes vs. Other One- or Two-Family Homes Fire Experience Rates (Excluding Fires Reported as Confined Fires), 2007-2011

Measure	Manufactured Homes	Other One- or Two-Family Homes
Fires (2007-2011 annual average)	11,400	186,900
Civilian deaths (2007-2011 annual average)	206	2,372
Civilian injuries (2007-2011 annual average)	434	11,016
Number of housing units (in millions) (2008 estimated as average of 2007 and 2009, and 2010 estimated as average of 2009 and 2011)	7.0*	79.1 – 87.4**
Civilian deaths per 100 fires	1.8	1.3
Civilian injuries per 100 fires	3.8	5.9
Fires per 1,000 housing units	1.6	2.1 – 2.4
Civilian deaths per 100,000 housing units	3.0	2.7 – 3.0
Civilian injuries per 100,000 housing units	6.2	12.6 – 13.9

WARNING: Because of limits of analysis forcing exclusion of confined fires, only the statistics on deaths per 100,000 housing units are considered reliable. The other statistics are provided for comparability between manufactured homes and other one- or two-family homes. The relative comparisons should be in the right direction even if the actual magnitudes are off.

*This is an upper bound because the definition includes "trailers," which probably is not limited to the trailer coaches or other manufactured housing referred to by terms including the word "trailer."

**The lower and higher figures in this range reflect the exclusion and inclusion of housing units in buildings housing 2-4 housing units. Buildings having just two housing units, which correspond to the fire statistics on one- and two-family dwellings, cannot be isolated.

Note: These are 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. Fires are estimated to the nearest hundred, and civilian deaths and injuries are estimated to the nearest one. Fires and fire losses are not limited to occupied units.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. Fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in other one- or two-family dwellings.

Sources: NFIRS and NFPA Survey; *American Housing Survey*, Washington: U.S. Bureau of the Census, 2007, 2009, and 2011.

Table 2-4. Fires in Manufactured Homes vs. One- or Two-Family Homes, by Leading Cause Annual Average of Structure Fires Reported to U.S. Fire Departments in 2007-2011 (Excluding Confined Fires)

Cause	Manufactured Homes		One- or Two-Family Homes	
Heating equipment	2,100	(19%)	22,400	(14%)
Cooking equipment	1,700	(15%)	27,600	(17%)
Electrical distribution or lighting equipment	1,400	(12%)	20,300	(12%)
Intentional	1,000	(9%)	15,100	(9%)
Clothes dryer or washer	900	(8%)	12,400	(8%)
Exposure (to other hostile fire)	700	(6%)	10,100	(6%)
Smoking material (i.e., lighted tobacco product)	600	(5%)	9,100	(6%)
Hot ember or ash	600	(5%)	10,600	(6%)
Candle	400	(4%)	7,800	(5%)
Playing with fire	300	(3%)	4,700	(3%)

Note: These are 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. Not all causes are shown, and the same fire may be counted under more than one cause. Statistics include proportional allocation of fires coded as unknown equipment involved in ignition, unknown Cause, unknown heat source, or unknown or none under factor contributing to ignition, as appropriate.

Statistics on one- or two-family home fires are taken from Marty Ahrens, *Home Structure Fires*, April 2013, and may include most of the manufactured home fires. One- or two-family home fires are identified by Incident Type 110-129 and Property Use 410-429. This definition includes all the fires counted here under manufactured homes except for those coded as Incident Type 120-121 with Property Use 400 and those coded as Incident Type 121 with Property Use ≠ 400-429.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in all one- or two-family homes.

Source: NFIRS and NFPA survey.

Table 2-5. Civilian Fire Deaths in Manufactured Homes vs. One- or Two-Family Homes, by Leading Cause Annual Average of Structure Fires Reported to U.S. Fire Departments in 2007-2011 (Excluding Confined Fires)

Cause	Manufactured Home		One- or Two-Family Homes	
Heating equipment	73	(35%)	480	(22%)
Smoking material (i.e., lighted tobacco product)	47	(23%)	450	(21%)
Electrical distribution or lighting equipment	31	(15%)	270	(13%)
Cooking equipment	31	(15%)	320	(15%)
Intentional	22	(11%)	290	(13%)
Clothes dryer or washer	7	(4%)	30	(1%)
Hot ember or ash	6	(3%)	100	(5%)
Candle	2	(1%)	100	(5%)
Playing with heat source	1	(1%)	70	(3%)
Exposure (to other hostile fire)	0	(0%)	10	(0%)

Note: These are 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. Not all causes are shown, and the same fire may be counted under more than one cause. Statistics include proportional allocation of fires coded as unknown equipment involved in ignition, unknown Cause, unknown heat source, or unknown or none under factor contributing to ignition, as appropriate.

