RESEARCH

Home Structure Fires Involving Christmas Trees

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Abstract

Christmas trees are a traditional part of the Christmas holiday. They can also be a major source of fuel in a fire.

National estimates of reported home structure fires derived from the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS) and NFPA's annual fire department experience survey show that in 2010-2014, Christmas trees were the item first ignited in an estimated average of 210 reported home structure fires per year, resulting in an annual average of six civilian fire deaths, 16 civilian fire injuries, and $16.2 million in direct property damage.

On average, one of every 34 reported home Christmas tree fires resulted in a death, compared to an average of one death per 142 total reported home fires.

This report describes the common causes and circumstances of these fires. These findings identify issues that should be highlighted for Christmas tree safety.

Keywords: fire statistics, home fires, Christmas trees, 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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U.S. Home Structure Fires in Which Christmas Trees Were the Item First Ignited:

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HOME CHRISTMAS TREE FIRES FACT SHEET

U.S. fire departments responded to an estimated average of 210 home[1] structure fires per year that began with Christmas trees in 2010-2014. These fires caused an annual average of six civilian deaths, 16 civilian injuries, and $16.2 million in direct property damage.

On average, one of every 34 reported home Christmas tree fires resulted in a death, compared to an average of one death per 142 total reported home fires.

Although Christmas tree fires are not common, when they do occur, they are much more likely to be deadly than most other fires.

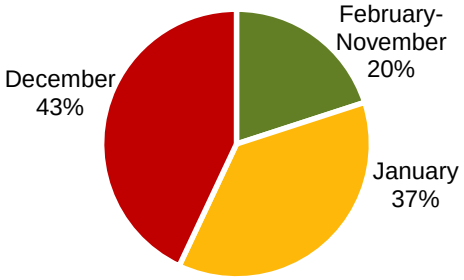
In one-quarter (26%) of the Christmas tree fires and 80% of the deaths, some type of heat source, such as a candle or equipment, was too close to the tree.

Electrical failures or malfunctions were also factors in one-quarter (26%) of Christmas tree fires.

Four of every five Christmas tree fires occurred in December and January.

More than two of every five Christmas tree fires (43%) were in December. More than one-third (37%) were in January.

Home structure fires in which Christmas trees were first ignited by month: 2010-2014



Leading causes of Christmas tree fires

Electrical distribution or lighting equipment was involved in one-third (35%) of home Christmas tree fires.

- Eighteen percent of home Christmas tree fires involved decorative lights.
- Wiring or related equipment was involved in 11%.
- Cords or plugs were involved in 4%.

Twenty-three percent of Christmas tree fires were intentional. More than half of these intentional fires occurred in January.

Heating equipment was involved in 15%.

Ten percent of Christmas tree fires were started by someone playing with fire.

Candles started 8% of home Christmas tree structure fires.

Leading areas of origin

Almost two of every five (38%) home Christmas tree fires started in the living room, family room, or den. All of the fatalities and three-quarters of the injuries resulted from fires started in this area.

Seven percent were chimney or flue fires.

To learn more about holiday safety, see NFPA's Winter Holiday Safety Tips.

[1] Homes include one- or two-family homes and apartments or other multi-family housing.

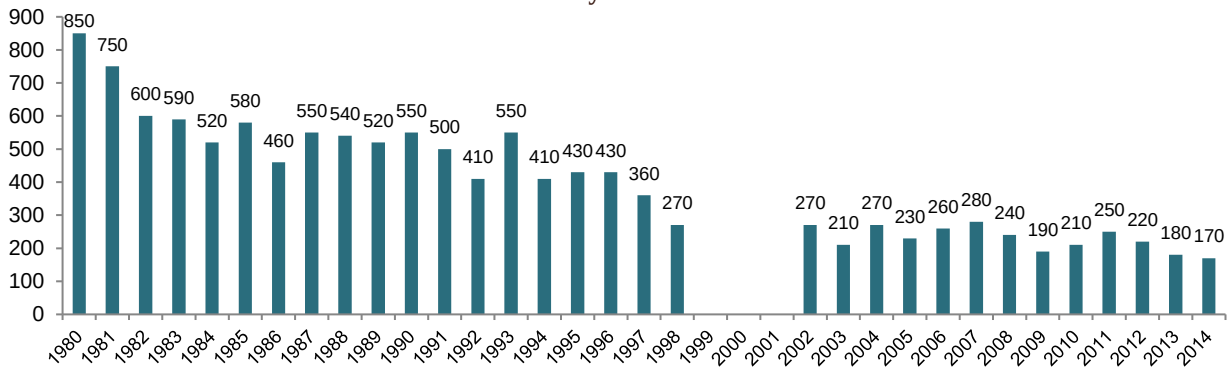
Home Structure Fires Originating with Christmas Trees

On average, 210 home structure fires began with Christmas trees per year. During 2010-2014, Christmas trees were the items first ignited in an estimated average of 210 reported home structure fires per year. These fires caused an estimated average of six civilian deaths, 16 civilian injuries, and $16.2 million in direct property damage per year.

Christmas tree fires accounted for 0.1% of the reported home fires, 0.2% of home fire deaths, 0.1% of home fire injuries, and 0.2% of the direct property damage resulting from home fires.

Home Christmas tree structure fires have been fairly stable over the past decade. Table 1 and Figure 1 show that the estimated number of Christmas tree fires declined fairly steadily from 1980 through the late 1990s. Overall, these fires fell a total of 80% from a high of 850 in 1980 to 170 in 2014, the lowest point in the available estimates. Home structure fires overall fell 50% from 1980 to 2014.[1] In recent years, the estimated number of reported home fires starting with Christmas trees has generally fallen between 170 and 280, with no clear trend up or down relative to the size of the year-to-year variation.

Figure 1. Home Structure Fires in Which Christmas Trees Were First Ignited by Year



Note: See Note and Source on Table 1. In 1999-2001, participation in NFIRS Version 5.0 was low, which means estimates for these years are highly uncertain and is why those estimates are not shown here.

Deaths from Christmas tree fires peaked in the mid-1980s to early 1990s. Over the 35-year period of 1980 to 2014, the estimated number of Christmas tree fire deaths ranged from a low of zero to a high of 54. Because these statistics are projections and not a complete census of all fire deaths resulting from these fires, it is possible to have an estimate of zero deaths in a year when some deaths actually occurred. If the death was not captured in NFIRS, it would not be included in the estimates. We compensate both for fires that were reported to fire departments but not to NFIRS and for fires reported to NFIRS in which the item first ignited was unknown. This means that a fire that kills several people, when projected, can result in an artificially high estimate of deaths.

[1] Marty Ahrens, *Home Structure Fires* (Quincy, MA: NFPA, 2016), 1.

