

# **THE SMOKING-MATERIAL FIRE PROBLEM**

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## **Abstract**

In 2005, there were an estimated 82,400 smoking-material fires in the U.S., up from 69,500 in 2004. These fires resulted in an estimated 800 civilian deaths, 1,660 civilian injuries and \$575 million in direct property damage. Mattresses, bedding, and upholstered furniture are the first items ignited for most home structure fatal fires started by smoking materials. One out of four fatal victims of smoking-materials is not the smoker whose cigarette started the fire. More fatal smoking-material fires start in living rooms, family rooms, and dens than in bedrooms. In recent years, Canada and nearly half of U.S. states, including the three most populous – California, Texas, and New York – have passed legislation requiring that all cigarettes sold be “fire safe,” that is, have sharply reduced ignition strength (ability to start fires), as determined by ASTM Standard E2187-04.

Keywords: Smoking, cigarette, fire statistics, fire safe cigarette

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## Executive Summary

Smoking-material fires are a major cause of concern because they result in more deaths than any other type of fire. In 2005, civilian deaths in smoking-related fires continued at roughly the levels of previous years, as normal year-to-year variation overshadowed any positive developments in New York, the first state to require fire-safe cigarettes. Smoking materials continued to account for the largest share of fire deaths. Realistically, any efforts to reduce fire deaths in this country must address the smoking-material fire problem. (In this analysis, “smoking materials” refer only to lighted tobacco products, not matches or lighters.)

In 2005, there were an estimated 82,400 smoking-material fires in the U.S., up from 69,500 in 2004. These fires resulted in an estimated 800 civilian deaths, 1,660 civilian injuries and \$575 million in direct property damage, all up from the year before. The long-term trend has been down, by 75% from 1980 to 2005, helped by the decline in smoking and by the effect of standards and regulations that have made mattresses and upholstered furniture more resistant to cigarette ignition.

Mattresses and bedding, upholstered furniture, and trash are the items most commonly ignited in smoking-material home fires. These items excluding trash also account for most associated fire deaths. More fatal smoking-material fires start in living rooms, family rooms, and dens than in bedrooms.

One out of four fatal victims of smoking-material fires is not the smoker whose cigarette started the fire.

The risk of dying in a home structure fire caused by smoking materials rises with age. One-third (34%) of fatal home smoking-material-fire victims were age 65 or older, compared to their 12% share of the population. Older adults (age 65 and over) are less likely to smoke than younger adults. Therefore, their high rates of smoking-material fire deaths per million people are even more noteworthy.

A USFA/NFPA study recommended seven educational messages to support the behavioral side of a comprehensive strategy to reduce smoking fires:

- If you smoke, smoke outside.
- Whenever you smoke, use deep, wide, sturdy ashtrays. Ashtrays should be set on something sturdy and hard to ignite, like an end table.
- Before you throw out butts and ashes, make sure they are out. Dowsing in water or sand is the best way to do that.
- Check under furniture cushions and in other places people smoke for cigarette butts that may have fallen out of sight.
- Smoking should not be allowed in a home where oxygen is used.
- To prevent a deadly cigarette fire, you have to be alert. You won't be if you are sleepy, have been drinking, or have taken medicine or other drugs.
- If you smoke, choose fire-safe cigarettes. They are less likely to cause fires.

In recent years, Canada and nearly half of all U.S. states – including the three most populous – California, Texas, and New York – have required that all cigarettes sold must be “fire safe,” that is, have sharply reduced ignition strength (ability to start fires), as determined by ASTM Standard E2187-04.

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## Smoking-Material Fire Problem

U.S. fire departments responded to an estimated 82,400 smoking-material fires in 2005. These fires caused:



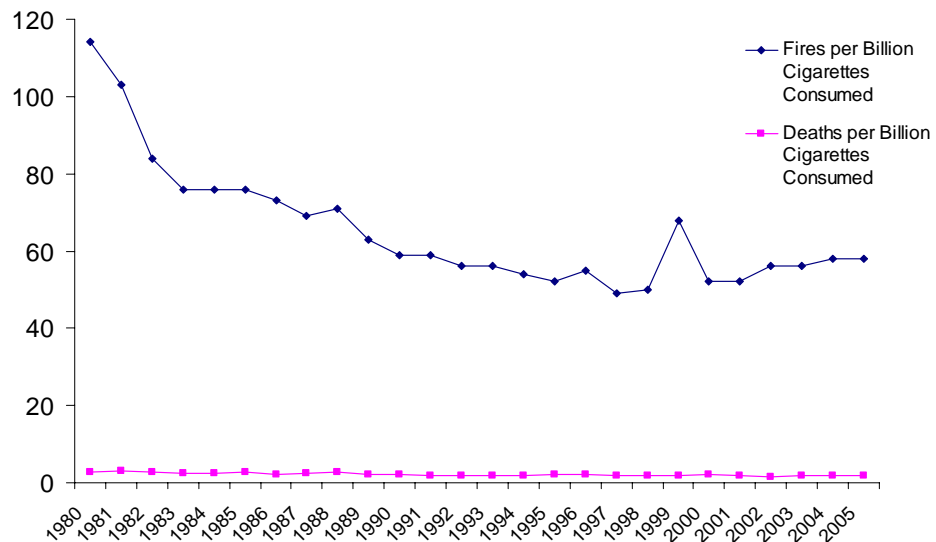
- 800 civilian deaths
- 1,660 civilian injuries, and
- \$575 million in direct property damage.

These estimates are derived from the U.S. Fire Administration national Fire Incident Reporting System (NFIRS) Version 5.0 and NFPA's annual fire department experience survey.

**Trends in the Smoke-Material Fire Problem, by Fire Loss Rates 1980-2005**

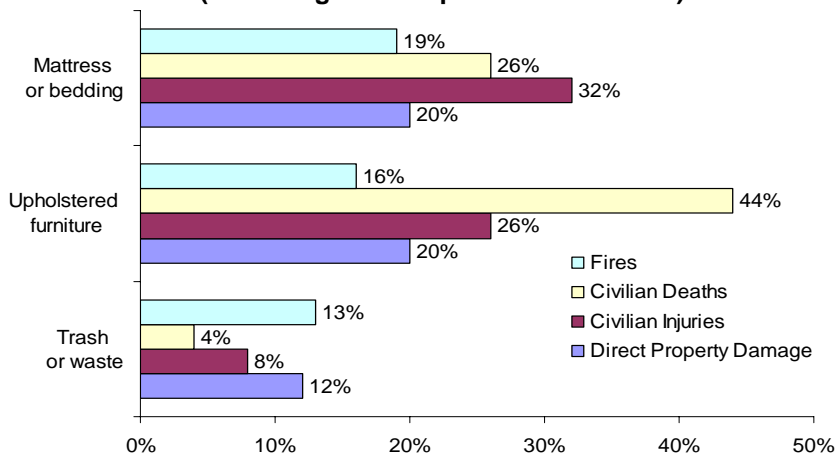


**FACT:** One out of four fatal victims of smoking-materials is not the smoker whose cigarette started the fire.



In recent years, Canada and nearly half of all U.S. states – including the three most populous – California, Texas, and New York – have required that all cigarettes sold must be “fire safe,” that is, have sharply reduced ignition strength or ability to start fires.