Statistics on one- or two-family home fires are taken from Marty Ahrens, *Home Structure Fires*, April 2013, and may include most of the manufactured home fires. One- or two-family home fires are identified by Incident Type 110-129 and Property Use 410-429. This definition includes all the fires counted here under manufactured homes except for those coded as Incident Type 120-121 with Property Use 400 and those coded as Incident Type 121 with Property Use ≠ 400-429.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in all one- or two-family homes.

Source: NFIRS and NFPA survey.

Table 2-6. Civilian Fire Injuries in Manufactured Homes vs. One- or Two-Family Homes, by Leading Cause Annual Average of Structure Fires Reported to U.S. Fire Departments in 2007-2011 (Excluding Confined Fires)

Cause	Manufactured Homes		One- or Two-Family Homes	
Cooking equipment	105	(24%)	2,210	(28%)
Smoking material (i.e., lighted tobacco product)	68	(16%)	790	(10%)
Heating equipment	60	(14%)	1,200	(15%)
Clothes dryer or washer	32	(7%)	370	(5%)
Electrical distribution or lighting equipment	31	(7%)	720	(9%)
Intentional	27	(6%)	570	(7%)
Playing with heat source	25	(6%)	540	(7%)
Candle	16	(4%)	610	(8%)
Hot ember or ash	14	(3%)	330	(4%)
Exposure (to other hostile fire)	3	(1%)	60	(1%)

Note: These are 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. Injuries are shown to the nearest one for manufactured homes and the nearest ten for other one- or two-family homes. Not all causes are shown and the same fire may be counted under more than one cause. Statistics include proportional allocation of fires coded as unknown equipment involved in ignition, unknown Cause, unknown heat source, or unknown or none under factor contributing to ignition, as appropriate.

Statistics on one- or two-family home fires are taken from Marty Ahrens, *Home Structure Fires*, April 2013, and may include most of the manufactured home fires. One- or two-family home fires are identified by Incident Type 110-129 and Property Use 410-429. This definition includes all the fires counted here under manufactured homes except for those coded as Incident Type 120-121 with Property Use 400 and those coded as Incident Type 121 with Property Use ≠ 400-429.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in all one- or two-family dwellings.

Source: NFIRS and NFPA survey.

Table 2-7. Direct Property Damage (in Millions) in Fires in Manufactured Homes vs. One- or Two-Family Homes, by Leading Cause Annual Average of Structure Fires Reported to U.S. Fire Departments in 2007-2011 (Excluding Confined Fires)

Cause	Manufactured Homes		One- or Two- Family Homes	
Candle	$39	(22%)	$354	(6%)
Heating equipment	$22	(12%)	$788	(13%)
Cooking equipment	$14	(8%)	$593	(10%)
Clothes dryer or washer	$14	(8%)	$181	(3%)
Electrical distribution or lighting equipment	$12	(6%)	$685	(12%)
Exposure (to other hostile fire)	$10	(6%)	$789	(13%)
Intentional	$10	(5%)	$489	(8%)
Smoking material (i.e., lighted tobacco product)	$7	(4%)	$306	(5%)
Hot ember or ash	$7	(4%)	$363	(6%)
Playing with fire	$5	(3%)	$128	(2%)

Note: These are 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. Damages are shown to the nearest million dollars and are not adjusted for inflation. Not all causes are shown, and the same fire may be counted under more than one cause. Statistics include proportional allocation of fires coded as unknown equipment involved in ignition, unknown Cause, unknown heat source, or unknown or none under factor contributing to ignition, as appropriate.