Data Sources, Definitions and Conventions Used in this Report

Unless otherwise specified, the statistics in this analysis 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. These estimates are projections based on the detailed information collected in Version 5.0 of the U.S. Fire Administration's National Fire Incident Reporting System (NFIRS 5.0) and the National Fire Protection Association's (NFPA's) annual fire department experience survey. Except for property use and incident type, fires with unknown or unreported data were allocated proportionally in calculations of national estimates. In general, any fire that occurs in or in a structure is considered a structure fire, even if the fire was limited to contents and the building itself was not damaged.

Christmas trees were identified by NFIRS 5.0 Item First Ignited code 41. Holiday lights and other decorative lighting with line voltage were identified by Equipment Involved in Ignition code 242. Homes were captured by property use codes in the 410-429 range. Structure fires were identified by incident type 110-129.

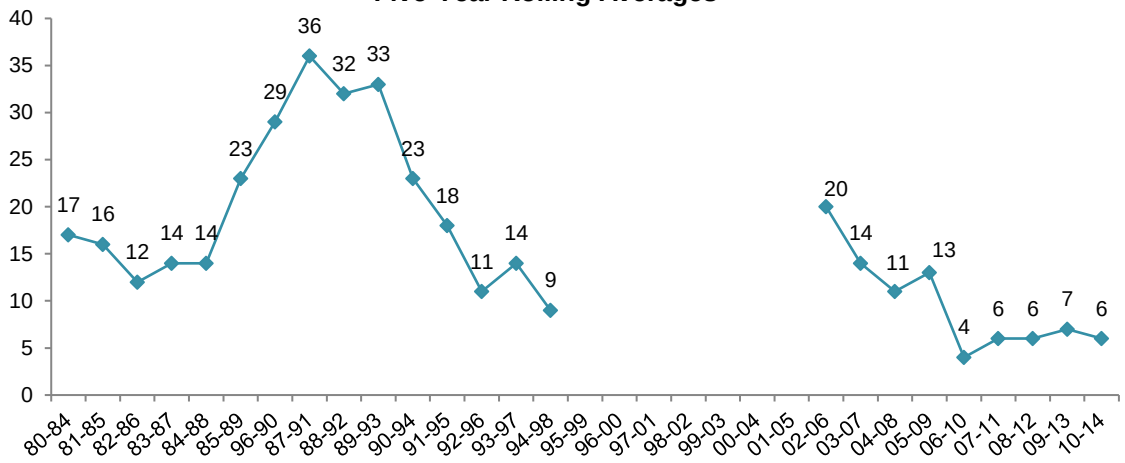
NFIRS 5.0 includes a category of structure fires collectively referred to as "confined fires," identified by incident type. These include confined cooking fires, confined chimney or flue fires, confined trash fires, confined fuel burner or boiler fires, confined commercial compactor fires, and confined incinerator fires (incident type 113-118). Losses are generally minimal in these fires, which by definition, are assumed to have been limited to the object of origin. Although causal data is not required for these fires, it is sometimes present. The percentage of unknown data is much higher for confined fires than non-confined fires.

For fires originating with Christmas trees, confined and non-confined fires were analyzed separately and summed for Cause of Ignition, Heat Source, Factor Contributing to Ignition, Area of Origin, and Item First Ignited. Non-confined fires were analyzed for Equipment Involved in Ignition. For that table, confined fires were not broken out further and were grouped by incident type with the non-confined fires.

Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Property damage has not been adjusted for inflation. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and direct property damage to the nearest hundred thousand. Additional details on the methodology may be found in Appendix A.

Figure 2 shows five-year estimated averages of deaths, beginning with the period of 1980-1984, and ending with 2010-2014. Because of low participation in NFIRS Version 5.0 in 1999-2001, those estimates are highly uncertain and are not shown here.

Figure 2. Deaths in Home Structure Fires in Which Christmas Trees Were First Ignited Five-Year Rolling Averages



Four out of five Christmas tree fires were reported in December or January. Figure 3 shows that 43% of reported home Christmas tree fires occurred in December and 37% were reported in January. The longer a tree is kept after Christmas, the more likely it is to dry out and become easy to ignite. Figure 4 shows that these fires peaked between 6:00 p.m. and 9:00 p.m. Two-thirds (69%) of the fires occurred between noon and midnight.

Figure 3.
Home Structure Fires in which Christmas Trees Were First Ignited, by Month: 2010-2014

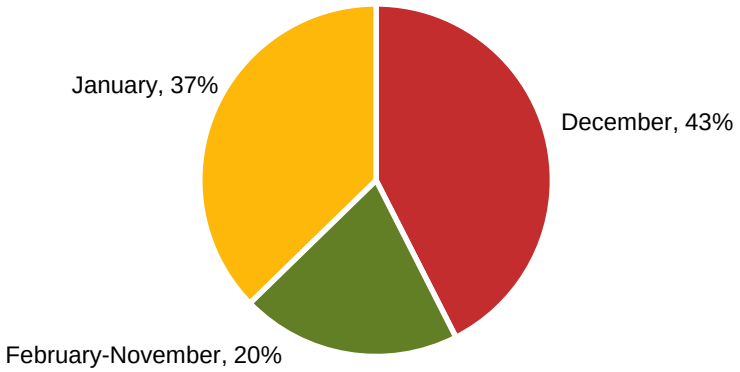
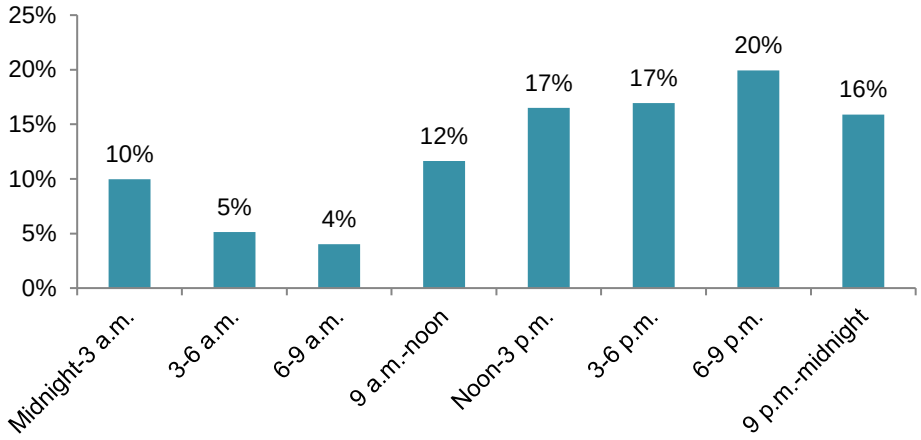


Figure 4.
Home Structure Fires in which Christmas Trees Were First Ignited by Time of Alarm: 2010-2014



Fire spread was limited to the room of origin in almost two-thirds of these fires. Table 2 shows that one-quarter (26%) of the reported fires that began with Christmas trees were confined fires identified by NFIRS incident type. Presumably, damage in these fires was confined to the object of origin. Nine percent of the Christmas tree home structure fires had flame damage confined to the object of origin but did not have one of the six NFIRS incident type codes indicating a confined structure fire. The fire spread beyond the Christmas tree but was limited to the room of origin in 28% of the fires. All of the deaths from Christmas tree fires were caused by incidents in which flame damage spread beyond the room of origin.

