

**SELECTIONS FROM
HOME FIRES INVOLVING COOKING EQUIPMENT
OVENS OR ROTISSERIES**

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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

Acknowledgements

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

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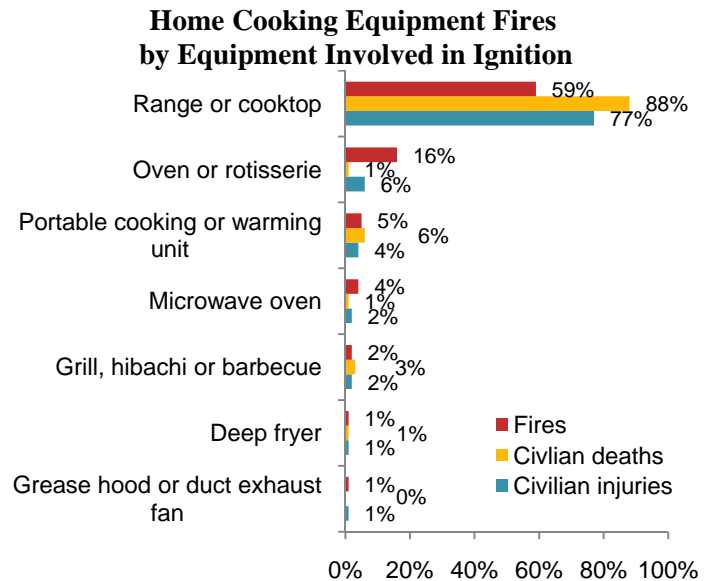


Home Fires Involving Cooking Equipment

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

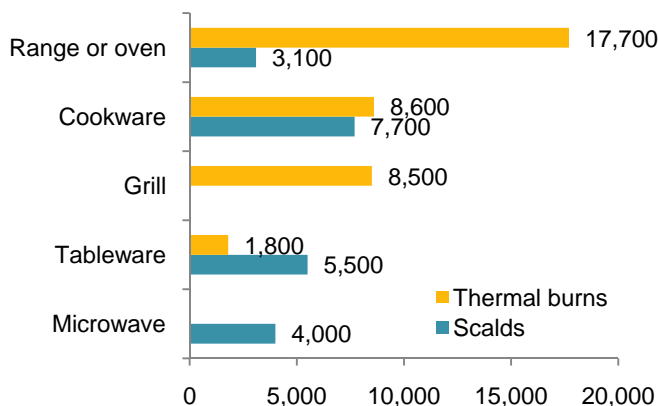
During the four-year period of 2003-2006:

- 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.

Ovens or Rotisseries

Ovens or rotisseries were involved in 16% of reported home cooking equipment fires.

During 2003-2006, U.S. fire departments responded to an average of 23,300 home structure fires per year in which an oven or rotisserie was involved in ignition. These fires caused an annual average of four civilian deaths, 280 civilian injuries, and \$32 million in direct property damage. These incidents accounted for 16% of the reported home fires involving cooking equipment, 1% of the associated civilian deaths, 6% of the associated civilian injuries, and 4% of the direct property damage from cooking equipment fires. Note that fires in ovens that are part of ranges may be coded as range fires. Therefore, these statistics probably understate the oven share of home cooking fires.

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. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths are rounded to the nearest one, civilian injuries are expressed to the nearest ten and property damage is rounded to the nearest million dollars. Property damage has not been adjusted for inflation unless so indicated.

NFIRS 5.0 equipment involved in ignition code 645 identifies ovens or rotisseries. Code 646 captures ranges with or without an oven, so some oven fires may be counted with the ranges. 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 changes in some definitions and coding rules. Because of these

changes, caution should be used when comparing data before 1998 with data from 1999 on.

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.

One-quarter of U.S. households use a conventional oven at least once a day.

The Energy Information Administration reported that in 2005, 28 million U.S. households (25%) used a conventional oven at least once a day. Seventy-two percent of the households used the oven at least once a week.¹

The risk of casualty or loss per 1,000 reported oven fires is lower than from reported cooking equipment fires in general.