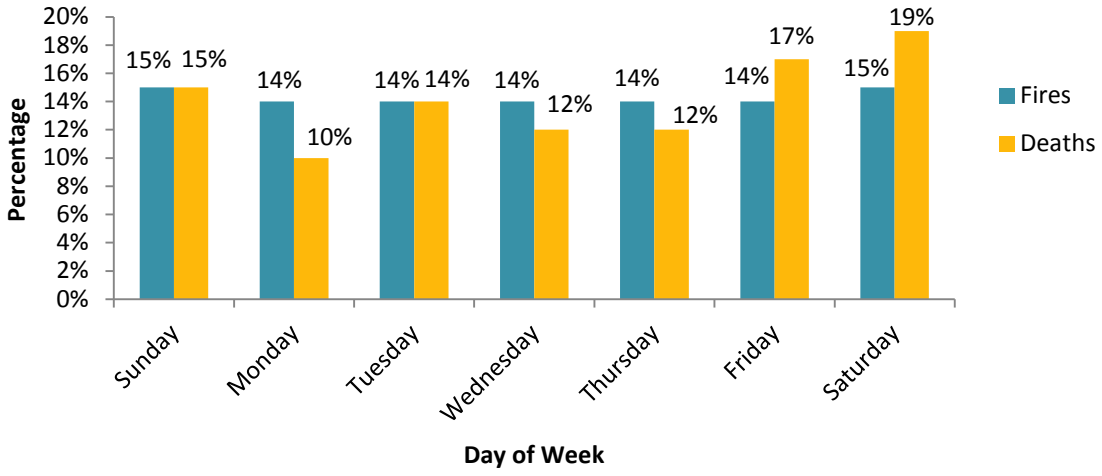
Statistics on one- or two-family home fires are taken from Marty Ahrens, *Home Structure Fires*, April 2013, and may include most of the manufactured home fires. One- or two-family home fires are identified by Incident Type 110-129 and Property Use 410-429. This definition includes all the fires counted here under manufactured homes except for those coded as Incident Type 120-121 with Property Use 400 and those coded as Incident Type 121 with Property Use ≠ 400-429.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in all one- or two-family homes.

Source: NFIRS and NFPA survey.

Manufactured home fires and associated civilian deaths are more frequent on weekends than on weekdays.
See Figure 3-1. This pattern is also seen in overall one- or two-family home structure fires.

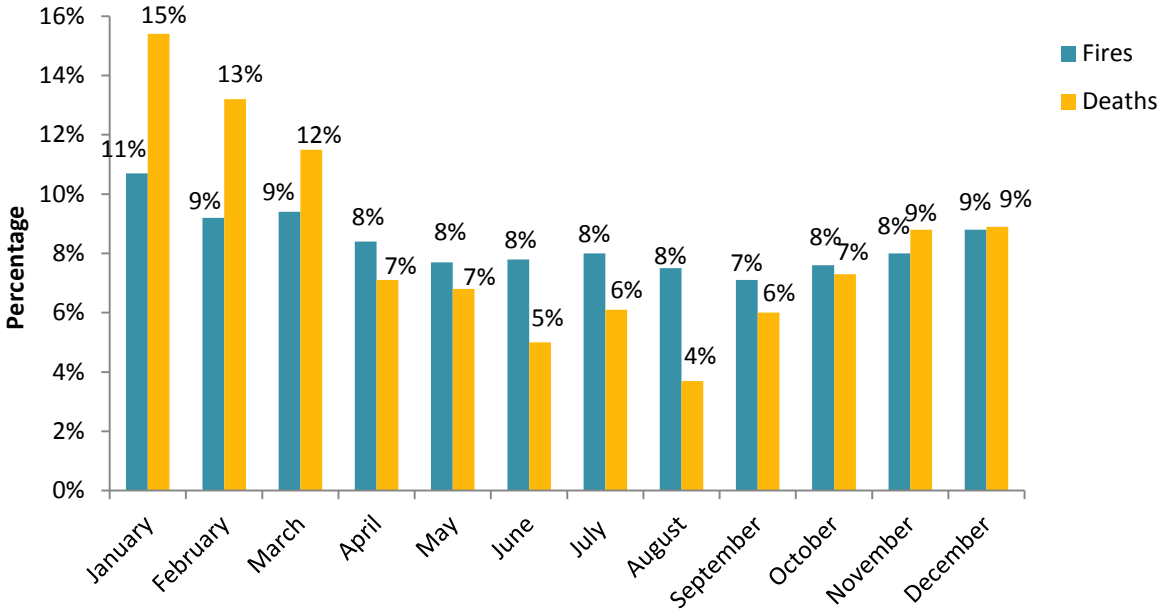
Figure 3-1. Manufactured Home Fires and Deaths, 2007-2011, by Day of Week



Source: NFIRS and NFPA survey.