If a Christmas tree fire occurs, the risk of death is unusually high. Although the number of home structure fires beginning with Christmas trees is relatively small, it is important to remember that these items are generally in use a short time each year. When they do occur, Christmas tree fires are unusually likely to be serious. In 2010-2014, on average, one of every 34 reported home structure Christmas tree fires resulted in a death, compared to an average of one death per 142 total reported home structure fires.

Four examples of deadly Christmas tree fires illustrate how these fires can happen. These incidents, taken from NFPA's Fire Incident Data Organization (FIDO) anecdotal database, were previously published in either *NFPA Journal's* "Firewatch" column, or in NFPA's studies of catastrophic fires. The full published incident descriptions may be found in Appendix B.

- A 14-year-old boy died in a 2007 fire in an Illinois single-family home that started when lights on the Christmas tree failed and ignited the tree. The fire spread to wall coverings and the couch.[2]
- Four people, including a 1-year old boy, a 12-year-old girl, a 38-year-old woman, and a 40-year-old man, died in a 2007 Pennsylvania fire in a single-family home that started when an electrical fault ignited combustibles, including an artificial Christmas tree and

[2] Kenneth J. Tremblay, 2008, "Christmas Tree Fire Kills One, Illinois," *NFPA Journal*, March/April, 24-25.

a sofa. Three people were injured when they jumped from other floors to escape the blaze.[3]

- In 2005, a Christmas tree fire started by an extension cord in a Tennessee single-family dwelling killed four people.[4]

Causes of Christmas Tree Fires

Electrical problems were factors in one-quarter of home Christmas tree fires. Table 3 shows that one-quarter (26%) of home Christmas tree fires occurred when some type of heat source, such as a candle, heating equipment or electrical lights, was too close to the tree. Eighty percent of Christmas tree fire deaths were caused by these incidents. Some type of electrical failure or malfunction was a factor in another quarter (26%) of the fires and one-fifth (19%) of associated civilian deaths. An unclassified misuse of material or product was a factor in 11% of the fires. Ten percent of the fires resulted from someone playing with fire or other heat source; an outside or open fire for waste disposal was a factor in another 10%, and abandoned or discarded material was a factor in 9% of these incidents.

Almost one-quarter of home Christmas tree fires were intentional. Table 4 shows that 23% of home Christmas tree structure fires were intentionally set. More than half (52%) of the intentional Christmas tree fires occurred in January.

Decorative lights were involved in 18% of the fires. Some type of electrical distribution or lighting equipment was involved in one-third (35%) of home Christmas tree fires. Table 5 shows that decorative lights (including holiday lights) were involved in 18% of these fires, while wiring or related equipment was involved in 11%, and cords or plugs were involved in 4%.

No equipment was involved in one-quarter (23%) of the incidents.

Some type of heating equipment was involved 15% of the fires. Fireplaces or chimneys were involved in 8% of total fires.

Candles started 8% of home Christmas tree structure fires. Arcing was the heat source in 16% of home Christmas tree structure fires, 14% were started by matches, 10% were started by radiated or conducted heat, hot embers or ashes started 9%, candles started 8%, and unclassified heat from powered equipment from operating equipment (like a space heater started another 8% of the fires. (See Table 6.)

The living room, family room or den was the leading area of origin for Christmas tree fires. Table 7 shows that almost two of every five (38%) home structure Christmas tree fires started in the living room, family room or den. All of the deaths, three-quarters (74%) of the injuries, and 61% of the direct property damage associated with home Christmas tree fires

[3] Kenneth J. Tremblay, 2009, "House Fire Kills Four, Pennsylvania," *NFPA Journal*, January/February, 23.
[4] Kenneth J. Tremblay, 2006, **"**Overloaded Extension Cord Ignites Christmas Tree, Tennessee," *NFPA Journal*, November/December, 20.

resulted from fires beginning in that area. Nine percent of the fires began in an unclassified outside area accounted, 8% started in an unclassified function area, and 7% were confined chimney or flue fires.

A disproportionate share of Christmas tree fires involved natural trees. The data element "type of material first ignited" provides the best indication of whether the Christmas tree was artificial or natural. The code for plastic implies an artificial tree (although it could also refer to plastic ornaments on the tree) and the codes for unclassified natural product, unclassified wood or paper, round timber and sawn wood all imply a natural tree. Other codes for wood do not as clearly relate to a natural tree and also make little difference in the share of fires attributable to natural trees.

Based on these coding conventions, fires involving natural trees outnumber fires involving artificial trees by about 3 to 1, and the ratios are even higher for associated losses: 23 to 1 for civilian injuries and 6 to 1 for direct property damage. No deaths were estimated for artificial tree fires.

According to results of annual consumer surveys by the National Christmas Tree Association, purchases of real trees outnumbered purchases of artificial trees by 1.9-to-3.3 in 2008-2015.[5] However, most artificial trees are used for more than one year. A 2015 Nielsen survey commissioned by the American Christmas Tree Association found that 99 million American housholds (77%) said they would have a Christmas tree in their home. Nineteen pecent of the trees were real and 81% were artificial. Five percent of households planned to have both real and artificial trees on display while eleven percent of the households with artificial trees planned to display more than one artificial tree.[6] This implies a considerably higher fire risk with natural trees.

Dry natural trees catch fire easily, but trees that have been kept moist do not.
In 1999, the National Institute of Standards and Technology (NIST) conducted tests to measure the heat release of Scotch Pine Christmas trees. Seven trees had been allowed to dry out for three weeks, while the eighth had been cut fresh and kept in a bucket of water. The first seven trees had dry needles that were slightly brown and brittle and fell when a branch was shaken. The eighth tree had greener pliable needles that did not separate from the tree as easily. An electric match easily ignited the first seven trees, but the electric match did not ignite the eighth tree that had been kept moist.[7]

White, DeMars, and Bishop also explored the flammability of Christmas trees.[8] They cited a 1963 Canada Department of Forestry Study by C. E. Van Wagner that found that matches

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5 National Christmas Tree Association, "Consumer Survey Results," Accessed on November 7, 2016.

