

**HOME STRUCTURE FIRES
INVOLVING KITCHEN EQUIPMENT
OTHER THAN COOKING EQUIPMENT**

John R. Hall, Jr.

August 2009



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

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Abstract

In 2003-2006, an estimated 2,800 reported U.S. home structure fires per year involving equipment normally used in kitchen for food preparation, storage or disposal but excluding cooking equipment resulted in annual averages of 11 reported civilian deaths, 100 civilian injuries, and \$73 million in direct property damage.

Nearly all home fires involving kitchen equipment excluding cooking equipment specifically involve refrigerators and freezers or dishwashers. Other equipment in this group include garbage disposers, blenders, juicers, food processors, can openers, coffee grinders, and knife sharpeners.

These estimates are based on data from the U.S. Fire Administration's (USFA's) National Fire Incident Reporting System (NFIRS) and the National Fire Protection Association's (NFPA's) annual fire department experience survey.

Keywords: Refrigerator, freezer, dishwasher, kitchen, cooking, scald, fire statistics

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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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Executive Summary

In 2003-2006, an estimated 2,800 reported U.S. home structure fires involving kitchen equipment excluding cooking equipment resulted in annual averages of 11 civilian deaths, 100 civilian injuries, and \$73 million in direct property damage.

Nearly all home fires involving kitchen equipment excluding cooking equipment specifically involve refrigerators and freezers or dishwashers.

Refrigerators, separate freezers, and separate ice makers together were involved in 1,600 home structure fires reported to U.S. fire departments per year in 2003-2006. These fires resulted in eight civilian deaths, 70 civilian injuries, and \$49 million in direct property damage per year.

Dishwashers were involved in 1,200 home structure fires reported to U.S. fire departments per year in 2003-2006. These fires resulted in four civilian deaths, 30 civilian injuries, and \$24 million in direct property damage per year.

The other equipment types in this group – garbage disposer, blender, juicer, food processor, can opener, coffee grinder, and knife sharpener – collectively were involved in 100 home structure fires reported to U.S. fire departments per year in 2003-2006.

Refrigerators, separate freezers, and separate ice makers were involved in an estimated 39,270 injuries reported to hospital emergency rooms in 2006. Most of these injuries did not involve burns or fire but instead involved sprains or strains, contusions or abrasions, lacerations, or fractures. Dishwashers were involved in 8,300 injuries reported to hospital emergency rooms in 2006.

Most 2003-2006 home non-confined structure fires involving refrigerators, separate freezers, or separate ice makers began with ignition of appliance housing or casing (31%) or wire or cable insulation (29%).* Most 2003-2006 home non-confined structure fires involving dishwashers also began with ignition of appliance housing or casing (39%) or wire or cable insulation (28%).

More than one-third (35%) of 2003-2006 home non-confined structure fires involving refrigerators, separate freezers, or separate ice makers began in a room other than the kitchen, starting with the garage (12%). Only 4% of 2003-2006 home non-confined structure fires involving dishwashers began in an area other than the kitchen.

* Beginning in 1999, the National Fire Incident Reporting System (NFIRS) has permitted abbreviated reporting for six types of fires reported as confined fires – confined to cooking vessel, boiler or burner, chimney or flue, trash, incinerator or commercial compactor. Because of the abbreviated reporting, these fires are analyzed separately and are not included in most detailed analyses.

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Overview of Kitchen Equipment

Most equipment involved in food preparation, storage, clean-up or disposal is used primarily in the kitchen and is here referred to as kitchen equipment, even when it is used in another area. This equipment is further separated into cooking equipment (food preparation employing heat) and any other equipment, primarily refrigerators, freezers, and dishwashers. See Table A.