During 2003-2006, the death rate per 1,000 reported home fires involving ovens or rotisseries was 0.2, a tiny fraction of the 3.3 deaths per 1,000 overall reported fires involving any type of cooking equipment and of the 5.0 deaths per 1,000 reported range or cooktop fires. The reported civilian injury rate for fires involving ovens or rotisseries was 12 per 1,000 fires, a little more than one-third the overall home cooking equipment fire injury rate of 31 injuries per 1,000 fires, and less than one-third the rate of 40 injuries per 1,000 range or cooktop fires. The \$1,400 average direct property loss in oven or rotisserie fires was roughly one-quarter the average loss in all reported home cooking equipment fires (\$5,000) and in reported home range or cooktop fires (\$5,900).

Households that use electric ovens have a higher risk of fires and associated losses than those using gas ovens.

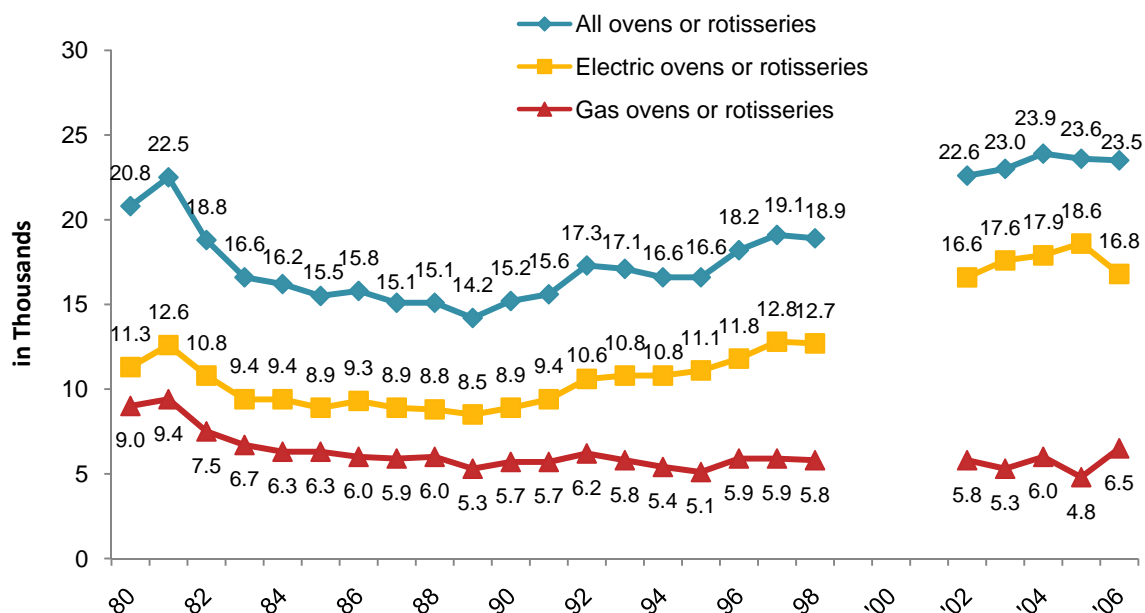
Although 60% of U.S. households used electricity as their primary cooking power source in 2003-2005, in 75% of the oven or rotisserie fires reported in 2003-2006, the equipment involved was powered by electricity. During 2003-2006, electric ovens or rotisseries were involved in an average of 17,600 reported home structure fires per year. These fires caused an annual average of four civilian deaths, 240 reported civilian injuries, and \$26 million in direct property damage. Gas ovens or rotisseries were involved in an average of 5,600 reported home structure fires annually during this period, resulting in an average of 40 civilian injuries, and \$5 million in direct property damage per year. No deaths involving gas-fueled ovens were reported during this time period.

More oven or rotisserie fires were reported in 2006 than in 1980.

Table 3.1 and Figure 3.1 show that the total number of reported fires involving ovens or rotisseries was 13% higher in 2006 than in 1980. Fires involving gas ovens or rotisseries were 27% lower in 2006 while electric range fires were actually up 49% from 1980. (See Tables 3.2 and 3.3.) The percentage of households using electricity as their primary power source for cooking increased from 52% in 1980 to 60% in 2005. Over the same period, the percentage of households using primarily gas for cooking dropped to 40% in 2005 from 47% in 1980.

Because of the changes in data collection rules and definitions that accompanied the introduction of NFIRS 5.0 in 1999, caution must be used in interpreting these findings. NFIRS 5.0 made it much easier to document minor cooking fires.

¹ Energy Information Administration. *2005 Residential Energy Consumption Survey: Preliminary Housing Characteristics Tables*, Table HC2.10 "Home Appliances Usage Indicators by Type of Housing Unit, 2005.