**Smoking-Material Fires in Homes, by Leading Item First Ignited in 2002-2005 (Excluding Fires Reported as Confined)**



**FACT:** More fatal smoking-material fires start in living rooms, family rooms, and dens



**FACT:** The risk of dying in a home structure fire caused by smoking materials rises with age.



## Fires Started by Smoking Materials

**In 2005, an estimated 82,400 smoking-material fires caused 800 civilian deaths, 1,660 civilian injuries and \$575 million in direct property damage.**

Fires started by smoking materials (i.e., lighted tobacco products but not matches or lighters) were down by 75% from 1980 to 2005 but were up from their low of 69,500 in 2004. Civilian deaths and injuries and associated property damage (adjusted for inflation) were also up from recent all-time lows but well down from 1980 levels. (See Table 1 and Figures 1-3.)

Smoking-material home structure fire injuries declined 69%, compared to a 32% decline for home structure fire injuries from all causes. Deaths per 100 smoking-material structure fires increased 11% from 1980-84 to 2001-05. The average severity in terms of civilian injuries per 100 fires decreased by 5% from 1980-84 to 2001-2005. (See Table 1 and Figures 1-5.)

**Smoking-related home structure fire deaths have declined faster than smoking itself.**

Table 2 shows that cigarette consumption declined by 39% from 1980 to 2005, but smoking-material home structure fire deaths declined 59%, and smoking-material home structure fire civilian deaths per million cigarettes declined by 31%. However, the rate of deaths relative to cigarette consumption have shown no consistent trend since the early 1990s.

**One-fourth of all 2005 U.S. structure fire deaths involved smoking materials.**

Smoking materials were by far the leading cause of civilian deaths in U.S. structure fires. One of every four civilian structure fire deaths (25%) in the U.S. in 2005 were attributed to smoking materials.

**The rate of cigarette structure fires per million cigarette smokers is higher than the rate of cigar or pipe structure fires per million cigar or pipe smokers by more than 10-to-1.**

In 2002-2005 home structure fires, excluding fires reported as confined fires, there were roughly 60 cigarette-started structure fires for every one started by a pipe or cigar. By contrast, current cigarette smokers age 12 and over outnumbered current cigar or pipe smokers age 12 and over by only 4- or 5-to-1 in 2002 and 2004.\*

**Standards have made mattresses and upholstered furniture more resistant to smoking-material ignition.**

Mattresses and bedding, upholstered furniture, and trash were the items most often ignited by smoking materials in home fires, and together they accounted for half of those fires, three-fourths of associated deaths, and two-thirds of associated injuries. (See Table 3.) Mattress or bedding accounted for the largest share of fires (19%) and the second largest share of associated deaths (26%). Upholstered furniture accounted for the second largest share of fires (16%) and the largest share of associated deaths (44%).

Table 3 shows the trend in smoking-material structure fires since 1980 for these three classes of items.

\*Statistical Abstract of the United States: 2007, Washington: U.S. Census Bureau, 2007, Table 194.

Smoking-related home fires starting in upholstered furniture and in mattresses and bedding have declined by 87% and 85%, respectively, from 1980 to 2005. A mandatory U.S. Standard for the

Flammability of Mattresses (and Mattress Pads), Title 16 CFR 1632, was enacted in 1973. A voluntary standard for upholstered furniture, the so-called "Upholstered Furniture Action Council (UFAC) standard," was introduced in the late 1970s and at that time was judged sufficiently substantial as to remove the need for a mandatory action.

The success of these two standards has been measured by studies of shifts in production toward less ignitable materials.\* Composite indices of the susceptibility to smoking-material ignitions for upholstered furniture and mattresses in use declined 18.4% and 36.1%, respectively, from 1980 to 1984, compared to declines of 37.8% and 35.1%, respectively, in the number of residential structure fires per billion cigarettes consumed beginning with ignition of these two types of items. This means the ignitability indices matched the decline in mattress fire rates quite well and the decline in upholstered furniture fire rates less well.

The gradual impact of these standards helps explain why the mattress, bedding and upholstered furniture share of home smoking-related fires has dropped so much (from 64% to 33% of fires, from 85% to 67% of fire deaths). (See Table 4.)

Items other than those targeted fuel sources (e.g., trash, clothing) have seen their smoking material fires decline substantially as well. It is possible that favorable changes affecting all smoking-material fires – the decline in the number of smokers, the growth in the use of smoke alarms – have had more of an impact than those changes that specifically targeted smoking-material-fires involving particular items (such as upholstered furniture and mattresses). It is possible that factors affecting fires of all causes, not just smoking materials, had more of an impact than factors specific to smoking-material fires. It is also possible that the full benefits from the targeted programs have yet to arrive.

#### **Most smoking-material structure fires and losses occur in homes.**

In 2002-2005, three-fourths of smoking-material fires (75%), excluding fires reported as confined fires, occurred in homes. These fires accounted for 94% of structure fire civilian deaths due to smoking materials, 87% of structure fire civilian injuries due to smoking materials, and 83% of direct property damage due to smoking-material structure fires. (See Table 5.)

#### **Nearly all home smoking-material fires are unintentional.**

Table 6A shows that only 3% of home smoking-material fires are intentional, and only 1% of associated deaths occur in intentional fires. Table 6B shows that only 1% of home smoking-material fires involve someone playing with the heat source.

The coding available on factor contributing to ignition does not have enough detail on the circumstances leading up to the fire to permit us to estimate even roughly how many smoking-material fires involve specific problems with inadequate ashtrays, poor placement or use of ashtrays, or use of some inappropriate substitute for disposal or storage of burning cigarettes or ashes. All that can be said is that most fires are attributed to some error in control or disposal.

\*See, for example, John R. Hall, Jr., *Final Report: Expected Changes in Fire Damages From Reducing Cigarette Ignition Propensity*, prepared for the Technical Study Group of the Cigarette Safety Act of 1984, Quincy: NFPA, July 16, 1987.

Three of the seven educational messages developed in the NFPA/USFA project on behavioral mitigation of smoking fires had to do with safe storage and disposal of burning cigarettes, butts, and ashes:\*

**Whenever you smoke, use deep, wide, sturdy ashtrays. Ashtrays should be set on something sturdy and hard to ignite, like an end table.**

**Before you throw out butts and ashes, make sure they are out. Dowsing in water or sand is the best way to do that.**

**Check under furniture cushions and in other places people smoke for cigarette butts that may have fallen out of sight.**

The PowerPoint presentations included with the project report on the U.S. Fire Administration website include many pictures of good vs. bad ashtrays, ashtray locations, and ways of using ashtrays.\*

**Sleeping is the primary human factor contributing to ignition cited for two-fifths (39%) of home smoking-material fire deaths.**

Possible drug in alcohol impairment was cited for 27% of the deaths. Table 6C indicates that only one-third (34%) of home smoking-material fires cited a human factor in the initiation of the fire (as opposed to a human factor in the injury suffered by a victim, which is discussed later). These are fires that did not say None under human factor. The fires that cited at least one human factor averaged 1.6 factors cited per fire. For fire deaths and injuries, roughly two-thirds (71% and 63%, respectively) cited at least one factor.