Manufactured home fires and associated civilian deaths peak during the winter months, when heating equipment fires are added to other, less seasonal types of fires.
See Figure 3-2. This pattern is also seen in overall one- or two-family home structure fires.

Figure 3-2. Manufactured Home Fires and Deaths, 2007-2011, by Month of Year



Source: NFIRS and NFPA survey.

Manufactured home fires peak in the afternoon and evening, while associated civilian deaths peak after midnight.
See Table 3-1. This pattern is also seen in overall one- or two-family home structure fires.

The leading items first ignited in manufactured home fires are very similar to the leading items first ignited in non-confined fires in other one- or two-family homes.
See Table 3-2. The items not shown on Table 3-2 that have larger shares of fires in one- or two-family homes than some items on the Table 3-2 list include flammable or combustible liquids or gases, unclassified structural component or finish, and clothing.

There also are no dramatic differences in leading areas of origin between manufactured home fires and fires involving other one- or two-family homes, as Table 3-3 shows. The areas not shown on Table 3-3 that have larger shares of fires in one- or two-family homes than some items on the Table 3-3 list include attic or ceiling/roof assembly or concealed space, garage, and exterior balcony or outside porch.

Table 3-1.
Manufactured Home Fires, by Hour of Day
Annual Average of 2007-2011 Structure Fires Reported to U.S. Fire Departments

Hour of Day	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Midnight – 12:59 a.m.	460	(4%)	13	(7%)	24	(5%)	$22	(12%)
1:00 – 1:59 a.m.	430	(4%)	13	(7%)	23	(5%)	$7	(4%)
2:00 – 2:59 a.m.	410	(4%)	16	(8%)	24	(6%)	$7	(4%)
3:00 – 3:59 a.m.	390	(3%)	10	(5%)	23	(5%)	$7	(4%)
4:00 – 4:59 a.m.	320	(3%)	29	(14%)	21	(5%)	$5	(3%)
5:00 – 5:59 a.m.	300	(3%)	8	(4%)	10	(2%)	$4	(3%)
6:00 – 6:59 a.m.	280	(2%)	10	(5%)	12	(3%)	$5	(3%)
7:00 – 7:59 a.m.	290	(3%)	9	(4%)	16	(4%)	$4	(2%)
8:00 – 8:59 a.m.	370	(3%)	7	(3%)	20	(5%)	$6	(3%)
9:00 – 9:59 a.m.	400	(3%)	8	(4%)	17	(4%)	$5	(3%)
10:00 – 10:59 a.m.	460	(4%)	7	(3%)	20	(5%)	$8	(5%)
11:00 – 11:59 a.m.	490	(4%)	4	(2%)	12	(3%)	$9	(5%)
Noon – 12:59 p.m.	560	(5%)	3	(1%)	21	(5%)	$8	(4%)
1:00 – 1:59 p.m.	580	(5%)	4	(2%)	13	(3%)	$8	(5%)
2:00 – 2:59 p.m.	600	(5%)	6	(3%)	17	(4%)	$8	(5%)
3:00 – 3:59 p.m.	610	(5%)	6	(3%)	20	(5%)	$8	(4%)
4:00 – 4:59 p.m.	600	(5%)	4	(2%)	19	(4%)	$7	(4%)
5:00 – 5:59 p.m.	590	(5%)	4	(2%)	16	(4%)	$8	(4%)
6:00 – 6:59 p.m.	590	(5%)	4	(2%)	16	(4%)	$8	(4%)
7:00 – 7:59 p.m.	560	(5%)	6	(3%)	17	(4%)	$7	(4%)
8:00 – 8:59 p.m.	570	(5%)	6	(3%)	18	(4%)	$6	(3%)
9:00 – 9:59 p.m.	560	(5%)	10	(5%)	19	(4%)	$7	(4%)
10:00 – 10:59 p.m.	520	(5%)	11	(5%)	20	(5%)	$7	(4%)
11:00 – 11:59 p.m.	470	(4%)	7	(3%)	16	(4%)	$7	(4%)
Total	11,400	(100%)	206	(100%)	434	(100%)	$179	(100%)

Note: These are 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. Fire estimated to the nearest ten for manufactured homes. Civilian deaths and injuries are estimated to the nearest one for manufactured homes. Direct property damage has been estimated to the nearest million dollars.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in other one- or two-family dwellings.

