

**SELECTIONS FROM
HOME FIRES INVOLVING COOKING EQUIPMENT
MICROWAVE OVENS**

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Abstract

During 2003-2006, U.S. fire departments responded to an estimated average of 150,200 home structure fires involving cooking equipment per year. These fires caused an annual average of 500 civilian deaths, 4,660 civilian injuries, and \$756 million in direct property damage.

Ranges, with or without ovens, account for the majority (59%) of total reported home structure fires involving cooking equipment and even larger shares of associated civilian deaths (88%) and civilian injuries (77%). Unattended equipment is the leading cause of cooking fires.

Keywords: Range, stove, oven, microwave, toaster, grill, frying, fryer, fire statistics, home fires, residential fires

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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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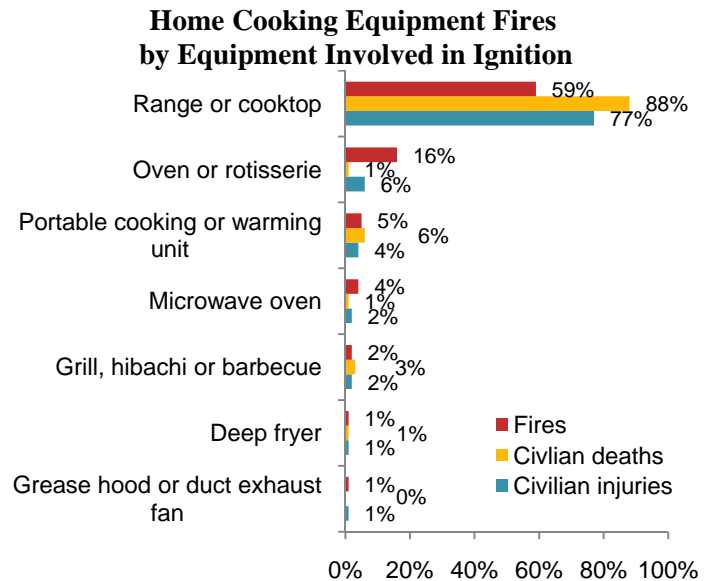


Home Fires Involving Cooking Equipment

Cooking equipment is the leading cause of home structure fires and associated civilian injuries and the third leading cause of home fire deaths.

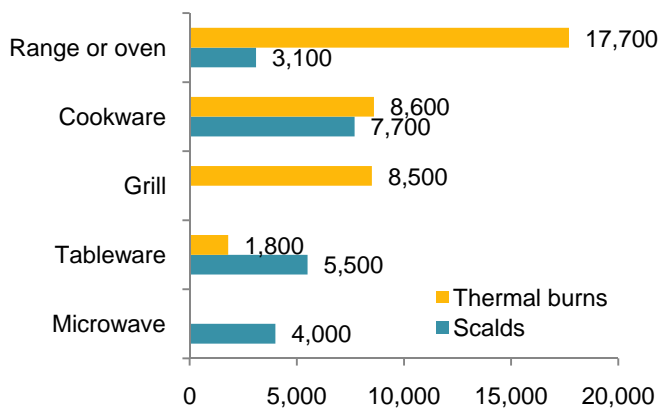
During the four-year period of 2003-2006:

- U.S. fire departments responded to an average of **150,200** home¹ structure fires that involved cooking equipment per year. These fires caused an average of 500 civilian fire deaths, 4,660 civilian fire injuries, and \$756 million in direct property damage.
- Cooking equipment was involved in 40% of all reported home fires, 17% of home fire deaths, 36% of home civilian injuries, and 12% of the direct property damage resulting from home fires.
- Unattended cooking was by far the leading contributing factor in these fires. Something that could catch fire was too close to the equipment ranked second and unintentionally turned on or not turned off ranked third.
- Ranges accounted for the largest share (59%) of home cooking fire incidents. Ovens accounted for 16%.
- Three-fifths (57%) of reported home cooking fire injuries occurred when victims tried to fight the fire themselves.