**Home smoking-related fire deaths are more likely to occur in fires that start in the living room, family room, or den than in the bedroom.**

Table 7 shows that these rooms together account for roughly two-thirds of home smoking-related fire deaths, but the combination of living rooms, family rooms and dens account for more fire deaths than bedrooms. Comparing Table 6C to Table 7 raises the question of how often a sleeping person is a human factor in fire initiation for fatal home smoking-material fires for different areas of origin.

Excluding fires reported as confined fires, 43% of 2002-2005 home smoking-material fire deaths from fires starting in a bedroom cite a sleeping person as a human factor contributing to ignition, while 40% of such fire deaths from fires starting in a living room, family room, or den cite a sleeping person.

Because there are more home smoking-material fire deaths in fires that begin in living rooms, family rooms, or dens (36%) than in bedrooms (31%), falling asleep and losing control of a lit cigarette leads to as many fire deaths in living rooms, family rooms, or dens (40% of 36% = 14%) as in bedrooms (43% of 31% = 13%). The same is not quite as true for drug or alcohol impairment, where the percentages are 37% for bedrooms and 23% for living room, family rooms, or dens.

\* John R. Hall, Jr., Marty Ahrens, Kimberly Rohr, Sharon Gamache, and Judy Comoletti, Behavioral Mitigation of Smoking Fires Through Strategies Based on Statistical Analysis, EME-2003-CA-0310, available from the U.S. Fire Administration at <http://www.usfa.dhs.gov/research/other/smoking-mitigation.shtm>, 2006.

These findings explain why educational messaging has moved away from the injunction not to smoke in bed in favor of a more broadly based message that reflects the diversity of actual fatal fire experience.\*

**To prevent a deadly cigarette fire, you have to be alert. You won't be if you are sleepy, have been drinking, or have taken medicine or other drugs.**

Outside locations – including exterior balcony or unenclosed porch; exterior wall; courtyard, patio, porch, or terrace (probably including unenclosed decks); exterior stairway; unclassified outside area; and exterior roof surface – collectively account for a substantial share of home smoking-material structure fires (24%) but a very small share of associated deaths (2%). This is not surprising, because outside locations have barriers separating them from the rest of the home, thereby preventing the easy spread of fire and fire effects to endanger the occupants. For this reason, the first listed educational message in the NFPA/USFA project on behavioral mitigation of smoking fires encouraged smoking outdoors:\*

**If you smoke, smoke outside.**

A 2003 survey by the U.S. Centers for Disease Control and Prevention found that 72% of all U.S. households ban indoor smoking (up from 43% in 1992-1993) and 32% of all households with at least one smoker ban indoor smoking (up from 10% in 1992-1993.\*\* For households with no smokers, the percentage banning indoor smoking was 84% (up from 57% in 1992-1993).

**Smoking-related home fires peak in frequency in late afternoon and early evening.**

Figure 6A shows these fires peaking during the late afternoon and early evening, but associated civilian fire deaths peak in the early morning (during 1:00 to 5:59 a.m.), which may suggest a long smoldering period for unnoticed, discarded cigarettes, which erupt into flames when no one is awake to discover them, and may suggest smoking when smokers are less alert due to drowsiness, drinking, or nighttime drugs.

As a share of all home fires, smoking-material fires vary from 5% to 9% by hour of the day. As a share of all home fire deaths, smoking-material fires vary considerably from hour to hour with little consistent variation by time of day. (See Figure 6B.)

**Smoking-related home fires and deaths peak during colder months, when people spend proportionally more time indoors and smokers may do much more of their smoking indoors.**

Figure 7 shows fires peaking in March and April while deaths peak in January through April. In those four months, cold temperatures are most likely to drive smokers indoors. This is further evidence of the potential benefit of educating smokers to smoke outside at home. January to

\*John R. Hall, Jr., Marty Ahrens, Kimberly Rohr, Sharon Gamache, and Judy Comoletti, Behavioral Mitigation of Smoking Fires Through Strategies Based on Statistical Analysis, EME-2003-CA-0310, available from the U.S. Fire Administration at <http://www.usfa.dhs.gov/research/other/smoking-mitigation.shtm>, 2006.

\*\* "State-specific prevalence of smoke-free home rules – United States, 1992-2003," *MMWR Weekly*, May 25, 2007, accessed at <http://www.cdc.gov> on September 11, 2007.

April (one-third of months) accounted for half the deaths. September to December (one-third of months) accounted for one-third of the deaths, right on the average. May to August (one-third of months), the warmest block of four months, accounted for one-fifth of the deaths.

**Tobacco products are also cited in 9,600 injuries a year reported to U.S. hospital emergency rooms.**

The total was 9,600 in 2006, according to the National Electronic Injury Surveillance System (NEISS), maintained by the U.S. Consumer Product Safety Commission (CPSC). Roughly half of the 2006 injuries (49%) were thermal burns, which could come from fire effects or direct contact. The next leading type of injury was poisoning (16%), presumably from swallowing tobacco. Children 4 years old or younger accounted for 22% of the injuries, which suggests educational messages to keep matches and lighters out of sight and out of reach of small children might usefully be expanded to include cigarettes.

**Canada's smoking-material fire problem may be larger proportionally than that of the U.S.**

Civilian deaths and injuries and direct property damage in smoking-material fires in U.S. are higher than those in Canada by roughly 3-to-1 to 5-to-1 while the U.S. population is nearly 9 times that of Canada. The proportion of people who smoke is slightly higher in Canada, by 1-4 percentage points, depending on the year and the studies used for comparison. Also, Canada's statistics include matches and lighters when used as smoker's materials. (See Table 8.)

The U.S. population is also slightly more than twice the population of Japan, while U.S. smoking-material fire deaths are more than three times those in Japan. The U.S. population is nearly five times the population of the United Kingdom, while U.S. home smoking-material fire deaths are also about five times the corresponding totals in the U.K.

**An important strategy centers on reduced ignition strength cigarettes.**

One of the seven educational messages developed in the NFPA/USFA project on behavioral mitigation of smoking fires had to do with reduced ignition strength cigarettes\*:

**If you smoke, choose fire-safe cigarettes. They are less likely to cause fires.**

See the sidebar on the next two pages for more on the fire-safe cigarette.

\* John R. Hall, Jr., Marty Ahrens, Kimberly Rohr, Sharon Gamache, and Judy Comoletti, Behavioral Mitigation of Smoking Fires Through Strategies Based on Statistical Analysis, EME-2003-CA-0310, available from the U.S. Fire Administration at <http://www.usfa.dhs.gov/research/other/smoking-mitigation.shtm>, 2006.

**Sidebar from the Coalition for Fire-Safe Cigarettes**  
at [www.firesafecigarettes.org](http://www.firesafecigarettes.org)

**What is a fire-safe cigarette?**

A fire-safe cigarette has a reduced propensity to burn when left unattended. The most common fire-safe technology used by cigarette manufacturers is to wrap cigarettes with two or three thin bands of less-porous paper that act as “speed bumps” to slow down a burning cigarette. If a fire-safe cigarette is left unattended, the burning tobacco will reach one of these speed bumps and self-extinguish.

Fire-safe cigarettes meet an established cigarette fire safety performance standard (based on ASTM E2187, Standard Test Method for Measuring the Ignition Strength of Cigarettes.)

**Is it possible for a “fire-safe” cigarette to ignite furniture or bedding?**

All cigarettes have the *potential* to ignite fires, but the use of “fire-safe” technology provides a tremendous reduction in those risks. A fire-safe cigarette cuts off the burning time before most cigarettes are able to ignite things like furniture or bedding material.