6 American Christmas Tree Association, "Christmas Trees Are the Centerpiece of American Family Holiday Celebrations" December 1, 2015. Accessed on November 7, 2016.

7 D.W. Stroup, L. DeLauter, J. Lee and G. Roadarmel. *Scotch Pine Christmas Tree Fire Tests: Report of Test FR 4010*, Gaithersburg, MD. U.S. Department of Commerce, National Institute of Standards and Technology, Building and Fire Research Laboratory, December 1,1999. Accessed on November 7, 2016.

8 Robert H. White, Donald DeMars, and Mark Bishop. "Flammability of Christmas Trees and Other Vegetation," *Proceedings of the International Conference on Fire Safety*, Volume 24, 1997, Accessed on November 7, 2016.

could not ignite Christmas trees that had been continuously standing in water. However, if a tree had dried to below the moisture recovery limit, it continued to dry out even if again placed in water.

The same study found that a burning ring around the base of the tree could ignite the crown of any of the trees. They tested trees with four different types of initial conditioning:

- immediately placed in water,
- bundled,
- laid in a pile without bundling, and
- bundled but left in storage.

Different types of trees were cut according to industry practices for that type. In three conditions, the tree was stored in an apartment. In the fourth, the trees were kept in a garage. In final conditioning for all four, the bottom of each tree was trimmed and the tree was placed in water.

Tests were done with four ignition sources: a match, a lighter, a sustained electric arc, and an overheated wire. In most cases, no ignition occurred. In a few, some needles ignited, but the fire was self-extinguished after the heat source was removed.

The authors concluded: "If proper procedures of cutting the stem and keeping it in plain water are followed by the consumer, our MN data support the position that the moisture content of the tree will likely be sufficient to make accidental ignition of the tree itself from matches, lighter, electric arc, or overheated wire very unlikely."

The authors also noted that the U.S. Department of Agriculture (USDA) Forest Products Library (FPL) no longer encourages the use of fire-retardant coatings with Christmas trees and instead stresses the importance of trimming the stem and keeping the tree in water.

NFPA's Winter holiday safety tips provides tips specifically about Christmas tree safety, holiday decorating and other holiday activities.

Table 1.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Year

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions)		Direct Property Damage (in Millions (in 2014 Dollars)
1980	850		80		$11.1		$32.0
1981	750		72		$7.0		$18.2
1982	600		56		$7.9		$19.4
1983	590		66		$9.8		$23.3
1984	520		64		$10.9		$24.8
1985	580		72		$13.3		$29.2
1986	460		70		$9.2		$19.9
1987	550		67		$11.2		$23.4
1988	540		125		$10.4		$20.8
1989	520		102		$14.1		$27.0
1990	550		109		$19.4		$35.2
1991	500		139		$18.0		$31.3
1992	410		93		$20.9		$35.3
1993	550		119		$33.4		$54.8
1994	410		125		$11.4		$18.2
1995	430		63		$19.1		$29.7
1996	430		64		$13.2		$20.0
1997	360		24		$10.3		$15.2
1998	270		11		$8.0		$11.6
1999	*380*	*(380)*	*58*	*(58)*	*$26.9*	*($26.9)*	*$38.2*
2000	*380*	*(380)*	*55*	*(55)*	*$36.8*	*($36.8)*	*$50.7*
2001	*290*	*(290)*	*0*	*(0)*	*$20.5*	*($20.5)*	*$27.4*
2002	270	(270)	15	(15)	$15.3	($15.3)	$20.2
2003	210	(210)	31	(31)	$10.4	($10.4)	$13.4
2004	270	(180)	16	(16)	$15.9	($15.9)	$20.0
2005	230	(210)	42	(42)	$12.0	($12.0)	$14.6
2006	260	(150)	10	(10)	$14.1	($14.1)	$16.6
2007	280	(200)	33	(33)	$15.0	($15.0)	$17.1
2008	240	(150)	18	(18)	$25.2	($25.2)	$27.8
2009	190	(170)	30	(30)	$17.6	($17.6)	$19.4
2010	210	(160)	15	(15)	$14.4	($14.4)	$15.7
2011	250	(160)	13	(13)	$18.7	($18.7)	$19.7
2012	220	(190)	25	(25)	$22.7	($22.7)	$23.5
2013	180	(120)	14	(14)	$14.4	($14.4)	$14.6
2014	170	(130)	16	(16)	$10.4	($10.4)	$10.4

Note: Estimates for 1999-2014 are based on data collected originally in NFIRS 5.0 only. The 1999-2014 estimates shown without parentheses are sums of the non-confined (shown in parentheses) and the confined fire (not shown) estimates. Confined fires are reported as confined to cooking vessel, chimney or flue, boiler or burner, incinerator, compactor, or trash. No injuries and very minimal property damage resulted from these confined fires. Due to the smaller share of NFIRS data collected in 1999-2001, statistics for these years should be viewed with caution.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2014) and from NFPA fire department experience survey. Inflation adjustments were based on the consumer price index purchasing power of the dollar.

Table 2.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Extent of Flame Damage
2010-2014 Annual Averages

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fire identified by incident type	50	(26%)	0	(0%)	0	(0%)	$0.0	(0%)
Confined to object of origin	20	(9%)	0	(0%)	0	(0%)	$0.2	(1%)
Confined to room of origin	60	(28%)	0	(0%)	8	(48%)	$3.0	(19%)
Confined to floor of origin	20	(7%)	0	(0%)	1	(3%)	$1.1	(7%)
Confined to building of origin	50	(25%)	5	(86%)	6	(36%)	$10.2	(63%)
Extended beyond building of origin	10	(4%)	1	(14%)	2	(13%)	$1.7	(11%)
Total	210	(100%)	6	(100%)	16	(100%)	$16.2	(100%)

Note: Sums may not equal totals due to rounding errors.

Source: NFIRS 5.0 and NFPA fire department experience survey.