Figure 3.1. Reported Home Structure Fires Involving Ovens or Rotisseries, by Year


Unattended cooking was the leading factor contributing to home fires involving ovens or rotisseries.

During 2003-2006, unattended equipment was a factor contributing to ignition in 23% of reported non-confined home structure fires involving ovens or rotisseries. This is a much smaller share than for ranges, the other primary type of cooking equipment, which probably reflects the fact that the oven is a more complete enclosure and that roasting does not require continuous, uninterrupted attention. Other leading factors were: electrical failures or malfunctions (12% of total fires); heat source too close to combustibles (10% of fires); failure to clean (also 10%); unclassified misuse of material (7%); abandoned or discarded material (6%); improper container or storage (6%); and unintentionally turned on or not turned off (also 6%). (See Tables 3.4, 3.5, and 3.6.)

Unattended equipment was a more common factor in reported non-confined gas oven fires than in electric oven fires (32% vs. 18%). Leaks or breaks were also seen more commonly in gas ovens or rotisseries (7%) than in those powered by electricity (1%). Electrical failures or malfunctions were factors in 17% of the electric oven or rotisserie fires but roughly 1% of the equipment powered by gas.

Cooking materials were first ignited in almost half of the reported oven or rotisserie fires.

Table 3.7 shows that in 2003-2006, cooking materials, include food, were the first items ignited in 45% of the reported non-confined home fires involving ovens or rotisseries. Other leading items first ignited included unclassified items (8%), appliance housings or casings (also 8%), household utensils (7% of fires), and wire or cable insulation (6%). Flammable or combustible gas or liquid or piping ranked higher (12%) for gas-fueled equipment, as might be expected, while electrical wire or cable insulation predictably was first ignited in a larger percentage (8%) of fires involving electric ovens or rotisseries. See Table 3.8 and 3.9 for more details.

A 1998 study of kitchen fires in the Bay-Waikato region of New Zealand noted that in some of the 10% of cooking fires started by ovens in their study, baking products fell or dripped onto the heating element. In some cases, non-food items had been left in the oven.²

Flame damage was limited to the room of fire origin in 99% of reported oven or rotisserie fires.

Table 3.10 shows that 87% of all home fires involving ovens or rotisseries 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 8%, fire spread was coded as confined to the object of origin.

Combined, the 95% of reported fires with confined fire incident types or non-confined fires with flame damage coded as confined to object of origin caused 70% of the injuries associated with oven or rotisserie fires. Flame damage spread beyond the room of origin in only 1% of these fires. Only 9% of the injuries resulted from fires that spread beyond the room of origin.

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 or other cooking appliances directly into an outlet. Never use an extension cord for a cooking appliance as it can overload the circuit and cause a fire.
- For gas-fueled ovens, be sure the oven is installed in accordance with NFPA 54, *National Fuel Gas Code*, which addresses clearances, installation, and maintenance. Read and follow manufacturer's instructions, particularly with regard to installation, maintenance, and operation. Liquefied-petroleum (LP)-gas-fueled ovens with self-contained fuel supplies are prohibited for home use by NFPA codes.
- For electric-powered ovens, be sure the oven is installed in accordance with NFPA's *National Electrical Code*®. Read and follow manufacturer's instructions, particularly with regard to, installation, maintenance, and operation.

Watch what you heat!

- The leading cause of fires in the kitchen is unattended cooking.
- Stay in the kitchen when you are frying, grilling, or broiling food. If you leave the kitchen for even a short period of time, turn off the stove.
- If you are simmering, baking, roasting, or boiling food, check it regularly, remain in the home while food is cooking, and use a timer to remind you that you're cooking.

² Key Research and Marketing, Ltd. *New Zealand Fire Service Bay-Waikato Fire Region Kitchen Fire Research, Summary of Findings*, October 1998.

Stay alert.

- To prevent cooking fires, you have to be alert. You won't be if you are sleepy, have taken medicine or drugs, or consumed alcohol.
- **Use equipment for intended purposes only.**
- Cook only with equipment designed and intended for cooking, and heat your home only with equipment designed and intended for heating. There is additional danger of fire, injury, or death if equipment is used for a purpose for which it was not intended.

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 oven.
- Keep the oven clean.
- Wear short, close fitting or tightly rolled sleeves when cooking. Loose clothing can dangle onto an oven's cooking elements and can catch fire if it comes in contact with a gas flame or electric burner.