- Households that use electric ranges have a higher risk of fires and associated losses than those using gas ranges.
- In a 1999 study of range fires by the U.S. Consumer Product Safety Commission, 83% of frying fires began in the first 15 minutes of cooking.

2008 Emergency Room Visits for Burns Associated with Cooking and Related Equipment



Most burns associated with cooking equipment, cookware, and tableware were not caused by fire or flame.

In 2008, ranges or ovens were involved in an estimated 17,700 thermal burn injuries seen in U.S. hospital emergency rooms.¹

- 92% resulted from contact with the hot equipment or some other non-fire source.

Children under five accounted for 52% of the tableware scalds.

¹ Data from the Consumer Product Safety Commission's National Electronic Injury Surveillance System, queried in August 2009.

Microwave Ovens

Microwave ovens were involved in 4% of reported home cooking equipment fires.

During 2003-2006, U.S. fire departments responded to an average of 6,600 home structure fires per year in which a microwave oven was involved in ignition. These fires caused an annual average of three civilian deaths, 110 civilian injuries, and \$22 million in direct property damage. These incidents accounted for 4% of the reported home fires involving cooking equipment, 1% of the associated civilian deaths, 2% of the civilian injuries, and 3% of the direct property damage from cooking equipment fires.

Fifty-six percent of the microwaves were stationary and 44% were portable. Nearly all (96%) of 2003-2006 non-confined home structure fires involving microwave ovens began in the kitchen.

Data Sources, Definitions and Conventions Used in this Report

The fire 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 national 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 NFPA's annual fire department experience survey. Fires are rounded to the nearest hundred, civilian deaths to the nearest one, civilian injuries to the nearest ten, and direct property damage is rounded to the nearest million dollars. 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 unless so indicated.

NFIRS 5.0 equipment involved in ignition code 644 captures fires involving microwave ovens. NFIRS 5.0 incident type codes in the range of 110-129 were used to identify structure fires. Unknown data were allocated proportionally in most fields analyzed except for incident type. NFIRS 5.0, first introduced in 1999, brought major changes to fire incident data, including the code that specifically identifies microwave ovens. The

estimates reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as kitchen or cooking equipment of undetermined type. Fires reported as "no equipment" but lacking a confirming specific heat source (codes 40-99) are also treated as unknown equipment and allocated.

Certain types of fires collectively referred to as "confined fires," including confined cooking fires, chimney fires, trash fires, and fuel burner or boiler fires (incident types 113-118) can be documented more easily in NFIRS 5.0. Causal data, including equipment involved in ignition, is generally not required for these incidents although it is provided in some cases. Equipment involved in ignition was reported in 22% of the non-confined fires and 4% of the confined fires. Confined and non-confined structure fires were analyzed separately and then summed to obtain estimates of all fires involving ranges. Detailed analyses on causal factors were done of non-confined fires only. Additional details on the methodology used may be found in Appendix A.

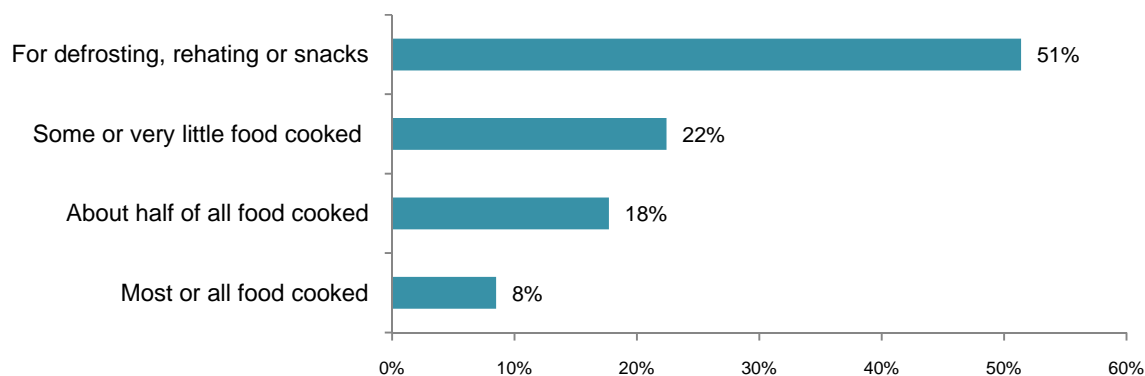
Microwave ovens have only been identified in NFIRS since 1999, and the level of participation in NFIRS has only been sufficient to produce reasonably stable estimates since 2002. Table 5-1 shows that home structure fires involving microwave ovens hit their highest point in 2006 with 7,800 fires, as did direct property damage from these fires with a new peak of \$27 million. The estimated number of civilian injuries tied the previous high in 2004 with 130 reported non-fatal injuries. Because of the very small numbers, estimates of deaths by year are unreliable.