Table 3.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Factor Contributing to Ignition
2010-2014 Annual Averages

Factor Contributing	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Heat source too close to combustibles	50	(26%)	5	(80%)	9	(53%)	$7.3	(45%)
Non-confined	50	(23%)	5	(80%)	9	(53%)	$7.3	(45%)
Confined	10	(3%)	0	(0%)	0	(0%)	$0.0	(0%)
Electrical failure or malfunction	50	(26%)	1	(19%)	4	(23%)	$7.1	(44%)
Non-confined	50	(26%)	1	(19%)	4	(23%)	$7.1	(44%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified misuse of material or product	20	(11%)	0	(0%)	0	(0%)	$0.1	(1%)
Non-confined	10	(5%)	0	(0%)	0	(0%)	$0.1	(1%)
Confined	10	(7%)	0	(0%)	0	(0%)	$0.0	(0%)
Playing with heat source	20	(10%)	0	(0%)	4	(23%)	$0.5	(3%)
Non-confined	10	(7%)	0	(0%)	4	(23%)	$0.5	(3%)
Confined	10	(3%)	0	(0%)	0	(0%)	$0.0	(0%)
Outside or open fire for debris or waste disposal	20	(10%)	0	(0%)	0	(0%)	$0.0	(0%)
Non-confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Confined	20	(10%)	0	(0%)	0	(0%)	$0.0	(0%)
Abandoned or discarded material or product	20	(9%)	0	(0%)	0	(0%)	$0.2	(1%)
Non-confined	10	(4%)	0	(0%)	0	(0%)	$0.2	(1%)
Confined	10	(5%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified factor contributed to ignition	10	(6%)	0	(0%)	0	(0%)	$0.5	(3%)
Non-confined	10	(5%)	0	(0%)	0	(0%)	$0.5	(3%)
Confined	0	(1%)	0	(0%)	0	(0%)	$0.0	(0%)
Other known factor contributing to ignition	30	(15%)	0	(0%)	0	(0%)	$3.4	(21%)
Non-confined	30	(12%)	0	(0%)	0	(0%)	$3.4	(21%)
Confined	10	(3%)	0	(0%)	0	(0%)	$0.0	(0%)
Total fires	210	(100%)	6	(100%)	16	(100%)	$16.2	(100%)
Non-confined	150	(74%)	6	(100%)	16	(100%)	$16.2	(100%)
Confined	50	(26%)	0	(0%)	0	(0%)	$0.0	(0%)
Total factors	230	(113%)	6	(100%)	16	(100%)	$19.1	(118%)
Non-confined	170	(81%)	6	(100%)	16	(100%)	$19.1	(118%)
Confined	70	(31%)	0	(0%)	0	(0%)	$0.0	(0%)

Table 3.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Factor Contributing to Ignition
2010-2014 Annual Averages (Continued)

Note: Multiple entries are allowed which can result in sums higher than totals. Rounding errors may also occur. Fires in which the factor contributing to ignition was coded as "none," unknown, or not reported have been allocated proportionally among fires with known factor contributing to ignition. Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). See Appendix A for details.

Source: NFIRS 5.0 and NFPA fire department experience survey.

Table 4.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Cause of Ignition
2010-2014 Annual Averages

Cause of Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Unintentional	120	(59%)	3	(44%)	14	(85%)	$11.1	(68%)
Non-confined	110	(51%)	3	(44%)	14	(85%)	$11.0	(68%)
Confined	20	(8%)	0	(0%)	0	(0%)	$0.0	(0%)
Intentional	50	(23%)	0	(0%)	1	(4%)	$0.4	(3%)
Non-confined	10	(7%)	0	(0%)	1	(4%)	$0.4	(3%)
Confined	30	(16%)	0	(0%)	0	(0%)	$0.0	(0%)
Failure of equipment or heat source	30	(14%)	1	(14%)	2	(11%)	$4.5	(28%)
Non-confined	30	(14%)	1	(14%)	2	(11%)	$4.5	(28%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Act of nature	10	(3%)	0	(0%)	0	(0%)	$0.1	(1%)
Non-confined	0	(1%)	0	(0%)	0	(0%)	$0.1	(1%)
Confined	0	(2%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified cause of ignition	0	(1%)	3	(42%)	0	(0%)	$0.1	(1%)
Non-confined	0	(1%)	3	(42%)	0	(0%)	$0.1	(1%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Total	210	(100%)	6	(100%)	16	(100%)	$16.2	(100%)
Non-confined	150	(74%)	6	(100%)	16	(100%)	$16.2	(100%)
Confined	50	(26%)	0	(0%)	0	(0%)	$0.0	(0%)

Note: Sums may not equal totals due to rounding errors. Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). See Appendix A for details.

Source: NFIRS 5.0 and NFPA fire department experience survey.

Table 5.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Equipment Involved in Ignition
2010-2014 Annual Averages

Equipment Involved	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Electrical distribution and lighting equipment	**70**	**(35%)**	**3**	**(47%)**	**7**	**(42%)**	**$9.9**	**(61%)**
Decorative lights	40	(18%)	3	(47%)	5	(28%)	$3.7	(23%)
Wiring and related equipment	20	(11%)	0	(0%)	2	(15%)	$5.2	(32%)
Cord or plug	10	(4%)	0	(0%)	0	(0%)	$0.7	(5%)
Unclassified lamp or lighting	10	(2%)	0	(0%)	0	(0%)	$0.3	(2%)
No equipment involved in ignition	**50**	**(23%)**	**0**	**(0%)**	**2**	**(15%)**	**$4.2**	**(26%)**
Contained trash or rubbish fire	**40**	**(18%)**	**0**	**(0%)**	**0**	**(0%)**	**$0.0**	**(0%)**
Heating equipment	**30**	**(15%)**	**3**	**(53%)**	**0**	**(0%)**	**$1.2**	**(7%)**
Fireplace or chimney, including confined chimney or flue fires	20	(8%)	0	(0%)	0	(0%)	$0.0	(0%)
Central heat	10	(3%)	0	(0%)	0	(0%)	$0.7	(4%)
Fixed or portable space heater	10	(3%)	3	(53%)	0	(0%)	$0.3	(2%)
Cooking equipment	**10**	**(3%)**	**0**	**(0%)**	**2**	**(14%)**	**$0.4**	**(2%)**
Other known equipment involved in ignition	**10**	**(7%)**	**0**	**(0%)**	**5**	**(29%)**	**$0.4**	**(2%)**
Total	**210**	**(100%)**	**6**	**(100%)**	**16**	**(100%)**	**$16.2**	**(100%)**

*The estimates for equipment involved in ignition did not break out the confined fires further.

Note: Non-confined fires in which the equipment involved in ignition was unknown or not reported have been allocated proportionally among fires with known equipment involved. 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. Non-confined fires in which the equipment was partially unclassified (i.e., unclassified kitchen or cooking equipment, unclassified heating, cooling or air condition equipment, etc.) were allocated proportionally among fires that grouping (kitchen or cooking equipment; heating, cooling or air conditioning equipment, etc.). Sums may not equal totals due to rounding errors.

Source: NFIRS 5.0 and NFPA fire department experience survey.