**MYTH:** Fire safe cigarettes are more toxic.

**FACT:** There is no evidence that reduced ignition propensity cigarettes are any more harmful to health. A report by RJ Reynolds conducted in 1993 compared the tar per cigarette in prototype low-ignition propensity cigarettes. The report concludes: “Ames assay results were not higher for the prototype cigarettes than their respective controls, either on a revertant-per-mg-tar basis or a revertant-per-cigarette basis.”

[A] Harvard School of Public Health study showed there were no substantial differences in toxicity when key indicators were measured for fire-safe cigarettes and their conventional counterparts. The report states, “The majority of smoke toxic compounds (14) tested were not different between New York and Massachusetts brands. Five compounds were slightly higher in New York brands. There is no evidence that these increases affect the already highly toxic nature of cigarette smoke.”

**MYTH:** People will behave carelessly with these fire-safe cigarettes.

**FACT:** Even tobacco industry documents show that people will remain careful with the new types. A 1991 report of focus groups prepared for RJ Reynolds on consumer behavior with fire-safe cigarettes concludes, “virtually all respondents said they would not alter their current smoking behavior.”

It goes against common sense to believe that people who have never before been reckless about how they smoke will suddenly become reckless because of a change in what they smoke. The millions of smokers who would like to be safer from fire should be given the tools that exist to save lives.

**Sidebar from the Coalition for Fire-Safe Cigarettes (Continued)**  
at [www.firesafecigarettes.org](http://www.firesafecigarettes.org)

**MYTH:** Cigarette sales dropped in New York State because of the new law that requires the sale of only fire-safe cigarettes.

**FACT:** The January 2005 Harvard School of Public Health study shows that no change in *per capita* cigarette sales occurred in New York when comparing the five months following their regulation compared with the corresponding time period the year before. The report found “New York has experienced no decline in cigarette sales or excise tax payments since the standard went into effect.” A 2.5% drop in cigarette revenue was “found not to be statistically significant when accounting for month-to-month and state-to-state variation.” In addition, because the price was not raised and many consumers have not even noticed the change, any decrease in sales would most likely be attributed to other factors, such as decreased smoking rates.

**MYTH:** State cigarette tax revenue will evaporate.

**FACT:** The Harvard School of Public Health researchers reviewed New York tax data for six months after the implementation of the new law. They found the lower ignition strength cigarettes appeared to have no effect on sales of cigarettes in New York. NASFM President and New York State Fire Administrator James A. Burns concurred with the analysis, saying the state has not lost revenue.

**MYTH:** The law discriminates against “mom and pop” retailers.

**FACT:** The New York requirement applies in all retail sales in the state, so there is no discrimination on the size of the retailer. The Harvard School of Public Health study found that cigarette sales in New York have not diminished since the new regulation has taken effect.

**Table 1. Fires Involving Smoking Materials, by Major Property Use and Year  
Fires Reported to U.S. Fire Departments**

**A. Fires**

Year	Homes	All Other Structures	Total Structures	Vehicles	Outdoor and Other	Total
1980	70,800	33,500	104,300	23,600	206,400	334,300
1981	64,700	30,900	95,600	20,900	217,600	334,000
1982	52,400	24,700	77,100	16,600	172,000	265,800
1983	45,300	21,500	66,800	14,500	146,500	227,800
1984	45,600	21,100	66,700	14,900	159,000	240,600
1985	44,900	21,600	66,500	14,500	167,300	248,300
1986	42,500	20,100	62,600	12,800	155,900	231,300
1987	39,800	18,900	58,700	13,500	159,800	231,900
1988	38,900	16,700	55,600	12,300	183,800	251,700
1989	34,000	14,600	48,700	10,200	149,000	207,900
1990	30,800	13,200	44,000	9,200	142,500	195,800
1991	29,900	12,700	42,600	8,300	136,200	187,100
1992	28,000	12,100	40,200	7,200	115,700	163,100
1993	27,200	11,400	38,600	6,800	106,500	151,900
1994	26,300	11,200	37,500	6,800	109,900	154,100
1995	25,400	10,100	35,400	7,500	110,400	153,400
1996	26,600	10,900	37,600	8,900	123,100	169,500
1997	23,300	9,800	33,100	6,900	97,000	136,900
1998	23,200	10,100	33,200	6,700	100,900	140,800
1999	29,500 (28,800)	10,500 (9,200)	40,000 (38,100)	7,000	147,700	194,700
2000	22,200 (21,500)	8,500 (7,300)	30,700 (28,800)	7,000	77,600	115,300
2001	22,000 (21,000)	8,400 (7,300)	30,500 (28,400)	5,700	55,000	91,100
2002	23,400 (21,700)	8,800 (7,300)	32,300 (29,000)	5,300	51,200	88,800
2003	22,500 (21,000)	7,600 (6,700)	30,100 (27,700)	5,200	34,500	69,900
2004	22,700 (20,900)	7,500 (6,600)	30,100 (27,500)	4,900	34,500	69,500
2005	21,700 (20,000)	9,400 (6,700)	31,100 (26,700)	5,000	46,200	82,400

Note: Numbers in parentheses exclude fires reported as confined (to trash container, heating or cooking equipment, incinerator or trash compactor); these 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. Figures include a proportional share of fires with heat source unknown or unknown between smoking material and open flame. *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 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 1. Fires Involving Smoking Materials, by Major Property Use and Year  
Fires Reported to U.S. Fire Departments (Continued)**

**B. Civilian Deaths**

Year	Homes	All Other Structures	Total Structures	Vehicles	Outdoor or Other	Total
1980	1,820	150	1,960	20	0	1,980
1981	1,980	210	2,190	20	0	2,210
1982	1,680	80	1,760	30	0	1,790
1983	1,510	90	1,600	20	10	1,620
1984	1,480	110	1,590	10	0	1,600
1985	1,580	110	1,690	20	0	1,700
1986	1,350	100	1,460	30	0	1,490
1987	1,380	80	1,460	30	0	1,490
1988	1,570	70	1,640	20	0	1,660
1989	1,190	50	1,240	20	0	1,270
1990	1,150	70	1,220	30	0	1,250
1991	880	60	930	10	0	950
1992	1,000	60	1,060	10	0	1,070
1993	980	40	1,020	10	0	1,030
1994	840	60	900	0	0	910
1995	1,040	70	1,110	10	10	1,120
1996	1,090	60	1,150	30	10	1,180
1997	870	40	900	10	0	920
1998	850	30	880	20	0	900
1999	830 (830)	80 (80)	920 (920)	0	0	920
2000	890 (890)	10 (10)	900 (900)	30	0	920
2001	770 (770)	80 (80)	850 (850)	10	0	860
2002	620 (620)	10 (10)	630 (630)	20	0	650
2003	690 (690)	70 (70)	760 (760)	0	0	760
2004	710 (710)	40 (40)	750 (750)	10	0	770
2005	740 (740)	40 (40)	780 (780)	20	0	800

Note: Numbers in parentheses exclude fires reported as confined (to trash container, heating or cooking equipment, incinerator or trash compactor); these 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. Figures include a proportional share of fires with heat source unknown or unknown between smoking material and open flame. *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 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 1. Fires Involving Smoking Materials, by Major Property Use and Year  
Fires Reported to U.S. Fire Departments (Continued)**