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.
- In case of an oven fire, turn off the heat and keep the door closed to prevent flames from burning you or your clothing. After a fire, the oven should be checked and/or serviced before being used again.

**Table 3.1. Home Fires Involving Ovens or Rotisseries, by Year
Structure Fires Reported to U.S. Fire Departments**

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions)		
					As Reported	In 2006 Dollars	
1980	20,800		260		\$14	\$34	
1981	22,500		320		\$13	\$29	
1982	18,800		410		\$16	\$33	
1983	16,600		280		\$14	\$28	
1984	16,200		310		\$21	\$41	
1985	15,500		370		\$19	\$36	
1986	15,800		320		\$24	\$44	
1987	15,100		280		\$26	\$46	
1988	15,100		390		\$28	\$48	
1989	14,200		310		\$26	\$42	
1990	15,200		490		\$22	\$34	
1991	15,600		400		\$32*	\$47*	
1992	17,300		480		\$39	\$56	
1993	17,100		530		\$42	\$59	
1994	16,600		520		\$213	\$290	
1995	16,600		520		\$40	\$53	
1996	18,200		610		\$44	\$57	
1997	19,100		580		\$49	\$62	
1998	18,900		570		\$45	\$56	
1999	32,000	(10,300)	520	(260)	\$72	(\$66)	\$87
2000	16,500	(3,700)	260	(260)	\$32	(\$20)	\$37
2001	24,000	(3,200)	210	(160)	\$23	(\$21)	\$26
2002	22,600	(3,000)	120	(90)	\$26	(\$24)	\$29
2003	23,000	(3,300)	280	(180)	\$21	(\$19)	\$23
2004	23,900	(2,600)	270	(110)	\$27	(\$25)	\$29
2005	23,600	(3,200)	320	(110)	\$49	(\$38)	\$51
2006	23,500	(3,000)	270	(150)	\$28	(\$25)	\$28

* All 1991 home fire property damage figures are inflated by estimation problems related to the handling of the Oakland fire storm. One 1994 fire with an implausibly high dollar loss accounted for the larger loss that year.

Note: Numbers in parentheses exclude confined fires. Confined fires are fires reported as confined to a cooking vessel and involving equipment; they are analyzed separately. These are national estimates of fires reported to U.S. 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. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Inflation adjustment to 2006 dollars is done using the consumer price index.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2006) and from NFPA survey.

**Table 3.2. Home Fires Involving Gas-Fueled Ovens or Rotisseries, by Year
Structure Fires Reported to U.S. Fire Departments**

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions)		
					As Reported	In 2006 Dollars	
1980	9,000		180		\$8		\$20
1981	9,400		150		\$5		\$11
1982	7,500		140		\$7		\$15
1983	6,700		120		\$7		\$14
1984	6,300		160		\$8		\$16
1985	6,300		170		\$7		\$13
1986	6,000		120		\$7		\$13
1987	5,900		90		\$11		\$20
1988	6,000		160		\$6		\$10
1989	5,300		110		\$9		\$15
1990	5,700		170		\$9		\$14
1991	5,700		130		\$12*		\$18*
1992	6,200		180		\$17		\$24
1993	5,800		200		\$16		\$22
1994	5,400		220		\$8		\$11
1995	5,100		150		\$10		\$13
1996	5,900		190		\$13		\$17
1997	5,900		180		\$16		\$20
1998	5,800		180		\$8		\$10
1999	3,700	(1,400)	0	(0)	\$8	(\$6)	\$10
2000	2,700	(600)	0	(0)	\$8	(\$3)	\$10
2001	5,500	(800)	90	(40)	\$4	(\$4)	\$5
2002	5,800	(600)	20	(20)	\$9	(\$9)	\$10
2003	5,300	(1,400)	70	(50)	\$6	(\$6)	\$7
2004	6,000	(800)	10	(10)	\$3	(\$2)	\$3
2005	4,800	(800)	20	(20)	\$3	(\$3)	\$3
2006	6,500	(1,000)	40	(40)	\$8	(\$7)	\$8

* All 1991 home fire property damage figures are inflated by estimation problems related to the handling of the Oakland fire storm.

Note: Numbers in parentheses exclude confined fires. Confined fires are fires reported as confined to chimney, flue, fuel burner, or boiler and involving heating 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. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Inflation adjustment to 2006 dollars is done using the consumer price index. Unknowns have been allocated proportionally.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2006) and from NFPA survey.