Table 6.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Heat Source
2010-2014 Annual Averages

Heat Source	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Arcing	30	(16%)	1	(16%)	3	(17%)	$3.3	(20%)
Non-confined	30	(16%)	1	(16%)	3	(17%)	$3.3	(20%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Match	30	(14%)	0	(0%)	0	(0%)	$0.2	(1%)
Non-confined	0	(2%)	0	(0%)	0	(0%)	$0.2	(1%)
Confined	30	(12%)	0	(0%)	0	(0%)	$0.0	(0%)
Radiated or conducted heat from operating equipment	20	(10%)	2	(35%)	1	(8%)	$2.3	(14%)
Non-confined	20	(10%)	2	(35%)	1	(8%)	$2.3	(14%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Hot ember or ash	20	(9%)	0	(0%)	1	(8%)	$0.6	(4%)
Non-confined	10	(4%)	0	(0%)	1	(8%)	$0.6	(4%)
Confined	10	(5%)	0	(0%)	0	(0%)	$0.0	(0%)
Candle	20	(8%)	3	(48%)	0	(0%)	$3.0	(19%)
Non-confined	20	(8%)	3	(48%)	0	(0%)	$3.0	(19%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified heat from powered equipment	20	(8%)	0	(0%)	0	(0%)	$1.4	(9%)
Non-confined	10	(7%)	0	(0%)	0	(0%)	$1.4	(9%)
Confined	0	(1%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified hot or smoldering object	20	(7%)	0	(0%)	0	(0%)	$1.1	(7%)
Non-confined	10	(5%)	0	(0%)	0	(0%)	$1.1	(7%)
Confined	0	(2%)	0	(0%)	0	(0%)	$0.0	(0%)
Lighter	10	(7%)	0	(0%)	4	(23%)	$0.3	(2%)
Non-confined	10	(5%)	0	(0%)	4	(23%)	$0.3	(2%)
Confined	0	(2%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified heat source	10	(5%)	0	(0%)	1	(9%)	$1.1	(7%)
Non-confined	10	(5%)	0	(0%)	1	(9%)	$1.1	(7%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Lightning	10	(3%)	0	(0%)	0	(0%)	$0.7	(4%)
Non-confined	10	(3%)	0	(0%)	0	(0%)	$0.7	(4%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Flame or torch used for lighting	10	(3%)	0	(0%)	0	(0%)	$0.1	(0%)
Non-confined	0	(0%)	0	(0%)	0	(0%)	$0.1	(0%)
Confined	0	(2%)	0	(0%)	0	(0%)	$0.0	(0%)
Other known heat source	20	(11%)	0	(0%)	6	(35%)	$2.0	(12%)
Non-confined	20	(10%)	0	(0%)	6	(35%)	$2.0	(12%)
Confined	0	(1%)	0	(0%)	0	(0%)	$0.0	(0%)

Table 6.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Heat Source
2010-2014 Annual Averages (Continued)

Heat Source	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Total	210	(100%)	6	(100%)	16	(100%)	$16.2	(100%)
Non-confined	150	(74%)	6	(100%)	16	(100%)	$16.2	(100%)
Confined	50	(26%)	0	(0%)	0	(0%)	$0.0	(0%)

Note: Sums may not equal totals due to rounding errors. The statistics on 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. Confined structure fires (NFIRS incident type 113-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). See Appendix A for details.

Source: NFIRS 5.0 and NFPA fire department experience survey.

Table 7.
U.S. Home Structure Fires
in Which Christmas Trees Were the Item First Ignited, by Area of Origin
2010-2014 Annual Averages

Area of Origin	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Living room, family room or den	80	(38%)	6	(100%)	12	(74%)	$9.9	(61%)
Non-confined	80	(38%)	6	(100%)	12	(74%)	$9.9	(61%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified outside area	20	(9%)	0	(0%)	0	(0%)	$0.0	(0%)
Non-confined	0	(1%)	0	(0%)	0	(0%)	$0.0	(0%)
Confined	20	(8%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassifed function area	10	(7%)	0	(0%)	1	(3%)	$1.0	(6%)
Non-confined	10	(7%)	0	(0%)	1	(3%)	$1.0	(6%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Confined chimney or flue fire*	10	(7%)	0	(0%)	0	(0%)	$0.0	(0%)
Non-confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Confined	10	(7%)	0	(0%)	0	(0%)	$0.0	(0%)
Dining room	10	(4%)	0	(0%)	0	(0%)	$0.4	(2%)
Non-confined	10	(4%)	0	(0%)	0	(0%)	$0.4	(2%)
Confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Unclassified area of origin	10	(3%)	0	(0%)	0	(0%)	$0.1	(1%)
Non-confined	0	(2%)	0	(0%)	0	(0%)	$0.1	(1%)
Confined	0	(2%)	0	(0%)	0	(0%)	$0.0	(0%)
Kitchen or cooking area	10	(3%)	0	(0%)	2	(10%)	$0.4	(3%)
Non-confined	10	(2%)	0	(0%)	2	(10%)	$0.4	(3%)
Confined	0	(1%)	0	(0%)	0	(0%)	$0.0	(0%)
Interior stairway or ramp	10	(3%)	0	(0%)	0	(0%)	$0.0	(0%)
Non-confined	0	(0%)	0	(0%)	0	(0%)	$0.0	(0%)
Confined	10	(2%)	0	(0%)	0	(0%)	$0.0	(0%)
Other known area of origin	40	(17%)	0	(0%)	2	(13%)	$2.6	(16%)
Non-confined	30	(13%)	0	(0%)	2	(13%)	$2.6	(16%)
Confined	10	(4%)	0	(0%)	0	(0%)	$0.0	(0%)
Total	210	(100%)	6	(100%)	16	(100%)	$16.2	(100%)
Non-confined	150	(74%)	6	(100%)	16	(100%)	$16.2	(100%)
Confined	50	(26%)	0	(0%)	0	(0%)	$0.0	(0%)

* Chimney is no longer a valid area of origin for non-confined fires.

Note: Sums may not equal totals due to rounding errors. All fires with the confined chimney or flue incident type (NFIRS incident type 114) are shown separately. Chimney is no longer an area of origin choice for non-confined fires. Other confined structure fires (NFIRS incident type 113, and 115-118) were analyzed separately from non-confined structure fires (incident type 110-129, except 113-118). See Appendix A for details.

Source: NFIRS 5.0 and NFPA fire department experience 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 https://www.nfirs.fema.gov/documentation/design/NFIRS_Paper_Forms_2012.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/osds 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.