**Table A. Home Fires Involving Kitchen Equipment, Including Cooking Equipment
Annual Average of 2003-2006 Structure Fires Reported to U.S. Fire Departments
(Including Fires Reported as Confined to Cooking Vessel
and Other Fires Reported as Confined Fires Involving Kitchen Equipment)**

Type or Group of Equipment	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
Cooking equipment	129,700	(37,200)	494	(489)	4,310	(3,190)	\$753	(\$728)
Range	88,000	(28,500)	440	(437)	3,540	(2,690)	\$523	(\$506)
Oven or rotisserie	23,300	(3,000)	4	(4)	280	(140)	\$32	(\$26)
Portable cooking or warming device	7,000	(2,200)	28	(28)	200	(150)	\$76	(\$75)
Microwave oven	6,600	(1,300)	3	(3)	110	(80)	\$22	(\$21)
Grill, hibachi, or barbecue	2,900	(1,300)	13	(13)	90	(70)	\$79	(\$79)
Deep fryer	1,000	(500)	5	(5)	60	(40)	\$15	(\$15)
Other equipment	800	(400)	0	(0)	30	(30)	\$6	(\$6)
Confined to cooking vessel but coded as equipment other than kitchen equipment	20,400		5		300		\$6	
Heating stove	9,400		0		180		\$4	
Other known equipment	1,400		0		10		\$0	
No equipment involved	9,600		5		110		\$1	
Kitchen equipment other than cooking equipment	2,800	(2,700)	11	(11)	100	(100)	\$73	(\$73)
Refrigerator, freezer, or ice maker	1,600	(1,500)	8	(8)	70	(70)	\$49	(\$49)
Dishwasher	1,200	(1,100)	4	(4)	30	(30)	\$24	(\$24)
Other equipment	100	(100)	0	(0)	0	(0)	\$0	(\$0)
Total fires coded as cooking or other kitchen equipment or confined to cooking vessel	152,900	(39,900)	510	(500)	4,710	(3,290)	\$832	(\$801)

Note: Numbers in parentheses exclude confined fires. Confined fires are fires reported as confined to cooking vessel, chimney, or flue, fuel burner, or boiler; trash, incinerator, or commercial compactor they are analyzed separately. These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths to the nearest one, civilian injuries to the nearest ten, and property damage to the nearest million dollars. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as cooking or kitchen 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. Damages have not been adjusted for inflation.

Source: Data from NFIRS Version 5.0 and from NFPA survey.

Kitchen Equipment Excluding Cooking Equipment

Nearly all home fires involving kitchen equipment excluding cooking equipment specifically involve refrigerators and freezers or dishwashers.

**Table B. Home Fires Involving Kitchen Equipment Other Than Cooking Equipment,
by Type or Group of Equipment
Annual Average of 2003-2006 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)**

Type or Group of Equipment	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Refrigerator, freezer, or icemaker	1,500	8	69	\$49
Dishwasher	1,120	4	26	\$24
Garbage disposer ¹	30	0	0	\$0
Blender, juicer, or food processor	20	0	0	\$0
Can opener	20	0	3	\$0
Knife sharpener	10	0	0	\$0
Coffee grinder	0	0	0	\$0
Total	2,700	11	98	\$73

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and civilian injuries are expressed to the nearest one and property damage is rounded to the nearest million dollars. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as cooking or other kitchen 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. Sums may not equal totals because of rounding error.

Source: Data from NFIRS Version 5.0 and NFPA survey.

In 2006, an estimated 2,600 reported U.S. home structure fires involving kitchen equipment excluding cooking equipment resulted in no reported civilian deaths, 70 civilian injuries, and \$63 million in direct property damage.

Most of these types of equipment were not separately identified in national fire incident data prior to the advent of NFIRS Version 5.0. Estimates for 1999-2001 are based on a small fraction of data reported in Version 5.0 and so are less stable. No clear trend is apparent. (See Table C.)

¹ “Garbage disposer” is the term used in NFIRS for what is more commonly called “garbage disposal.”