These fires divide as about 4-to-1 confined fires to non-confined fires. This compares to a roughly 2 to-1 ratio for ranges and portable cooking or warming devices, and a ratio of 7-to-1 for ovens or rotisseries, which most closely resemble microwave ovens in providing a complete enclosure in which fire can be effectively contained.

98 million households use a microwave oven.

The Energy Information Administration's *2005 Residential Energy Survey* found that microwave ovens were used in 98 million housing units, or 88% of all households.³⁴ Respondents were asked to select the description that best described how much of their food was cooked in the microwave.³⁵ Figure 5.1 shows that roughly half (51%) of the households that used microwave ovens used them only for defrosting, reheating or snacks; 22% cooked some or a little of their food in microwaves; 18% used microwaves for almost half of their cooked food; and 8% used microwaves for most or all of their cooking.

Figure 5.1. Amount of Food Cooked in Microwave Ovens by Households that Use Them According to DOE's 2005 Residential Energy Survey



Electrical failure or malfunction was a factor in two-fifths of the non-confined home fires involving microwave ovens.

During 2003-2006, an electrical failure or malfunction was a factor contributing to ignition in 41% of reported non-confined home structure fires involving microwave ovens. In 14% of the

³⁴ Energy Information Administration. *2005 Residential Energy Consumption Survey*, Table HC2.10, "Home Appliance Usage Indicators by Type of Housing Unit", accessed at http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/hc10homeapplianceindicators/pdf/alltables.pdf on October 23, 2009.

³⁵ Energy Information Administration. "2005 Residential Energy Consumption Survey Form EIA-457A (2005) Household Questionnaire, Question B-5a, accessed at http://www.eia.doe.gov/emeu/recs/recs2005/hc2005_tables/2005recshouseholdquex.pdf on October 23, 2009.

fires, the equipment was unattended. An unclassified mechanical failure or malfunction contributed to 12% of the incidents. (See Table 5.2.)

Almost one-third of the non-confined microwave oven fires began with the appliance housing or casing.

Table 5.3 shows that in 31% of the non-confined home structure fires involving microwave ovens, an appliance housing or casing was the item first ignited. Cooking materials, including food, were first ignited in 21%. Electrical wire or cable insulation was first ignited in 14% while 7% started with the ignition of cabinetry.

Flame damage was limited to the room of fire origin in 98% of reported microwave oven fires.

Table 5.4 shows that four of every five (80%) home structure fires involving microwave ovens reported in 2003-2006 were coded with an incident type that indicated the fire was confined to the vessel or object or origin. In an additional 7%, fire spread was coded as confined to the object of origin fires. Flame damage spread beyond the room of origin in 2% of these fires.

CPSC estimates U.S. homes have an average of 332,000 unreported microwave fires per year.

Based on their 2004-2005 survey, the Consumer Product Safety Commission estimates that U.S. homes experienced an annual average of 332,000 fires involving microwave ovens to which the fire department did not respond.³⁶

Microwave ovens were involved in more electrocution deaths than all other types of cooking equipment combined.

In 1995-2002 excluding 1999 (when there was no report), microwave ovens were involved in an average of seven electrocution deaths a year.³⁷ All other cooking devices combined averaged two a year in the same period. In recent years, electrocution death statistics for microwave ovens have been combined with those for other appliances, which prevent updating of the statistics. A special study by the CPSC found that four electrocution deaths per year, or about half the total, involved victims who were trying to repair their own microwave ovens.³⁸

Nearly half of microwave oven-related emergency room visits were for scald burns.