**Table 3.3. Home Fires Involving Electric-Powered Ovens or Rotisseries, by Year
Structure Fires Reported to U.S. Fire Departments**

Year	Fires		Civilian Injuries		Direct Property Damage (in Millions)		
					As Reported	In 2006 Dollars	
1980	11,300		70		\$6		\$15
1981	12,600		170		\$7		\$15
1982	10,800		250		\$8		\$17
1983	9,400		150		\$5		\$10
1984	9,400		150		\$13		\$25
1985	8,900		190		\$11		\$21
1986	9,300		190		\$15		\$28
1987	8,900		190		\$15		\$27
1988	8,800		210		\$21		\$36
1989	8,500		190		\$16		\$26
1990	8,900		310		\$13		\$20
1991	9,400		270		\$18*		\$27*
1992	10,600		290		\$19		\$27
1993	10,800		320		\$24		\$33
1994	10,800		290		\$18		\$24
1995	11,100		360		\$29		\$38
1996	11,800		420		\$31		\$40
1997	12,800		380		\$32		\$40
1998	12,700		400		\$43		\$53
1999	26,900	(8,500)	520	(260)	\$63	(\$59)	\$76
2000	13,400	(3,000)	260	(260)	\$23	(\$17)	\$27
2001	18,000	(2,300)	120	(120)	\$19	(\$17)	\$21
2002	16,600	(2,400)	100	(70)	\$16	(\$15)	\$18
2003	17,600	(2,000)	210	(130)	\$14	(\$13)	\$16
2004	17,900	(1,700)	260	(100)	\$24	(\$23)	\$26
2005	18,600	(2,400)	290	(80)	\$46	(\$35)	\$47
2006	16,800	(2,000)	220	(100)	\$19	(\$18)	\$19

* All 1991 home fire property damage figures are inflated by estimation problems related to the handling of the Oakland fire storm.

Note: Numbers in parentheses exclude confined fires. Confined fires are fires reported as confined to chimney, flue, fuel burner, or boiler and involving heating 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. *Because of low participation in NFIRS Version 5.0 during 1999-2001, estimates for those years are highly uncertain and must be used with caution.* Inflation adjustment to 2006 dollars is done using the consumer price index. Unknowns have been allocated proportionally.

Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2006) and from NFPA survey.

**Table 3.4. Home Fires Involving Ovens or Rotisseries, by Factor Contributing to Ignition
Annual Average of 2003-2006 Structure Fires Reported
(Excluding Fires Reported as Confined Fires)**

Factor	Fires		Civilian Deaths		Civilian Injuries		Direct Property	
							Damage (in Millions)	
Equipment unattended	700	(23%)	*	(*)	30	(24%)	\$6	(23%)
Electrical failure or malfunction	300	(12%)	*	(*)	10	(6%)	\$3	(13%)
Heat source too close to combustible	300	(10%)	*	(*)	10	(4%)	\$2	(9%)
Failure to clean	300	(10%)	*	(*)	20	(13%)	\$0	(1%)
Unclassified misuse of material	200	(7%)	*	(*)	10	(5%)	\$3	(10%)
Abandoned or discarded material	200	(6%)	*	(*)	30	(19%)	\$2	(7%)
Improper container or storage	200	(6%)	*	(*)	10	(5%)	\$1	(5%)
Unintentionally turned on or not turned off	200	(6%)	*	(*)	10	(9%)	\$1	(5%)
Unclassified mechanical failure or malfunction	100	(4%)	*	(*)	0	(0%)	\$2	(6%)
Unclassified factor contributed to ignition	100	(4%)	*	(*)	0	(2%)	\$3	(10%)
Leak or break	100	(3%)	*	(*)	10	(9%)	\$1	(4%)
Unclassified operational deficiency	100	(3%)	*	(*)	0	(0%)	\$0	(1%)
Equipment used for unintended purpose	100	(2%)	*	(*)	0	(0%)	\$0	(1%)
Equipment not being operated properly	100	(2%)	*	(*)	0	(0%)	\$1	(4%)
Other known factor	200	(8%)	*	(*)	10	(8%)	\$1	(5%)
Total	3,000	(100%)	4	(100%)	140	(100%)	\$26	(100%)
Total entries	3,200	(107%)	*	(*)	140	(105%)	\$28	(105%)

* Not available because all fires with deaths were coded as Factor Contributing to Ignition unknown or not reported.