**Table C. Home Fires Involving Kitchen Equipment Other Than Cooking Equipment, by Year
Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Coded as Confined Fires)**

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	
				As Reported	In 2006 Dollars
1999	3,300	0	510	\$28	\$34
2000	3,400	60	210	\$63	\$74
2001	2,900	0	110	\$84	\$96
2002	3,200	20	90	\$53	\$59
2003	2,700	0	120	\$87	\$95
2004	2,700	20	100	\$55	\$59
2005	2,800	30	110	\$91	\$94
2006	2,600	0	70	\$63	\$63

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and civilian injuries are expressed to the nearest ten and property damage is rounded to the nearest million dollars. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as cooking or other kitchen 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. *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 5.0 and NFPA survey.

In 2006, an estimated quarter-million injuries involving kitchen equipment and other products used in food preparation or presentation, excluding cooking equipment, were reported to hospital emergency rooms.²

Table D provides numbers of injuries by type of equipment for all types of injuries and the six leading types of injuries.

As further context, there were a total of 63,150 scald burn injuries reported to hospital emergency rooms in 2006. Three-fourths of these involved hot water. Many of these hot-water scald burns involved water that had been heated for cooking, while most (more than four-fifths) of the scald burn injuries that did not cite hot water cited cooking equipment or other home products used in food preparation or presentation.

² Statistics from the National Electronic Injury Surveillance system (NEISS), queried at the U.S. Consumer Product Safety Commission website, www.cpsc.gov.

Table D. 2006 Injuries Involving Kitchen Products Excluding Cooking Equipment Reported to Hospital Emergency Rooms, by Type of Product

Type of Product	Any Type of Injury	Laceration	Contusion or Abrasion	Scald Burn	Sprain or Strain	Thermal Burn	Fracture
Tableware (excluding flatware)	89,240	67,110	3,320	5,570	3,100	1,050	1,800
Drinking glass	75,800	67,880	1,400	30	340	0	210
Refrigerator, freezer, or ice maker	39,270	7,510	8,540	160	8,870	20	6,000
Cookware	29,650	2,870	2,500	9,220	1,780	10,310	600
Dishwasher	8,290	5,400	880	60	480	80	480
Blender	3,150	2,660	60	150	0	0	70
Food processor	2,870	2,590	70	0	0	0	20
Mixing bowl	2,250	1,580	180	90	210	0	60
Food grinder	1,200	590	80	0	20	0	200
Electric mixer	750	260	230	0	60	0	80
Garbage disposer	670	370	90	60	60	0	0
Unpowered coffee maker*	280	80	70	100	0	20	0
Juicer	250	220	0	0	0	0	0
Electric can opener	150	150	0	0	0	0	0
Ice cream maker	120	70	10	0	0	0	40
Ice crusher	90	90	0	0	0	0	0
Total	254,030	159,430	17,420	15,430	14,930	11,470	9,560

* This does not include 3,000 injuries involving unknown-type coffee makers, which might be powered (and so cooking equipment) or unpowered.

Note: Injuries are estimated to the nearest ten.