The CPSC's National Electronic Injury Surveillance System (NEISS) estimates that 8,500 people visited hospital emergency rooms because of microwave-oven related injuries during 2008.³⁹ Forty-seven percent (4,000) of these injuries were scald burns. Eleven percent of the scald burns and 5% of all microwave oven related injuries were scald burns incurred by children under five years of age. In some cases, the children were taking food or liquids out of the microwave oven

³⁶ Michael A. Greene and Craig Andres. *2004-2005 National Sample Survey of Unreported Residential Fires*. U.S. Consumer Product Safety Commission, July 2009, p. 127.

³⁷ Risana T. Chowdhury, 2003 Electrocutions Associated With Consumer Products, U.S. Consumer Product Safety Commission, December 2006, <http://www.cpsc.gov>, Table 2, and earlier reports in series.

³⁸ Consumer Product Safety Commission, *Electrocution Hazard with Do-It-Yourself Repairs of Ovens*, CPSC document #5061, undated, accessed at <http://www.cpsc.gov/cpsc/pub/pubs/5061.html>.

³⁹ All statistics are based on National Electronic Injury Surveillance System (NEISS) data obtained from the U.S. Consumer Product Safety Commission (CPSC) website, www.cpsc.gov, accessed in August, 2009.

themselves when it spilled. In others, an older relative or caregiver spilled or splashed the hot food.

Safety tips

Choose the right cooking equipment. Install and use it properly.

- Always use cooking equipment tested and approved by a recognized testing facility.
- Follow manufacturer's instructions and code requirements when installing and operating cooking equipment.
- Plug microwave ovens directly into an outlet. Never use an extension cord for a cooking appliance as it can overload the circuit and cause a fire.

Keep things that can catch fire and heat sources apart.

- Keep anything that can catch fire – potholders, oven mitts, wooden utensils, paper or plastic bags, boxes, food packaging, towels or curtains – away from your microwave oven.
- Keep the microwave oven clean.
- Keep pets off cooking equipment and nearby countertops to prevent them from knocking things over.

Know what to do if your clothes catch fire.

- If your clothes catch fire, stop, drop, and roll. Stop immediately, drop to the ground, and cover face with hands. Roll over and over or back and forth to put out the fire. Immediately cool the burn with *cool* water for 3 to 5 minutes and seek emergency medical treatment.

Know what to do if you have a cooking fire.

- When in doubt, just get out! When you leave, close the door behind you to help contain the fire. Call 911 or the local emergency number after you leave.
- If you do try to fight the fire, be sure others are already getting out and you have a clear path to the exit.
- If you have a fire in your microwave oven, turn it off immediately and keep the door closed. Never open the door until the fire is completely out. Unplug the appliance if you can safely reach the outlet. After a fire, the microwave oven should be checked and/or serviced before being used again.

Install and use microwave ovens safely.

- Place or install the microwave oven at a safe height, within easy reach of all users. The face of the person using the microwave oven should always be higher than the front of the microwave oven door. This is to prevent hot food or liquid from spilling onto a user's face or body from above and to prevent the microwave oven itself from falling onto a user.

- Never use aluminum foil or metal objects in a microwave oven. They can cause a fire and damage the oven.
- Heat food only in containers or dishes that are safe for microwave use.
- Open food containers slowly away from the face to avoid steam burns. Hot steam escaping from the container or food can cause burns.
- Foods heat unevenly in microwave ovens. Stir and test before eating or giving to children.