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 3.5. Home Fires Involving Gas-Fueled Ovens or Rotisseries, 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	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Equipment unattended	300 (32%)	0 (NA)	0 (0%)	\$0 (8%)
Failure to clean	100 (11%)	0 (NA)	0 (0%)	\$0 (4%)
Heat source too close to combustible	100 (10%)	0 (NA)	0 (0%)	\$0 (2%)
Leak or break	100 (7%)	0 (NA)	10 (42%)	\$1 (24%)
Unclassified misuse of material	100 (6%)	0 (NA)	0 (0%)	\$1 (24%)
Improper container or storage	100 (6%)	0 (NA)	0 (10%)	\$0 (1%)
Other known factor	300 (34%)	0 (NA)	20 (63%)	\$2 (42%)
Total	1,000 (100%)	0 (NA)	30 (100%)	\$5 (100%)
Total entries	1,000 (105%)	0 (NA)	30 (115%)	\$5 (105%)

NA – Not applicable because estimated total was zero.

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 3.6. Home Fires Involving Electric-Powered Ovens or Rotisseries, 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	Fires		Civilian Deaths		Civilian Injuries		Direct Property	
							Damage (in Millions)	
Equipment unattended	400	(18%)	*	(*%)	30	(33%)	\$6	(26%)
Electrical failure or malfunction	300	(17%)	*	(*%)	10	(8%)	\$3	(15%)
Heat source too close to combustible	200	(11%)	*	(*%)	10	(6%)	\$2	(11%)
Failure to clean	200	(9%)	*	(*%)	20	(17%)	\$0	(1%)
Abandoned or discarded material	100	(7%)	*	(*%)	20	(22%)	\$2	(8%)
Unintentionally turned on or not turned off	100	(7%)	*	(*%)	0	(3%)	\$1	(6%)
Unclassified misuse of material	100	(7%)	*	(*%)	10	(7%)	\$1	(6%)
Improper container or storage	100	(6%)	*	(*%)	0	(4%)	\$1	(5%)
Unclassified mechanical failure or malfunction	100	(5%)	*	(*%)	0	(0%)	\$1	(6%)
Unclassified factor contributed to ignition	100	(4%)	*	(*%)	0	(0%)	\$2	(10%)
Unclassified operational deficiency	100	(3%)	*	(*%)	0	(0%)	\$0	(1%)
Other known factor	300	(14%)	*	(*%)	0	(0%)	\$2	(10%)
Total	2,000	(100%)	4	(100%)	100	(100%)	\$22	(100%)
Total entries	2,100	(107%)	*	(*%)	100	(100%)	\$23	(105%)

* Not available because all fires with deaths were coded as Factor Contributing to Ignition unknown or not reported.

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 3.7. Home Fires Involving Ovens or Rotisseries, by Item First Ignited
Annual Average of 2003-2006 Structure Fires Reported by U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Cooking materials, including food	1,400	(45%)	*	(*%)	70	(50%)	\$11	(41%)
Unclassified item first ignited	200	(8%)	*	(*%)	0	(3%)	\$1	(4%)
Appliance housing or casing	200	(8%)	*	(*%)	10	(7%)	\$1	(5%)
Household utensil	200	(7%)	*	(*%)	10	(5%)	\$1	(4%)
Electrical wire or cable insulation	200	(6%)	*	(*%)	0	(2%)	\$0	(1%)
Flammable or combustible liquid or gas, piping or filter	100	(4%)	*	(*%)	0	(4%)	\$1	(2%)
Cabinetry	100	(4%)	*	(*%)	0	(3%)	\$4	(13%)
Box, carton, bag, basket or barrel	100	(3%)	*	(*%)	10	(7%)	\$0	(1%)
Interior wall covering, excluding drapes	100	(2%)	*	(*%)	10	(10%)	\$1	(4%)
Other known item	300	(12%)	*	(*%)	10	(9%)	\$6	(24%)
Total	3,000	(100%)	4	(100%)	140	(100%)	\$26	(100%)

* Not available because all fires with deaths were coded as Item First Ignited unknown.