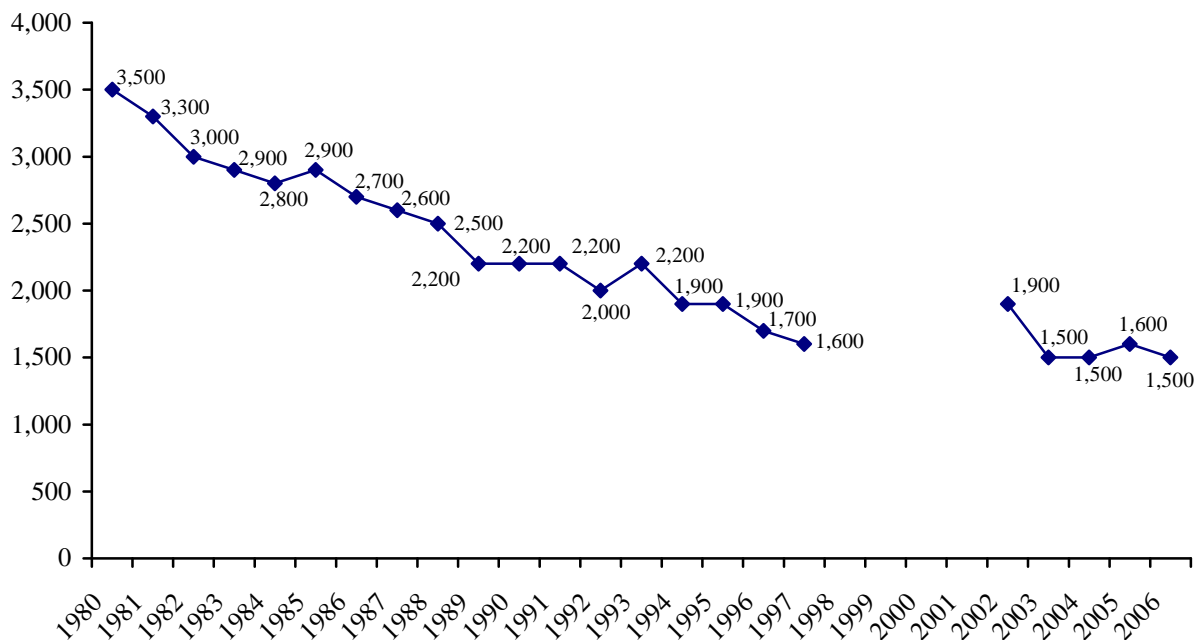
Source: CPSC National Electronic Injury Surveillance System.

Refrigerators and Freezers

In 2006, an estimated 1,500 reported U.S. home structure non-confined fires involving refrigerators, freezers, or icemakers resulted in no reported civilian deaths, 50 civilian injuries, and \$44 million in direct property damage.

Refrigerator and freezer non-confined fires declined by more than half from 1980 to 1998. After some volatility during the transition years as NFIRS Version 5.0 was introduced, the estimates returned to the levels of the late 1990's.

**Home Non-Confined Fires Involving Refrigerators or Freezers, by Year
Structure Fires Reported to U.S. Fire Departments**



Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Fires are rounded to the nearest hundred. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as cooking or other kitchen 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. *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.*

Source: Data from NFIRS Version 5.0 and NFPA survey.

Refrigerator fires outnumbered fires involving separate freezers by nearly 5½-to-1 in 2003-2006. There were no reported fires involving separate icemakers.

Home Fires Involving Refrigerator or Freezer, by Type of Equipment
Annual Average of 2003-2006 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Equipment	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Refrigerator	1,270	8	50	\$37
Separate freezer	230	0	19	\$12
Separate ice maker	0	0	0	\$0
Total	1,500	8	69	\$49

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and civilian injuries are expressed to the nearest one and property damage is rounded to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as cooking or other kitchen 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.

Source: Data from NFIRS Version 5.0 and NFPA survey.

In 1995-2000, there were an average of 2.8 electrocution deaths per year involving refrigerators or freezers, while in 2001-2003, there were no such deaths.³

This captures all reports issued by the U.S. Consumer Product Safety Commission, which did not report on product-related electrocution deaths in 1999.

Electrocution Deaths Involving Refrigerator or Freezers

Year	Deaths
1995	3
1996	1
1997	6
1998	2
1999	NA
2000	2
2001	0
2002	0
2003	0
2004	NA

NA – 1999 statistic not available because no report published with product details for 1999; 2004 statistic not available because no detail provided for specific types of large appliances.

Source: CPSC special report series; see footnote 3.

³ Matthew V. Hnatov, *2004 Electrocutions Associated with Consumer Products*, April 2009, Table 2, www.cpsc.gov, and previous reports in the series.

In 2006, an estimated 39,270 injuries involving refrigerators, freezers or ice makers were reported to hospital emergency rooms.⁴

Refrigerators accounted for 31,880 injuries, freezers for 6,770 injuries, and ice makers for 620 injuries. Most injuries related to refrigerators, freezers or ice makers, were sprains or strains (8,870), contusions or abrasions (8,540), lacerations (7,510), or fractures (6,000). These are injuries that may occur when moving the refrigerator or freezer or when a person or an appliance falls onto the other.