**Table 5.1. Home Fires Involving Microwave Ovens, by Year
Structure Fires Reported to U.S. Fire Departments**

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions)		
					As Reported	In 2006 Dollars	
1999	4,500	(1,000)	0	(0)	\$4	(\$4)	\$5
2000	3,400	(800)	100	(100)	\$12	(\$11)	\$14
2001	4,200	(1,000)	40	(40)	\$8	(\$7)	\$10
2002	5,600	(1,000)	90	(60)	\$9	(\$8)	\$10
2003	6,300	(1,100)	100	(60)	\$21	(\$20)	\$23
2004	6,200	(1,300)	130	(90)	\$21	(\$20)	\$22
2005	6,300	(1,400)	80	(40)	\$18	(\$17)	\$18
2006	7,800	(1,500)	130	(110)	\$27	(\$26)	\$27

Note: Numbers in parentheses exclude confined fires. Confined fires are fires reported as confined to a cooking vessel and involving cooking equipment; they are analyzed separately. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Because of their small numbers, annual estimates of fire deaths involving this equipment are unreliable and not shown. Inflation adjustment to 2006 dollars is done using the consumer price index. Unknowns have been allocated proportionally.

Source: Version 5.0 (1999-2006) and from NFPA survey.

**Table 5.2. Home Fires Involving Microwave Ovens, by Factor Contributing to Ignition
Annual Average of 2003-2006 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)**

Factor Contributing to Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Electrical failure or malfunction	500	(41%)	0	(0%)	40	(48%)	\$11	(50%)
Equipment unattended	200	(14%)	0	(0%)	10	(11%)	\$2	(7%)
Unclassified mechanical failure or malfunction	200	(12%)	0	(0%)	0	(7%)	\$2	(10%)
Unclassified misuse of material or product	100	(9%)	0	(0%)	20	(21%)	\$1	(6%)
Unintentionally turned on or not turned off	100	(4%)	0	(0%)	0	(0%)	\$1	(4%)
Other known factor*	300	(25%)	3	(100%)	20	(29%)	\$6	(31%)
Total	1,300	(100%)	3	(100%)	80	(100%)	\$21	(100%)
Total entries	1,400	(106%)	3	(100%)	90	(117%)	\$23	(109%)

* "Other known" includes equipment not being operated properly (100% of deaths).

Note: Multiple entries are allowed, resulting in more factor entries than fires. Home cooking fires involving cooking equipment and factor contributing to ignition listed as unknown, unreported, none, or blank have also been allocated proportionally. Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Table 5.3. Home Fires Involving Microwave Ovens, by Item First Ignited
Annual Average of 2003-2006 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Appliance housing or casing	400	(31%)	0	(0%)	20	(25%)	\$6	(29%)
Cooking materials, including food	300	(21%)	0	(0%)	10	(14%)	\$3	(14%)
Electrical wire or cable insulation	200	(14%)	0	(0%)	0	(3%)	\$4	(17%)
Cabinetry	100	(7%)	0	(0%)	10	(12%)	\$2	(11%)
Unclassified item first ignited	100	(5%)	0	(0%)	0	(5%)	\$1	(6%)
Interior wall covering	100	(4%)	0	(0%)	10	(9%)	\$2	(9%)
Other known item*	200	(17%)	3	(100%)	20	(30%)	\$3	(14%)
Total	1,300	(100%)	3	(100%)	80	(100%)	\$21	(100%)

* "Other known" includes unclassified furniture or utensil (100% of deaths).

Note: Sums may not equal totals due to rounding errors. Unknowns have been allocated proportionally.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Table 5.4. Home Fires Involving Microwave Ovens, by Extent of Flame Damage
Annual Average of 2003-2006 Structure Fires Reported by U.S. Fire Departments

Extent of Flame Damage	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Confined fire identified by incident type	5,300	(80%)	0	(0%)	30	(31%)	\$1	(3%)
Confined to object of origin	500	(7%)	0	(0%)	10	(10%)	\$1	(3%)
Confined to room of origin	700	(10%)	3	(100%)	50	(49%)	\$10	(45%)
Confined to floor of origin	0	(1%)	0	(0%)	0	(2%)	\$2	(10%)
Confined to building of origin	100	(1%)	0	(0%)	0	(3%)	\$6	(27%)
Extended beyond building of origin	0	(0%)	0	(0%)	10	(5%)	\$3	(13%)
Total	6,600	(100%)	3	(100%)	110	(100%)	\$22	(100%)

Note: Sums may not equal totals due to rounding errors. Unknowns have been allocated proportionally.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Appendix A. How National Estimates Statistics Are Calculated

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

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/_download/nfirpaperforms2007.pdf.