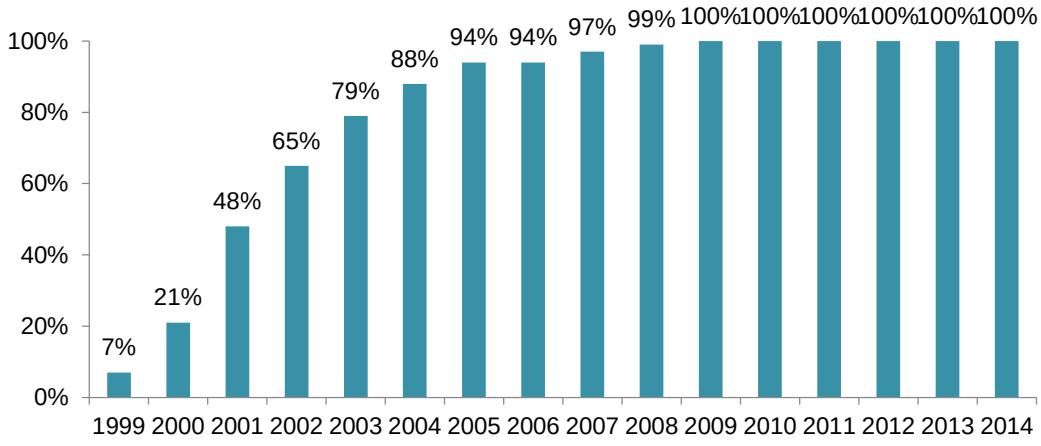
Figure A.1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

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.

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



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.

Because this analysis focused on fatalities only, no distinction was made between confined and non-confined fires.

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.

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.

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

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

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)
Code Grouping	**EII Code**	**NFIRS definitions**
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.
Selected Published Incidents

The following are selected published incidents involving Christmas tree fires. Included are short articles from the "Firewatch" or "Bi-monthly" columns in *NFPA Journal* or it predecessor *Fire Journal* and incidents from either the large-loss fires report or catastrophic fires report.

It is important to remember that this is anecdotal information. Anecdotes show what can happen; they are not a source to learn about what typically occurs.

NFPA's Fire Incident Data Organization (FIDO) identifies significant fires through a clipping service, the Internet and other sources. Additional information is obtained from the fire service and federal and state agencies. FIDO is the source for articles published in the "Firewatch" column of the *NFPA Journal* and many of the articles in this report.

Man dies after reentering burning manufactured home, Colorado

A family of four managed to escape from their burning manufactured home through the back door but could not leave the small fenced yard because the gate was locked. Trying get the key to the gate, the man reentered the house and was just 3 feet (0.9 meters) from the back door when the ceiling collapsed on him. He died as a result of smoke inhalation and burns.

The single-story, steel-frame manufactured home, which was 68 feet (20 meters) long and 14 feet (4 meters) wide, had a battery-operated smoke alarm, but the battery had been removed or disconnected. There were no sprinklers.

The man was awakened by his 43-year-old wife, who had been awakened by the smell of smoke, and the couple managed to get themselves and their 5-year-old son and 10-year-old daughter out of the house. When the ceiling collapsed, the woman tried to break several windows in the rear of the house to help her husband escape, but the added oxygen only caused the fire to burn more intensely. Eventually, she lifted her children over the fence and jumped over it herself.

The fire department received a 911 call at 2:09 p.m., and responding firefighters, who could see the fire's glow and heavy smoke some distance away, called for additional resources. By the time fire crews arrived four and a half minutes later, the entire dwelling was involved in flames, and the fire was threatening four similar units nearby. Using multiple hose lines, they protected the exposures and tried to rescue the trapped man without success.

Investigators determined that a string of Christmas lights on one end of the home short circuited and arced earlier in the day, overloading the single outlet into which they were plugged. The family left the lights on when they went to bed, and the overloaded wiring eventually ignited exposed paneling.

The five manufactured homes sustained combined structural losses of $73,000 and combined damage to their contents estimated at $100,000. This included the complete destruction of the home of origin. The woman suffered burn and smoke inhalation injuries, and two firefighters were injured when they slipped on ice.

Kenneth J. Tremblay, 2013,"Firewatch," *NFPA Journal*, January/February, 18.

Two-year-old dies in house fire, North Carolina
An 83-year-old great-grandmother saved two children from a fire in a single-family home but was burned when she tried to rescue a third child, who died in the blaze.

A single-story, wood-frame house, which was 30 feet (9 meters) long and 40 feet (12 meters) wide, had smoke alarms, but investigators could not determine if they operated. There were no sprinklers.

The fire started in the living room, which contained a Christmas tree, presents, and a kerosene heater, as well as two 5-gallon (18-liter) containers of fuel. Investigators could not determine how the fire started but noted that the fuel allowed it to spread rapidly.

The value of the home and contents was not reported. The two-year-old boy died of smoke inhalation.

Kenneth J. Tremblay, 2013,"Firewatch," *NFPA Journal*, March/April, 22-23.

House fire kills four, Pennsylvania
An early-morning fire that started in the first-floor living room of a single-family home killed four and injured three others who jumped from upper floors while trying to escape. Five firefighters were also injured.

The three-story house, which had an asphalt shingle roof and brick walls, was 49 feet (15 meters) long and 20 feet (6 meters) wide. Smoke alarms were installed in the basement, on the second floor, and in the attic, but the occupants did not hear them and they appear not to have sounded during the fire. There were no sprinklers.

An occupant discovered the fire and called to report it at 2:54 a.m. A 1-year-old boy, a 12-year-old girl, a 38-year-old woman, and a 40-year-old man died when they failed to escape from the burning house, though the report does not say where they were found. A 14-year-old girl and a 16-year-old girl were injured when they jumped from a second-floor window, as was an 18-year-old girl who jumped from a third-floor window.

Investigators believe that the fire began when an electrical fault ignited combustibles, including an artificial Christmas tree and a sofa.

The home and its contents, valued at $95,000, were nearly destroyed.

Kenneth J. Tremblay, 2009, "Firewatch", *NFPA Journal*, January/February, 23.

Christmas tree fire kills one, Illinois
A fire that started in a natural Christmas tree quickly spread throughout a two-story, single-family home before firefighters arrived, killing a 14-year-old boy.

The wood-frame house, which was 44 feet (13 meters) long and 24 feet (7 meters) wide, was constructed of balloon-type framing with an asphalt roof. It had a battery-operated smoke alarm, which operated, but its location was not reported. There were no sprinklers.

The fire began when ornamental lights on the Christmas tree in the first-floor living room failed and ignited the tree. The blaze spread to wall coverings and a couch.

The boy discovered the fire and woke his aunt as a smoke alarm began to operate. Both of them made it to the first floor, but investigators believe the boy stayed in the house or ran back into it in search of two cats.

Once outside the house, the aunt tried to call 911 on her cell phone, but discovered that the battery was dead. Heavy smoke prevented her from going back inside the home to search for her nephew, so she flagged down a car, which took her to a neighbor's house where she called the fire department. She and the neighbor then returned to the house and broke a first-floor window in an attempt to release some of the smoke and find her nephew. Unfortunately, this action only intensified the fire.