Most non-confined home structure fires involving refrigerators or freezers involved electrical or mechanical failures or malfunctions with few details, if any, on the nature of the failure or malfunction.

The leading factors contributing to ignition with some details include short circuit arc from defective or worn insulation (5% of fires), worn out (4% of fires), automatic control failure (4% of fires), failure to clean (3% of fires), and short circuit arc from mechanical damage (3% of fires).

Two-thirds of non-confined home structure fires involving refrigerators or freezers began with ignition of appliance housing or casing (31%), wire or cable insulation (29%), or interior wall covering (6%).

All reported deaths occurred in fires beginning with ignition of appliance housing or casing. The reports do not indicate whether the appliance housing ignited is the housing of the kitchen appliance involved in ignition or is the housing or casing of some other appliance in or next to the kitchen appliance that supplied the heat of ignition.

Two-thirds of non-confined home structure fires involving refrigerators or freezers began in the kitchen (65%).

Other areas of origin for refrigerator or freezer fires included garage (12%).

Safety Tips:

- To help prevent refrigerator and freezer fires, have a professional inspect the appliance to see that the wiring is safe and that the mechanical parts of the refrigerator are in good working order.
- Make sure the refrigerator is plugged directly into a wall outlet appropriate for that type of appliance.
- Do not install or place combustibles too close to the refrigerator or freezer. When installing, leave air space in the back between the refrigerator and wall for heat to vent from the refrigerator.
- Remove lint and dust from under and behind the unit periodically.
- Make sure the power cord is not pinched in back of or under the appliance.

⁴ Statistics from the National Electronic Injury Surveillance system (NEISS), queried at the U.S. Consumer Product Safety Commission website, www.cpsc.gov.

Home Fires Involving Refrigerator or Freezers, by Year
Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Year	Fires	Direct Property Damage (in Millions)			
		Civilian Deaths	Civilian Injuries	As Reported	In 2006 Dollars
1980	3,500	0	40	\$20	\$46
1981	3,300	10	110	\$18	\$38
1982	3,000	0	50	\$19	\$39
1983	2,900	30	100	\$26	\$51
1984	2,800	0	60	\$24	\$45
1985	2,900	0	80	\$25	\$46
1986	2,700	40	70	\$20	\$35
1987	2,600	40	110	\$22	\$39
1988	2,500	10	80	\$26	\$43
1989	2,200	0	150	\$25	\$39
1990	2,200	10	100	\$31	\$46
1991	2,200	20	100	\$36	\$52
1992	2,000	10	70	\$29	\$40
1993	2,200	10	100	\$24	\$32
1994	1,900	0	0	\$22	\$29
1995	1,900	30	90	\$23	\$29
1996	1,700	0	40	\$22	\$28
1997	1,600	0	100	\$27	\$32
1998	1,600	10	80	\$30	\$36
1999	2,200	0	510	\$18	\$22
2000	2,200	60	110	\$58	\$68
2001	1,400	0	70	\$69	\$78
2002	1,900	20	40	\$39	\$44
2003	1,500	0	60	\$65	\$72
2004	1,500	20	90	\$34	\$37
2005	1,600	10	80	\$53	\$55
2006	1,500	0	50	\$44	\$44

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and civilian injuries to the nearest ten and property damage to the nearest million dollars. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or reported as cooking or kitchen 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. Before 1999, statistics also include a proportional allocation of fires coded as air conditioning or refrigeration of unknown type. *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.