**C. Civilian Injuries**

Year	Homes	All Other Structures	Total Structures	Vehicles	Outdoor or Other	Total	
1980	4,190	870	5,050	160	70	5,280	
1981	4,030	1,140	5,160	160	110	5,430	
1982	3,710	640	4,350	230	120	4,700	
1983	3,680	770	4,450	130	40	4,620	
1984	3,340	540	3,880	150	70	4,100	
1985	3,330	440	3,770	160	60	4,000	
1986	2,980	460	3,440	160	50	3,640	
1987	3,100	520	3,620	150	40	3,810	
1988	3,570	610	4,170	110	70	4,350	
1989	2,970	430	3,400	120	30	3,560	
1990	2,930	430	3,360	120	50	3,530	
1991	2,730	490	3,220	100	60	3,380	
1992	2,740	360	3,100	70	70	3,230	
1993	2,850	470	3,320	50	70	3,450	
1994	2,380	440	2,820	110	60	2,990	
1995	2,230	270	2,500	90	80	2,660	
1996	2,480	300	2,780	70	80	2,930	
1997	1,990	350	2,330	90	60	2,480	
1998	2,010	280	2,290	100	70	2,450	
1990	2,040	(1,980)	480 (480)	2,520 (2,460)	140	80	2,740
2000	2,090	(2,090)	230 (230)	2,320 (2,320)	50	100	2,480
2001	1,450	(1,440)	200 (210)	1,650 (1,640)	50	70	1,780
2002	1,350	(1,340)	210 (200)	1,570 (1,550)	60	50	1,670
2003	1,400	(1,380)	180 (170)	1,580 (1,560)	60	30	1,670
2004	1,300	(1,290)	220 (220)	1,520 (1,520)	30	40	1,600
2005	1,300	(1,270)	210 (210)	1,520 (1,480)	110	30	1,660

Note: Numbers in parentheses exclude fires reported as confined (to trash container, heating or cooking equipment, incinerator or trash compactor); these 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. Figures include a proportional share of fires with heat source unknown or unknown between smoking material and open flame. *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 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 1. Fires Involving Smoking Materials, by Major Property Use and Year  
Fires Reported to U.S. Fire Departments (Continued)**

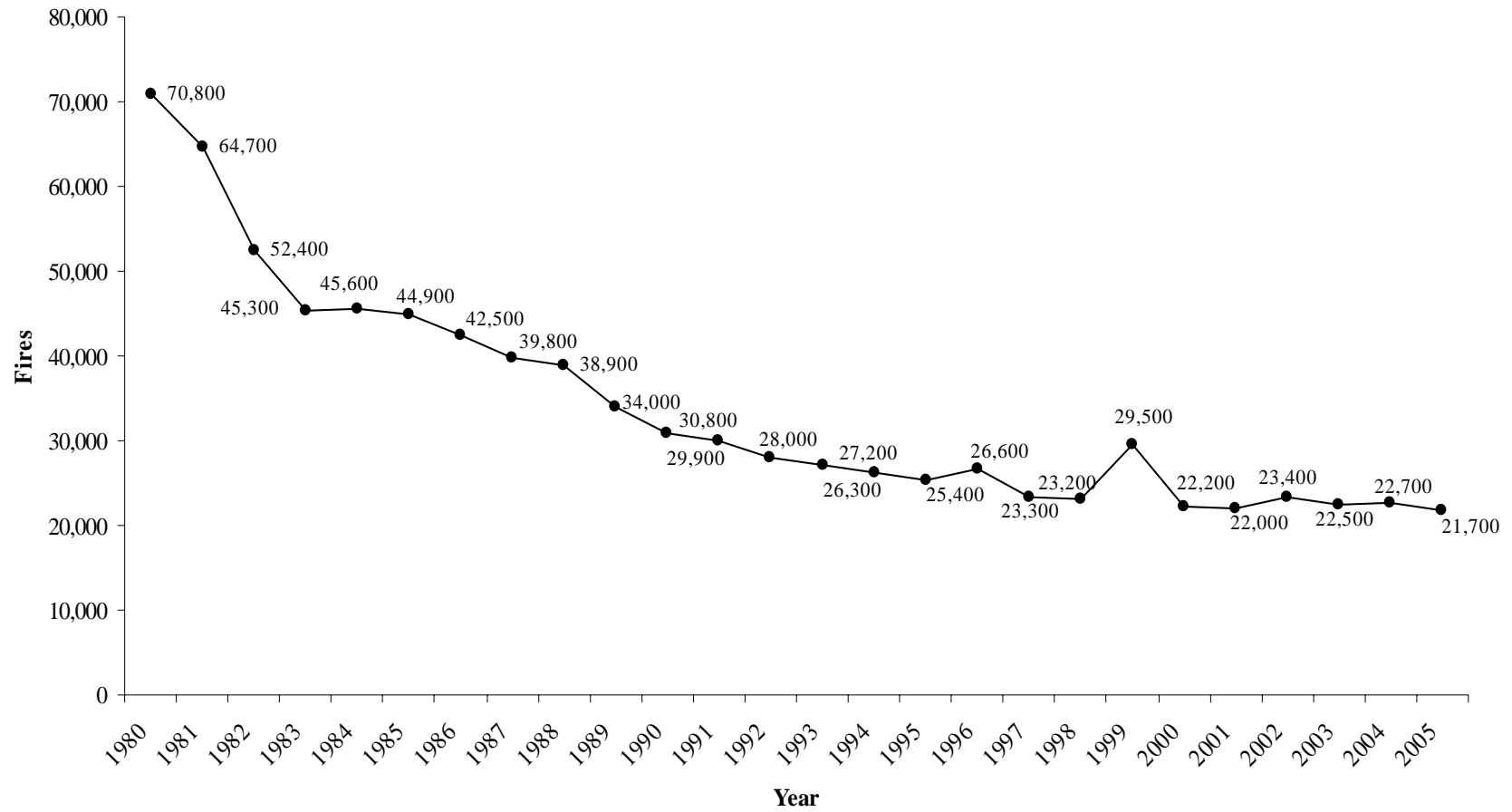
**D. Direct Property Damage (in Millions)**