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; and (3) 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.

Analysts at the NFPA, the USFA and the Consumer Product Safety Commission have developed the specific 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.

Figure 1.

Fires Originally Collected in NFIRS 5.0 by Year

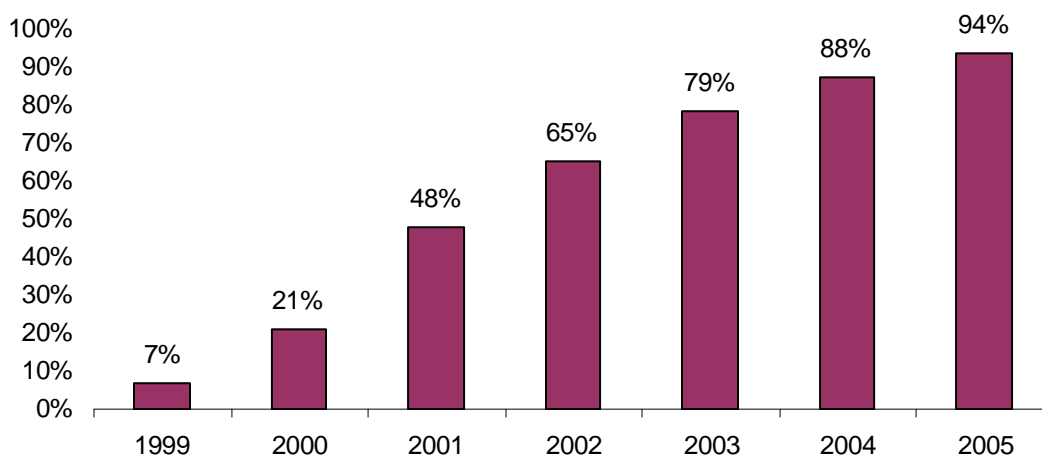


Figure 1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

For 2002 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.

A second option is to omit year estimates for 1999-2001 from year tables.

NFIRS 5.0 has 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. In order for that limited detail to be used to characterize the confined fires, they must be analyzed separately from non-confined fires. Otherwise, the patterns in a factor for the more numerous non-confined fires with factor known will dominate the allocation of the unknown factor fires for both non-confined and confined fires. If the pattern is different for confined fires, which is often the case, that fact will be lost unless analysis is done separately.

For most fields other than Property Use, 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.

For Factor Contributing to Ignition, 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%. Groupings for this field show all category headings and specific factors if they account for a rounded value of at least 1%.

Type of Material First Ignited (TMI). This field is required only if the Item First Ignited falls within the code range of 00-69. NFPA has created a new code “not required” for this field that is applied when Item First Ignited is in code 70-99 (organic materials, including cooking materials and vegetation, and general materials, such as electrical wire, cable insulation, transformers, tires, books, newspaper, dust, rubbish, etc..) and TMI is blank. The ratio for allocation of unknown data is:

$$\frac{\text{(All fires – TMI Not required)}}{\text{(All fires – TMI Not Required – Undetermined – Blank)}}$$

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, fusee,
68. Backfire from internal combustion engine. Excludes flames and sparks from an exhaust system, (11)
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, the 2006 data is not yet available and a large portion of the fires coded as no equipment involved (NNN) have heat sources in the operating equipment category. To compensate, NFPA treats fires in which EII = NNN and heat source is not in the range of 40-99 as an additional unknown.

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

All fires

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

Additional allocations may be used in specific analyses. For example, NFPA’s report about home heating fires treats Equipment Involved in Ignition Code 120, fireplace, chimney, other” as a partial unknown (like Heat Source 60) and allocates it over its related decade of 121-127, which includes codes for fireplaces (121-122) and chimneys (126-127) but also includes codes for fireplace insert or stove, heating stove, and chimney or vent connector. More general analyses of specific occupancies may not perform as many allocations of partial allocations. Notes at the end of each table describe what was allocated.

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. Values that appear identical may be associated with different percentages, and identical percentages may be associated with slightly different values.