**Home Structure Fires Involving Refrigerator or Freezer, 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)	
Unclassified electrical failure or malfunction	390	(26%)	4	(52%)	15	(22%)	\$15	(31%)
Unclassified mechanical failure or malfunction	380	(25%)	0	(0%)	10	(14%)	\$11	(22%)
Unspecified short circuit arc	240	(16%)	0	(0%)	14	(21%)	\$5	(11%)
Arc or spark from operating equipment	110	(7%)	0	(0%)	9	(13%)	\$5	(10%)
Short circuit arc from defective or worn insulation	80	(5%)	0	(0%)	8	(11%)	\$2	(4%)
Worn out	60	(4%)	0	(0%)	0	(0%)	\$1	(1%)
Automatic control failure	50	(4%)	0	(0%)	7	(10%)	\$4	(8%)
Failure to clean	50	(3%)	0	(0%)	0	(0%)	\$0	(0%)
Short circuit arc from mechanical damage	50	(3%)	0	(0%)	3	(4%)	\$1	(2%)
Heat too close to combustibles	40	(2%)	0	(0%)	0	(0%)	\$4	(8%)
Unclassified misuse of material or product	30	(2%)	0	(0%)	4	(6%)	\$0	(1%)
Equipment overloaded	30	(2%)	0	(0%)	0	(0%)	\$4	(8%)
Unclassified factor contributed to ignition	30	(2%)	0	(0%)	3	(4%)	\$1	(1%)
Other known factor*	160	(10%)	4	(48%)	6	(8%)	\$5	(10%)
Total fires	1,500	(100%)	8	(100%)	69	(100%)	\$49	(100%)
Total factor entries	1,680	(112%)	8	(100%)	79	(114%)	\$57	(117%)

* “Other known” includes improper container or storage (48% of deaths).

Note: Multiple entries are allowed, resulting in more factor entries than fires. Multiple entries are allowed, resulting in more factor entries than fires. These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as cooking or kitchen 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. Home fires with this 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.

Home Structure Fires Involving Refrigerator or Freezer, 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	470 (31%)	8 (100%)	27 (40%)	\$12 (24%)
Wire or cable insulation	430 (29%)	0 (0%)	17 (24%)	\$9 (18%)
Interior wall covering	90 (6%)	0 (0%)	5 (7%)	\$8 (16%)
Unclassified item	60 (4%)	0 (0%)	4 (6%)	\$1 (2%)
Flammable or combustible gas or liquid	50 (3%)	0 (0%)	6 (9%)	\$7 (14%)
Dust, fiber, or lint	40 (3%)	0 (0%)	0 (0%)	\$0 (0%)
Structural member or framing	40 (2%)	0 (0%)	2 (3%)	\$3 (5%)
Cabinetry	30 (2%)	0 (0%)	0 (0%)	\$2 (5%)
Exterior wall covering or finish	30 (2%)	0 (0%)	0 (0%)	\$0 (1%)
Floor covering	30 (2%)	0 (0%)	0 (0%)	\$0 (1%)
Other known item first ignited	230 (15%)	0 (0%)	7 (11%)	\$7 (13%)
Total fires	1,500 (100%)	8 (100%)	69 (100%)	\$49 (100%)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as cooking or kitchen 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. Home fires with this equipment and item first ignited unknown have also been allocated proportionally. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Home Structure Fires Involving Refrigerator or Freezer, by Area of Origin
Annual Average of 2003-2006 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Area of Origin	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Kitchen	980 (65%)	8 (100%)	36 (52%)	\$23 (46%)
Garage	180 (12%)	0 (0%)	15 (22%)	\$10 (21%)
Laundry room or area	30 (2%)	0 (0%)	5 (7%)	\$1 (2%)
Crawl space or substructure space	30 (2%)	0 (0%)	0 (0%)	\$1 (2%)
Unclassified storage area	30 (2%)	0 (0%)	2 (3%)	\$1 (1%)
Wall assembly or concealed space	30 (2%)	0 (0%)	0 (0%)	\$2 (4%)
Living room, family room, or den	30 (2%)	0 (0%)	7 (10%)	\$4 (9%)
Unclassified function area	30 (2%)	0 (0%)	0 (0%)	\$1 (1%)
Other known area of origin	170 (11%)	0 (0%)	4 (5%)	\$7 (14%)
Total fires	1,500 (100%)	8 (100%)	69 (100%)	\$49 (100%)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as cooking or kitchen 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. Home fires with this equipment and area of origin unknown have also been allocated proportionally. Totals may not equal sums because of rounding error.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Dishwashers

In 2006, an estimated 1,100 reported U.S. home non-confined structure fires involving dishwashers resulted in no reported civilian deaths, 20 civilian injuries, and \$18 million in direct property damage.