Year	Homes	All Other Structures		Structures	Vehicles		Outdoor or Other	Total	Total in 2005 Dollars	
1980	\$314	\$161		\$474	\$20		\$4	\$498	\$1,183	
1981	\$307	\$118		\$424	\$15		\$8	\$447	\$959	
1982	\$332	\$76		\$408	\$20		\$1	\$430	\$869	
1983	\$266	\$90		\$356	\$13		\$3	\$372	\$730	
1984	\$310	\$78		\$388	\$16		\$7	\$410	\$770	
1985	\$304	\$106		\$409	\$9		\$3	\$422	\$765	
1986	\$301	\$87		\$388	\$10		\$2	\$401	\$714	
1987	\$282	\$97		\$379	\$13		\$3	\$395	\$679	
1988	\$300	\$127		\$427	\$13		\$3	\$443	\$732	
1989	\$276	\$187		\$464	\$14		\$3	\$481	\$758	
1990	\$320	\$80		\$400	\$14		\$11	\$425	\$636	
1991	\$398	\$136		\$535	\$16		\$2	\$553	\$792	
1992	\$231	\$72		\$303	\$9		\$6	\$318	\$443	
1993	\$300	\$79		\$379	\$10		\$2	\$391	\$529	
1994	\$294	\$100		\$395	\$13		\$8	\$416	\$548	
1995	\$308	\$176		\$483	\$19		\$4	\$507	\$649	
1996	\$316	\$116		\$432	\$17		\$3	\$452	\$563	
1997	\$320	\$100		\$420	\$12		\$5	\$437	\$531	
1998	\$308	\$69		\$377	\$21		\$13	\$412	\$494	
1999	\$418	(\$416)	\$213	(\$207)	\$631	(\$624)	\$19	\$4	\$653	\$766
2000	\$492	(\$491)	\$182	(\$182)	\$673	(\$673)	\$19	\$3	\$695	\$789
2001	\$366	(\$366)	\$74	(\$73)	\$440	(\$439)	\$16	\$3	\$459	\$506
2002	\$396	(\$395)	\$94	(\$93)	\$490	(\$488)	\$17	\$1	\$508	\$552
2003	\$405	(\$403)	\$78	(\$77)	\$483	(\$480)	\$18	\$8	\$510	\$541
2004	\$370	(\$370)	\$68	(\$66)	\$438	(\$436)	\$19	\$4	\$461	\$477
2005	\$459	(\$458)	\$97	(\$97)	\$556	(\$555)	\$16	\$3	\$575	\$575

Note: Numbers in parentheses exclude fires reported as confined (to trash container, heating or cooking equipment, incinerator or trash compactor); these 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. Figures include a proportional share of fires with heat source unknown or unknown between smoking material and open flame. *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.*

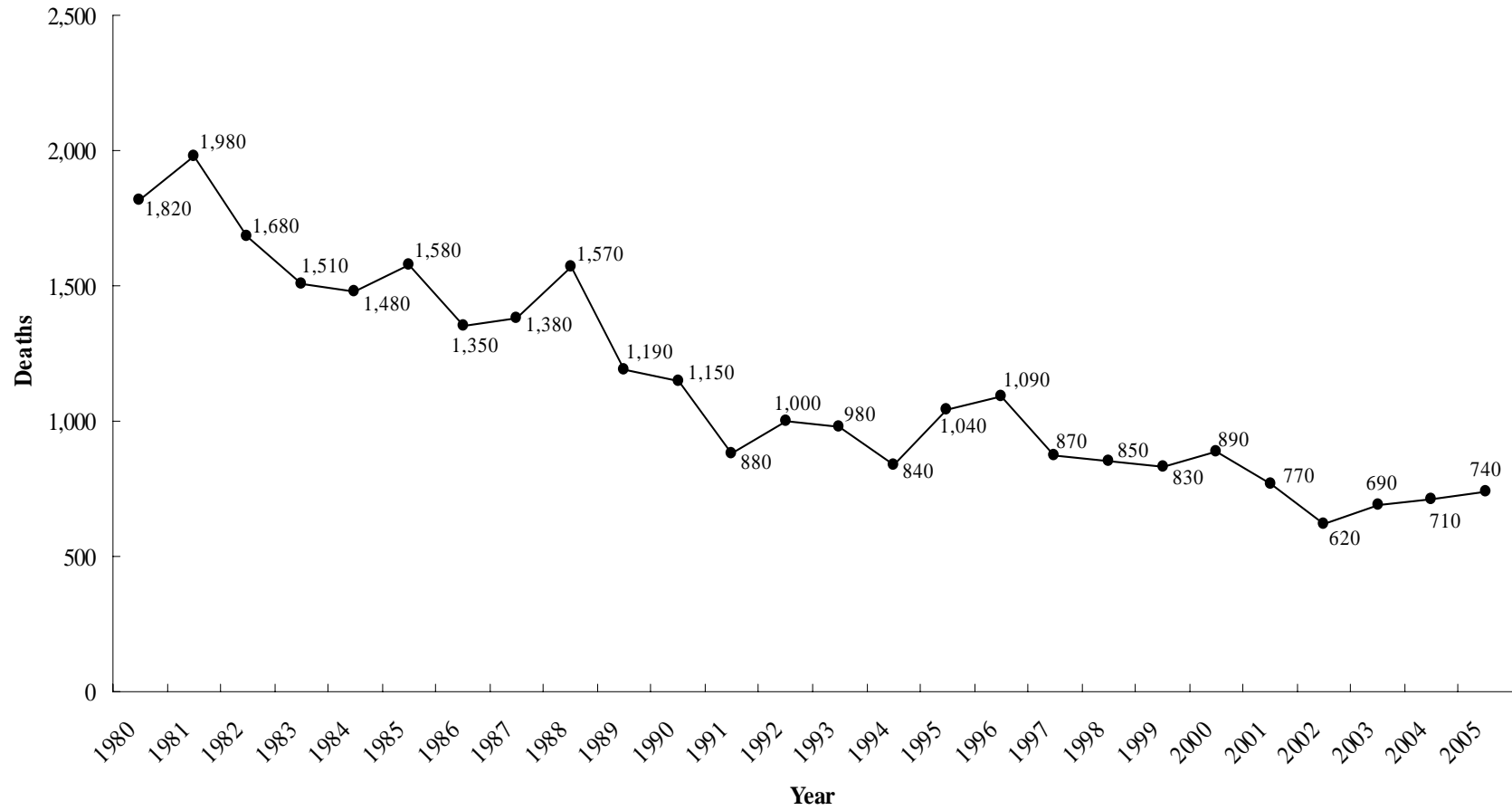
Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Figure 1. Trend in U.S. Smoking-Material Home Fires**