Source: NFIRS and NFPA survey.

Table 3-2. Leading Items First Ignited in Fires in Manufactured Homes and One- or Two-Family Homes Annual Average of 2007-2011 Structure Fires Reported to Fire Departments

A. Manufactured Homes, Probably Excluding Confined Fires

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wire or cable insulation	1,290	(11%)	12	(6%)	27	(6%)	$13	(8%)
Cooking materials	850	(7%)	12	(6%)	62	(14%)	$11	(6%)
Unclassified item first ignited	810	(7%)	15	(7%)	24	(5%)	$11	(6%)
Structural material or framing	750	(7%)	12	(6%)	17	(4%)	$13	(7%)
Interior wall covering	710	(6%)	16	(8%)	23	(5%)	$20	(11%)
Exterior wall covering	650	(6%)	6	(3%)	11	(2%)	$9	(5%)
Mattress or bedding	520	(5%)	31	(15%)	47	(11%)	$9	(5%)
Appliance housing or casing	480	(4%)	2	(1%)	15	(3%)	$5	(3%)
Insulation within structural area	470	(4%)	1	(0%)	8	(2%)	$5	(3%)
Floor covering	420	(4%)	16	(8%)	14	(3%)	$7	(4%)
Upholstered furniture	410	(4%)	21	(10%)	27	(6%)	$9	(5%)

B. One- or Two-Family Homes, Excluding Confined Fires

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wire or cable insulation	13,700	(8%)	100	(5%)	340	(4%)	$386	(6%)
Cooking materials	14,600	(9%)	100	(5%)	1,460	(18%)	$317	(5%)
Unclassified item first ignited	8,400	(5%)	90	(4%)	300	(4%)	$292	(5%)
Structural material or framing	18,000	(11%)	130	(6%)	340	(4%)	$940	(16%)
Interior wall covering	6,600	(4%)	90	(4%)	220	(3%)	$288	(5%)
Exterior wall covering	12,100	(7%)	30	(1%)	170	(2%)	$401	(7%)
Mattress or bedding	7,200	(4%)	250	(11%)	910	(11%)	$269	(5%)
Appliance housing	4,800	(3%)	30	(1%)	170	(2%)	$115	(2%)
Insulation within structural area	5,400	(3%)	10	(0%)	80	(1%)	$134	(2%)
Floor covering	4,200	(3%)	100	(4%)	210	(3%)	$149	(2%)
Upholstered furniture	4,800	(3%)	370	(17%)	520	(7%)	$251	(4%)

Table 3-2. Leading Items First Ignited in Fires in Manufactured Homes and One- or Two-Family Homes Annual Average of 2007-2011 Structure Fires Reported to Fire Departments (Continued)

C. One- or Two-Family Homes, All Structure Fires Including Confined Fires

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Wire or cable insulation	15,200	(6%)	100	(5%)	350	(4%)	$387	(6%)
Cooking materials	54,700	(21%)	100	(5%)	2,080	(23%)	$326	(5%)
Unclassified item first ignited	21,800	(8%)	90	(4%)	350	(4%)	$295	(5%)
Structural material or framing	18,400	(7%)	130	(6%)	340	(4%)	$941	(16%)
Interior wall covering	6,800	(3%)	90	(4%)	220	(3%)	$288	(5%)
Exterior wall covering	12,300	(5%)	30	(1%)	170	(2%)	$401	(7%)
Mattress or bedding	7,400	(3%)	250	(11%)	910	(10%)	$269	(5%)
Appliance housing	9,100	(3%)	30	(1%)	200	(2%)	$117	(2%)
Insulation within structural area	5,500	(2%)	10	(0%)	80	(1%)	$134	(2%)
Floor covering	4,300	(2%)	100	(4%)	210	(2%)	$149	(2%)
Upholstered furniture	4,900	(2%)	370	(17%)	520	(6%)	$251	(4%)

Note: These are 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. Fires are estimated to the nearest ten for manufactured homes and the nearest hundred for other one- or two-family homes. Civilian deaths and injuries are estimated to the nearest one for manufactured homes and the nearest ten for other one- or two-family homes. Direct property damage has been estimated to the nearest million dollars. Statistics include proportional allocation of fires coded as item first ignited unknown.