Dishwashers could not be identified in national fire incident data prior to 1999 when NFIRS Version 5.0 was introduced. Participation in Version 5.0 was high enough to produce stable estimates beginning in 2002.

Home Fires Involving Dishwashers Structure Fires Reported to U.S. Fire Departments (Excluding Fires Reported as Confined Fires)

Year	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)	
				As Reported	In 2006 Dollars
1999	1,000	0	0	\$8	\$10
2000	1,100	0	110	\$5	\$6
2001	1,400	0	20	\$15	\$17
2002	1,100	0	40	\$10	\$11
2003	1,100	0	50	\$20	\$22
2004	1,100	0	10	\$21	\$22
2005	1,200	10	20	\$38	\$39
2006	1,100	0	20	\$18	\$18

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest hundred, civilian deaths and civilian injuries are expressed to the nearest ten and property damage is rounded to the nearest million dollars. Figures reflect a proportional share of home fires with equipment involve in ignition unknown or reported as cooking or other kitchen 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. *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 5.0 and NFPA survey.

In 2006, an estimated 8,300 injuries involving dishwashers were reported to hospital emergency rooms.⁵

Most of these injuries (5,400) related to dishwashers involved lacerations.

⁵ Statistics from the National Electronic Injury Surveillance System (NEISS), queried at the U.S. Consumer Product Safety Commission website, www.cpsc.gov.

Most non-confined home structure fires involving dishwashers involved electrical or mechanical failures or malfunctions with few if any details on the nature of the failure or malfunction.

The leading factors contributing to ignition with some details include heat source too close to combustibles (5%), short circuit arc from defective or worn insulation (5%), automatic control failure (5%), and short circuit arc from mechanical damage (3%).

Two-thirds of non-confined home structure fires involving dishwashers began with ignition of appliance housing or casing (39%) or wire or cable insulation (28%).

The reports do not indicate whether the cited appliance housing or casing is the dishwasher's own housing or the housing of some appliance in or next to the dishwasher.

Nearly all (96%) non-confined home structure fires involving dishwashers began in the kitchen.

Safety Tips

- For greatest assurance of safe installation, have a professional install any major appliance.
- Make sure power cords are not pinched or crimped.
- Make sure appliances are connected to circuits with enough capacity.
- Make sure any equipment has adequate clearance from nearby fixed and portable combustibles.

**Home Structure Fires Involving Dishwasher, 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)	
Unclassified electrical failure or malfunction	290	(26%)	*	(*)	3	(10%)	\$7	(29%)
Unclassified mechanical failure or malfunction	220	(20%)	*	(*)	9	(34%)	\$7	(28%)
Unspecified short circuit arc	210	(19%)	*	(*)	0	(0%)	\$2	(10%)
Heat source too close to combustibles	50	(5%)	*	(*)	0	(0%)	\$0	(2%)
Arc or spark from operating equipment	50	(5%)	*	(*)	0	(0%)	\$1	(4%)
Short circuit arc from defective or worn insulation	50	(5%)	*	(*)	2	(9%)	\$1	(2%)
Automatic control failure	50	(5%)	*	(*)	10	(37%)	\$2	(10%)
Unclassified operational deficiency	40	(3%)	*	(*)	0	(0%)	\$0	(0%)
Short circuit arc from mechanical damage	40	(3%)	*	(*)	0	(0%)	\$0	(1%)
Unclassified factor contributed to ignition	30	(3%)	*	(*)	3	(10%)	\$0	(2%)
Other known factor	150	(13%)	*	(*)	3	(10%)	\$5	(20%)
Total fires	1,120	(100%)	4	(100%)	26	(100%)	\$24	(100%)
Total factor entries	1,180	(105%)	*	(*)	29	(110%)	\$26	(108%)

* Not available because all deaths were in fires with factor contributing to ignition unknown.