Arriving firefighters, who found the home nearly engulfed in flames, were told that the boy was missing. After they knocked down the heavy fire, they found him in a bathroom not far from his room. He had died of smoke inhalation.

The home, valued at $40,000, and its contents, valued at $5,000, were completely destroyed.

Kenneth J. Tremblay, 2008, "Firewatch," *NFPA Journal*, March/April, 24-25.

Overloaded extension cord ignites Christmas tree, Tennessee

A fire investigators believe was started by an electrical extension cord killed a family of four and destroyed their single-family home.

The single-story, wood-frame house had an asphalt-covered roof and encompassed approximately 1,100 square feet (335 square meters) of living space. The three-bedroom house had neither smoke alarms nor sprinklers.

A passerby called 911 at 11:27 p.m. to report the fire, and firefighters arrived eight minutes later to find the blaze spreading in all directions from the middle of the house. Firefighters entering through two doors and a front window found all four victims in their bedrooms and took them outside for emergency medical treatment.

Investigators determined that the fire started in the dining room near a window where the Christmas tree was located and spread up the wall and across the ceiling, filling the house with heat and smoke.

The four victims, a 39-year-old man, his 40-year-old wife, their 10-year-old son, and their 17-year-old daughter, died of smoke inhalation. The house and its contents were destroyed.

Kenneth J. Tremblay, 2006, "Firewatch," *NFPA Journal*, November/December, 20.

Electrical fire in Christmas tree kills three, Virginia
Three people died when a fire in a live Christmas tree quickly spread to other combustibles in their single-family home. A fire a month earlier had damaged the smoke alarm on the floor of origin, and it had never been replaced. The ranch-style, wood-frame house measured 24 feet (7 meters) by 24 feet (7 meters) with a full basement. The first-floor smoke alarm had been disconnected, but there was a working smoke alarm in the basement. There were no sprinklers.

At the time of the fire, a family of four lived in the basement, and another family of four lived on the first floor where a single person also rented a room. The earlier fire had displaced the two children who lived on the first floor from their bedroom, forcing the daughter to sleep on the floor of her parents' room and the son to sleep in the living room.

Shortly after 2 a.m., the son awoke to find a fire in the living room and alerted his parents. The father broke a window in the bedroom and forced his wife out, but he and the two children remained in the house. The renter on the first floor also awoke to find flames burning through the top of her bedroom door. She escaped through the sliding glass door in her room and met another occupant who was going to a neighbor's house to call 911. It wasn't reported how the tenants in the basement apartment were alerted, but witnesses saw them escape through windows.

The fire department received the 911 call at 2:24 a.m. and arrived to find the house in flames. The officer checking all four sides of the building found fire shooting from the double-glass door of the dining room and ordered his crew to position a 1-3/4-inch hose line at the front door. Firefighters forced entry and searched for the trapped civilians. By this time, flames had ignited nearly everything in the front rooms, and the crew discovered the bodies, two in one bedroom and the third in a second.

Investigators discovered that the holiday lights on the Christmas tree had been left operating. They were connected to two extension cords, and it appears that resistance heating on the lights ignited the tree, which was quickly consumed. Flames ignited contents of the living room and spread down the hallway, trapping the victims.

The house, valued at $225,000, suffered an estimated fire loss of $60,000, and its contents, valued at $50,000, suffered a $40,000 loss. The 48-year-old father, his 25-year-old son, and his 14-year-old daughter all died.

Kenneth J. Tremblay, 2004, "Firewatch," *NFPA Journal*, November/December, 16-17.

Heat from fireplace ignites Christmas gifts in fatal fire, California
Three of the five people in a two-family house died of smoke inhalation when embers or flames from the fireplace in one apartment ignited the contents of the living room. Investigators believe a hard-wired smoke alarm in the apartment was removed from its mounting prior to the fire, contributing to the deaths.

The two-story, wood-framed structure, which covered 900 square feet (83.6 square meters), was unsprinklered; the smoke alarms, installed in the hallways leading to the bedrooms, had no battery backup.

On the night of the fire, four children, ages 11, 9, 5, and 3, were at home with their 60-year-old grandmother. During the evening, the 9-year-old boy started a fire in the living room fireplace without supervision. He and the others then went to bed, only to awaken around 2:30 a.m. to find the apartment filled with fire and smoke.

Investigators determined that embers or flames from the fireplace ignited nearby combustibles, which included holiday gifts and a Christmas tree. The tree, only a foot or two (30 to 60 centimeters) from the fireplace, was a significant source of fuel for the fire, which spread to other combustibles in the room.

The 9-year-old and his 11-year-old sibling escaped the blaze, but neither called 911 to report the fire. Their grandmother, 5-year-old sister, and 3-year-old brother died in the blaze.
Damage to the house, valued at $500,000, was estimated at $200,000. Damage to its contents, valued at $50,000, was estimated at $10,000.

Kenneth J. Tremblay, 2003, "Firewatch," *NFPA Journal*, November/December, 14.

Christmas tree fire kills three, Oklahoma
A mother and her two young sons were removing a dry Christmas tree from their wood-framed house when the tree ignited, blocking the door. Security bars and storage against another door and windows prevented them from escaping as fire heavily damaged the home.

The two-story, single-family home had a ground-floor area of approximately 1,500 square feet (139 square meters). Its exterior walls were covered with brick veneer, and the roof had asphalt shingles. There were working battery-operated smoke alarms on each floor, but no sprinklers.

The three were dragging the tree out of the house when it touched a gas-fired heater and caught fire. The mother, who was already outside, ran back into the house to rescue her two boys, ages 9 and 10, but the fire blocked their escape route. They were unable to open the other door because stored items were piled in front of it, and security bars with no quick-release lever covered the windows.

All three victims died of smoke inhalation. The house, valued at $75,000, and its contents, valued at $25,000, were near-total losses.

Kenneth J. Tremblay, 2003, "Firewatch," *NFPA Journal*, January/February, 16.

Seven killed by Christmas tree fire, Ohio
Seven people, including two children under six years of age, were killed by a fire in a two-and-a-half story single-family house that was reported at 4:06 a.m. on a December morning The fire began when a Christmas tree either fell over or was unintentionally knocked over onto a lit candle. The home was built with unprotected wood-frame construction.

There was a delay in notifying the fire department while the family members arriving home attempted to extinguish the fire. Due to heavy fire and high heat conditions, firefighters were driven back in their rescue attempts.

Adapted from Stephen G. Badger's 2004 article, "Catastrophic Multiple-Death Fires 2003," *NFPA Journal*, September/October, 68.