Statistics on one- or two-family home fires are taken from Marty Ahrens, *Home Structure Fires*, April 2013. One- or two-family home fires are identified by Incident Type 110-129 and Property Use 410-429. This definition includes all the fires counted here under manufactured homes except for those coded as Incident Type 120-121 with Property Use 400 and those coded as Incident Type 121 with Property Use ≠ 400-429.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in all one- or two-family dwellings.

Source: NFIRS and NFPA survey.

Table 3-3. Leading Areas of Origin in Fires in Manufactured Homes and One- or Two-Family Homes Annual Average of 2007-2011 Structure Fires Reported to Fire Departments

A. Manufactured Homes, Probably Excluding Confined Fires

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Kitchen	2,260	(20%)	27	(13%)	126	(29%)	$33	(18%)
Bedroom	1,560	(14%)	44	(21%)	94	(22%)	$30	(17%)
Living room, family room or den	820	(7%)	60	(29%)	63	(14%)	$18	(10%)
Unclassified function area	620	(5%)	25	(12%)	44	(10%)	$12	(7%)
Laundry room or area	550	(5%)	6	(3%)	11	(2%)	$7	(4%)
Crawl space or substructure space	550	(5%)	2	(1%)	7	(2%)	$6	(3%)
Unclassified area of origin	480	(4%)	5	(3%)	6	(1%)	$6	(4%)
Exterior wall surface	460	(4%)	1	(1%)	6	(1%)	$5	(3%)
Unclassified structural area	460	(4%)	8	(4%)	9	(2%)	$8	(5%)
Bathroom	420	(4%)	3	(2%)	10	(2%)	$6	(3%)
Wall assembly or concealed space	390	(3%)	1	(0%)	3	(1%)	$8	(4%)
Heating equipment room or area	390	(3%)	4	(2%)	4	(1%)	$4	(2%)

B. One- or Two-Family Homes, Excluding Confined Fires

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Kitchen	29,800	(18%)	320	(15%)	2,170	(27%)	$762	(13%)
Bedroom	20,800	(13%)	520	(24%)	1,770	(22%)	$775	(13%)
Living room, family room, or den	10,400	(6%)	520	(24%)	950	(12%)	$484	(8%)
Unclassified function area	6,900	(4%)	220	(10%)	460	(6%)	$302	(5%)
Laundry room or area	8,200	(5%)	30	(2%)	270	(3%)	$188	(3%)
Crawl space or substructure space	4,500	(3%)	50	(2%)	170	(2%)	$168	(3%)
Unclassified area of origin	4,100	(3%)	40	(2%)	70	(1%)	$127	(2%)
Exterior wall surface	8,200	(5%)	10	(0%)	110	(1%)	$172	(3%)
Unclassified structural area	4,700	(3%)	70	(3%)	130	(2%)	$247	(4%)
Bathroom	4,800	(3%)	30	(1%)	180	(2%)	$96	(2%)
Wall assembly or concealed space	6,200	(4%)	30	(1%)	110	(1%)	$196	(3%)
Heating equipment room or area	2,800	(2%)	20	(1%)	110	(1%)	$101	(2%)

Table 3-3. Leading Areas of Origin in Fires in Manufactured Homes and One- or Two-Family Homes Annual Average of 2007-2011 Structure Fires Reported to Fire Departments (Continued)