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 3.8. Home Fires Involving Gas-Fueled Ovens or Rotisseries, by Item First Ignited
Annual Average of 2003-2006 Structure Fires Reported by U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Cooking materials, including food	400	(41%)	0	(NA)	0	(0%)	\$2	(50%)
Household utensil	100	(12%)	0	(NA)	0	(7%)	\$0	(3%)
Flammable or combustible liquid or gas or piping	100	(12%)	0	(NA)	0	(16%)	\$1	(11%)
Appliance housing or casing	100	(8%)	0	(NA)	0	(16%)	\$0	(6%)
Unclassified item first ignited	100	(8%)	0	(NA)	0	(0%)	\$0	(10%)
Other known factor	200	(20%)	0	(NA)	20	(62%)	\$1	(19%)
Total	1,000	(100%)	0	(NA)	30	(100%)	\$5	(100%)

NA -- Not applicable because estimated total was zero.

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 3.9. Home Fires Involving Electric-Powered Ovens or Rotisseries, by Item First Ignited
Annual Average of 2003-2006 Structure Fires Reported by U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Item First Ignited	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Cooking materials	1,100	(44%)	*	(*)	70	(69%)	\$7	(34%)
Unclassified item first ignited	200	(9%)	*	(*)	0	(0%)	\$1	(6%)
Household utensil	200	(9%)	*	(*)	10	(6%)	\$1	(5%)
Electrical wire or cable insulation	200	(8%)	*	(*)	0	(3%)	\$0	(1%)
Appliance housing or casing	200	(8%)	*	(*)	0	(0%)	\$1	(5%)
Cabinetry	100	(4%)	*	(*)	0	(0%)	\$2	(9%)
Box or bag	100	(3%)	*	(*)	10	(6%)	\$0	(1%)
Interior wall covering	100	(3%)	*	(*)	0	(3%)	\$1	(6%)
Other known item first ignited	300	(13%)	*	(*)	10	(15%)	\$7	(33%)
Total fires	2,500	(100%)	4	(100%)	100	(100%)	\$22	(100%)

* Not available because all fires with deaths were coded as Item First Ignited unknown.

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 3.10. Home Fires Involving Ovens or Rotisseries, 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	20,300	(87%)	0	(0%)	140	(50%)	\$5	(17%)
Confined to object of origin	1,800	(8%)	0	(0%)	50	(20%)	\$2	(7%)
Confined to room of origin	1,000	(4%)	4	(100%)	60	(21%)	\$10	(31%)
Confined to floor of origin	100	(0%)	0	(0%)	10	(2%)	\$3	(9%)
Confined to building of origin	100	(1%)	0	(0%)	10	(5%)	\$11	(35%)
Extended beyond building of origin	0	(0%)	0	(0%)	0	(1%)	\$0	(1%)
Total	23,300	(100%)	4	(100%)	280	(100%)	\$32	(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

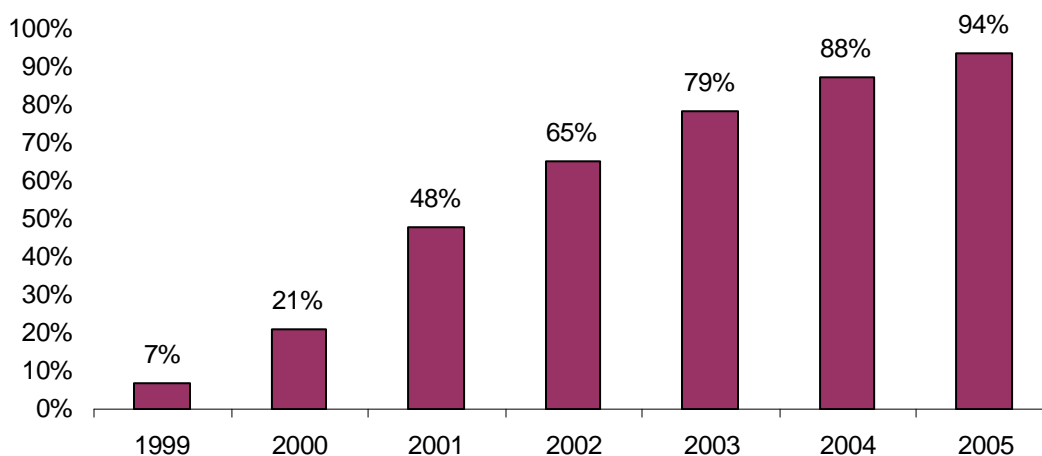


Figure 1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

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.