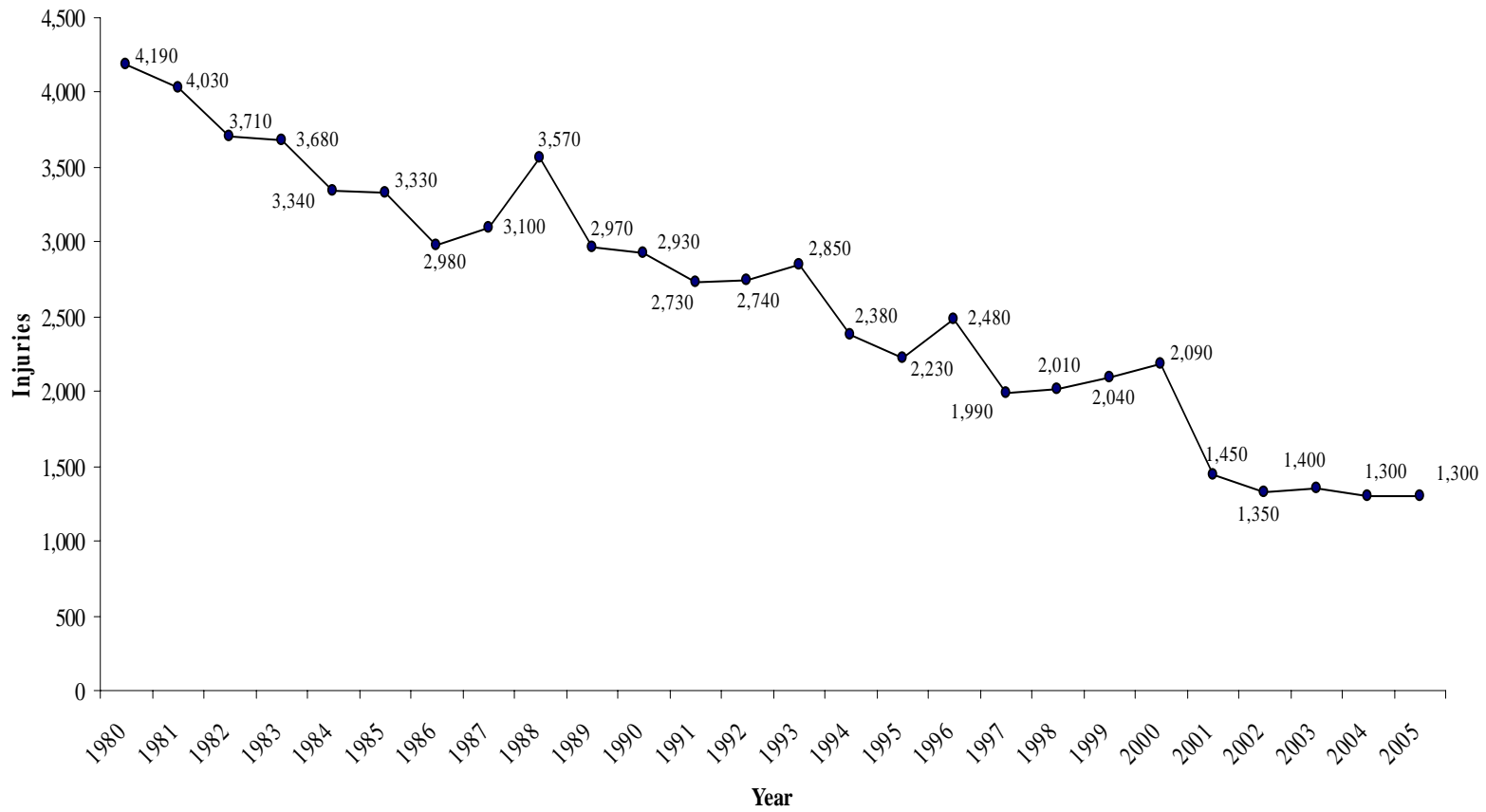
Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Figure 2. Trend in Civilian Deaths in U.S. Smoking-Material Home Fire**



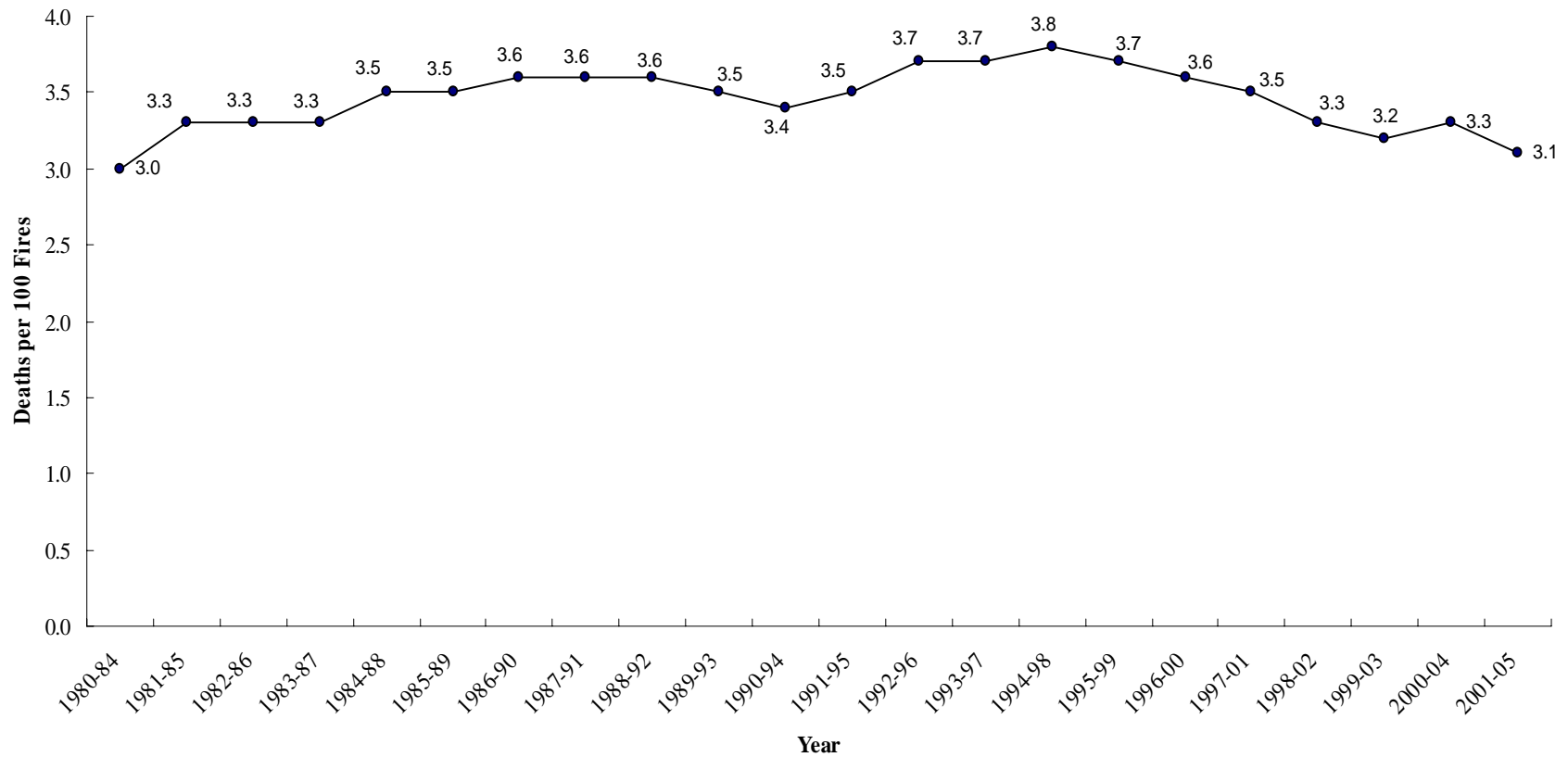
Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Figure 3. Trend in Civilian Injuries in U.S. Smoking-Material Home Fires**