Note: Multiple entries are allowed, resulting in more factor entries than fires. Multiple entries are allowed, resulting in more factor entries than fires. These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as cooking or kitchen 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. Home fires with this 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.

Home Structure Fires Involving Dishwasher, 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	440 (39%)	0 (0%)	20 (77%)	\$10 (42%)
Wire or cable insulation	310 (28%)	0 (0%)	4 (15%)	\$2 (8%)
Household utensil	100 (9%)	0 (0%)	0 (0%)	\$2 (9%)
Cabinetry	60 (5%)	0 (0%)	0 (0%)	\$3 (13%)
Unclassified item	50 (5%)	0 (0%)	0 (0%)	\$0 (1%)
Other known item first ignited	160 (14%)	4 (100%)*	2 (8%)	\$6 (26%)
Total fires	1,120 (100%)	4 (100%)	26 (100%)	\$24 (100%)

* "Other known" includes unclassified structural component (100% of deaths).

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as cooking or kitchen 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. Home fires with this equipment and item first ignited unknown have also been allocated proportionally. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

Home Structure Fires Involving Dishwasher, by Area of Origin
Annual Average of 2003-2006 Structure Fires Reported to U.S. Fire Departments
(Excluding Fires Reported as Confined Fires)

Area of Origin	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Kitchen	1,080 (96%)	4 (100%)	25 (93%)	\$24 (100%)
Other known area of origin	40 (4%)	0 (0%)	2 (7%)	\$0 (0%)
Total fires	1,120 (100%)	4 (100%)	26 (100%)	\$24 (100%)

Note: These are national estimates of fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies or industrial fire brigades. National estimates are projections. Casualty and loss projections can be heavily influenced by the inclusion or exclusion of one unusually serious fire. Fires are rounded to the nearest ten, civilian deaths and injuries to the nearest one, and direct property damage to the nearest million dollars. Damage has not been adjusted for inflation.. Figures reflect a proportional share of home fires with equipment involved in ignition unknown or recorded as cooking or kitchen 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. Home fires with this equipment and area of origin unknown have also been allocated proportionally. Totals may not equal sums because of rounding error.

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/nfirspaperforms2007.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

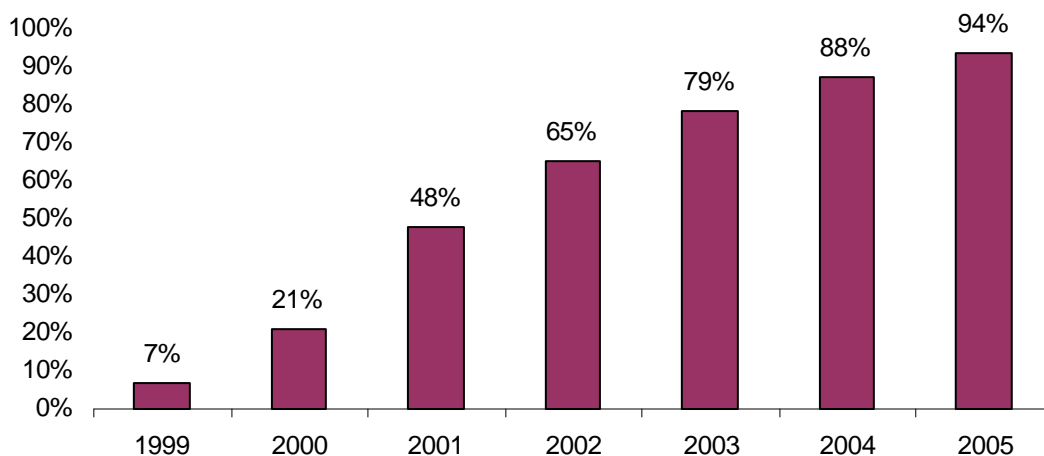


Figure 1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

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

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

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.