C. One- or Two-Family Homes, All Structure Fires Including Confined Fires

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Kitchen	85,000	(33%)	330	(15%)	2,970	(33%)	$776	(13%)
Bedroom	21,200	(8%)	520	(24%)	1,780	(20%)	$775	(13%)
Living room, family room or den	10,900	(4%)	520	(24%)	960	(11%)	$484	(8%)
Unclassified function area	7,500	(3%)	220	(10%)	470	(5%)	$302	(5%)
Laundry room or area	8,900	(3%)	30	(2%)	270	(3%)	$188	(3%)
Crawl space or substructure space	4,900	(2%)	50	(2%)	180	(2%)	$168	(3%)
Unclassified area of origin	6,100	(2%)	40	(2%)	70	(1%)	$127	(2%)
Exterior wall surface	8,300	(3%)	10	(0%)	110	(1%)	$172	(3%)
Unclassified structural area	5,000	(2%)	70	(3%)	140	(2%)	$247	(4%)
Bathroom	5,200	(2%)	30	(1%)	190	(2%)	$97	(2%)
Wall assembly or concealed space	6,300	(2%)	30	(1%)	110	(1%)	$196	(3%)
Heating equipment room or area	5,300	(2%)	20	(1%)	130	(1%)	$102	(2%)

Note: These are 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 o f one unusually serious fire. Fires are estimated to the nearest ten for manufactured homes and the nearest hundred for other one- or two-family homes. Civilian deaths and injuries are estimated to the nearest one for manufactured homes and the nearest ten for other one- or two-family homes. Direct property damage has been estimated to the nearest million dollars. Statistics include proportional allocation of fires coded as area of origin unknown.

Statistics on one- or two-family home fires are taken from Marty Ahrens, *Home Structure Fires*, April 2013. One- or two-family home fires are identified by Incident Type 110-129 and Property Use 410-429. This definition includes all the fires counted here under manufactured homes except for those coded as Incident Type 120-121 with Property Use 400 and those coded as Incident Type 121 with Property Use ≠ 400-429.

Manufactured home fires are identified as Incident Type 121 with any Property Use or Incident Type 120 with Property Use 400-429. Manufactured home fires coded as Incident Type 110-118 with Mobile Property Type 17 are not included because nearly all fires with Incident Type 113-118 (confined fires) have Mobile Property Type blank, making it impossible to estimate relevant fires of this type. For this reason, fires coded as confined fires are excluded from comparisons of manufactured home fires to fires in all one- or two-family dwellings.

Source: NFIRS 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.

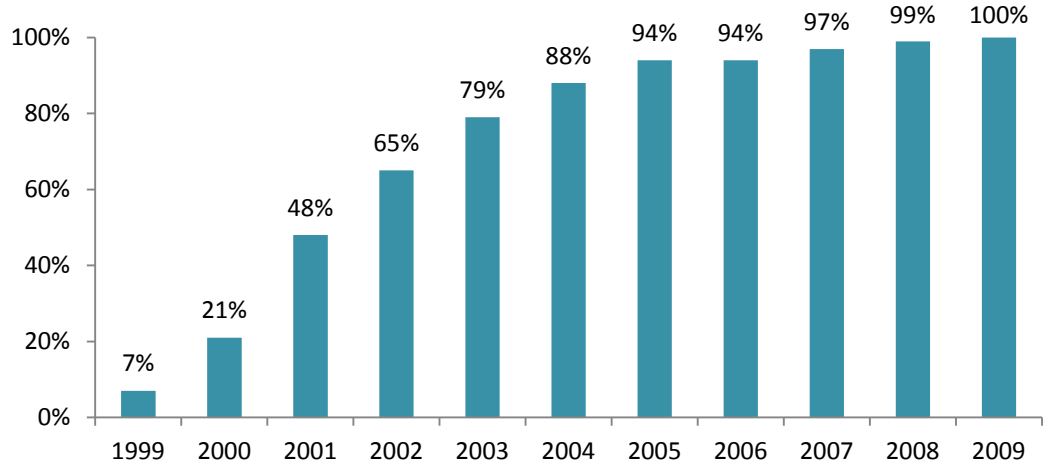
Scaling ratios are obtained by comparing NFPA's projected totals of residential structure fires, non-residential structure fires, vehicle fires, and outside and other fires, and associated civilian deaths, civilian injuries, and direct property damage with comparable totals in NFIRS. Estimates of specific 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.

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.

Figure A.1. Fires Originally Collected in NFIRS 5.0 by Year



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

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

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.