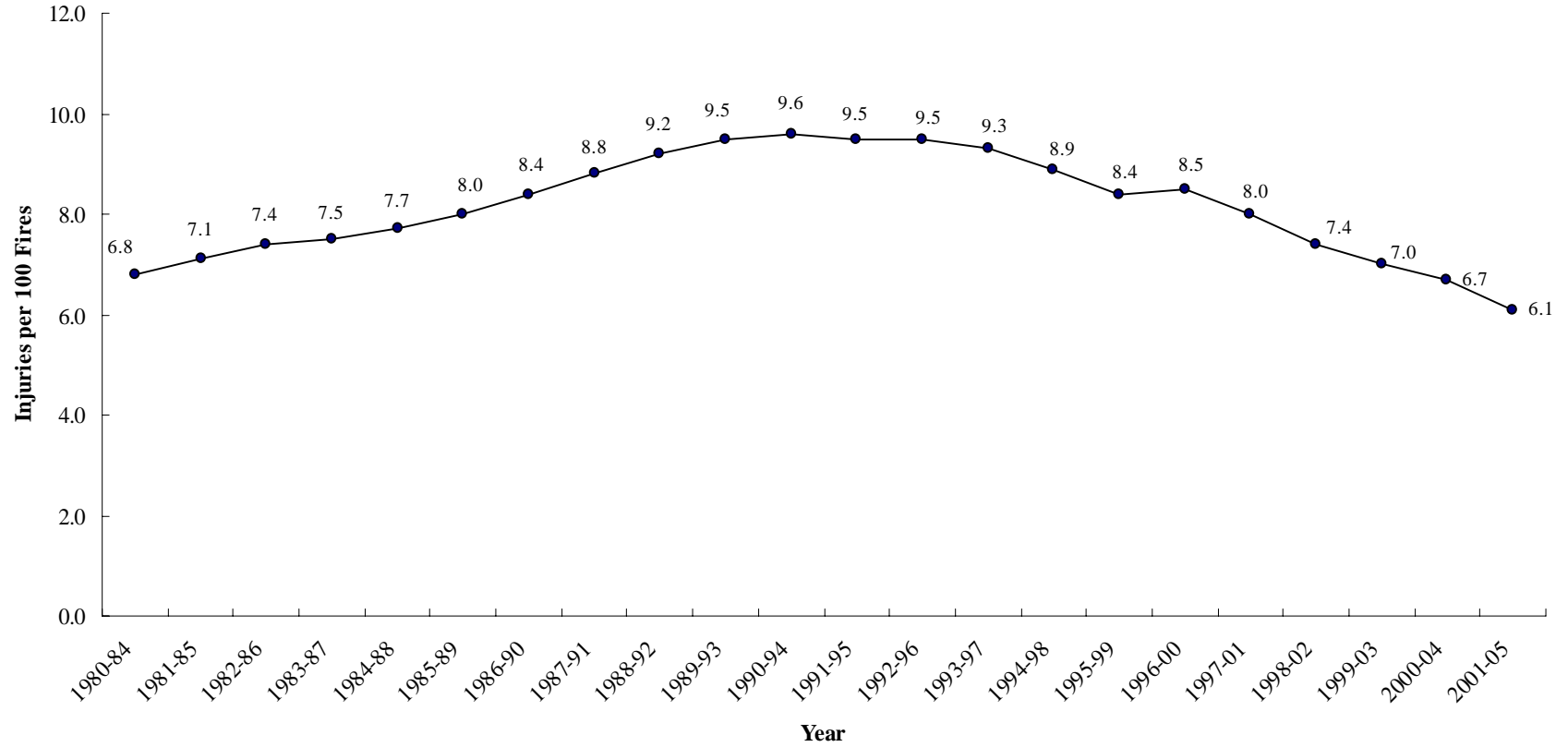
Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Figure 4. Trend in Civilian Deaths per 100 U.S. Smoking-Material Home Fires (Five-Year Rolling Averages)**



Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Figure 5. Trend in Civilian Injuries per 100 Smoking-Material Home Fires (Five-Year Rolling Averages)**



Source: Data from NFIRS Version 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 2. Cigarette Consumption and Related Home Fire Loss Rates, by Year**

<b>Year</b>	<b>Home Fires</b>	<b>Home Fire Deaths</b>	<b>Cigarettes Consumed (Billions)</b>	<b>Fires per Billion Cigarettes</b>	<b>Deaths per Billion Cigarettes</b>
1980	70,800	1,820	619	114	2.9
1981	64,700	1,980	628	103	3.1
1982	52,400	1,680	624	84	2.7
1983	45,300	1,510	596	76	2.5
1984	45,600	1,480	600	76	2.5
1985	44,900	1,580	595	76	2.7
1986	42,500	1,350	583	73	2.3
1987	39,800	1,380	577	69	2.4
1988	38,900	1,570	550	71	2.8
1989	34,000	1,190	540	63	2.2
1990	30,800	1,150	525	59	2.2
1991	29,900	880	510	59	1.7
1992	28,000	1,000	500	56	2.0
1993	27,200	980	485	56	2.0
1994	26,300	840	486	54	1.7
1995	25,400	1,040	487	52	2.1
1996	26,600	1,090	487	55	2.2
1997	23,300	870	480	49	1.8
1998	23,200	850	465	50	1.8
1999	29,500	830	435	68	1.9
2000	22,200	890	430	52	2.1
2001	22,000	770	425	52	1.8
2002	23,400	620	415	56	1.5
2003	22,500	690	400	56	1.7
2004	22,700	710	388	58	1.8
2005	21,700	740	376	58	2.0

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 and civilian deaths to the nearest ten. Fire statistics include a proportional share of fires with heat source unknown or unknown between smoking material and open flame source.

Source: National estimates based on NFIRS and NFPA Survey; "Table 1 – Cigarettes: U.S. output, removals, and consumption, 1996-2006," U.S. Department of Agriculture website, [www.ers.usda.gov/briefing/tobacco/Data/table01.pdf](http://www.ers.usda.gov/briefing/tobacco/Data/table01.pdf), accessed August 2007.

**Table 3. Smoking-Material Fires in Homes, by Item First Ignited**  
**Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments**  
**(Excluding Fires Reported as Confined Fires)**

Item	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage	
							(in Millions)	
Mattress or bedding	3,900	(19%)	180	(26%)	420	(32%)	\$81	(20%)
Upholstered furniture	3,300	(16%)	300	(44%)	340	(26%)	\$82	(20%)
Trash or waste	2,600	(13%)	30	(4%)	110	(8%)	\$50	(12%)
Exterior wall covering	1,100	(5%)	0	(0%)	20	(1%)	\$22	(5%)
Unclassified furniture or utensil	1,000	(5%)	40	(5%)	90	(7%)	\$26	(6%)
Structural member or framing	900	(4%)	0	(0%)	10	(0%)	\$7	(2%)
Clothing	700	(3%)	30	(5%)	40	(3%)	\$6	(2%)
Unclassified item first ignited	700	(3%)	10	(1%)	30	(3%)	\$9	(2%)
Floor covering	700	(3%)	20	(3%)	50	(4%)	\$10	(2%)
Unclassified organic material	700	(3%)	0	(1%)	10	(1%)	\$20	(5%)
Box or bag	500	(3%)	0	(0%)	20	(2%)	\$14	(4%)
Papers	500	(3%)	10	(1%)	40	(3%)	\$12	(3%)
Light vegetation, including grass	500	(3%)	0	(0%)	0	(0%)	\$9	(2%)
Exterior trim, including doors	500	(3%)	0	(0%)	0	(0%)	\$4	(1%)
Unclassified structural component or finish	500	(2%)	0	(0%)	0	(0%)	\$5	(1%)
Unclassified soft goods or clothing	300	(1%)	10	(1%)	20	(1%)	\$3	(1%)
Multiple items first ignited	300	(1%)	10	(2%)	10	(1%)	\$11	(3%)
Flammable or combustible liquid or gas	300	(1%)	20	(3%)	40	(3%)	\$10	(2%)
Linen other than bedding	200	(1%)	0	(0%)	10	(1%)	\$1	(0%)
Interior wall covering	200	(1%)	0	(0%)	10	(1%)	\$2	(1%)
Chips, including wood chips	200	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Cabinetry	100	(1%)	10	(1%)	0	(0%)	\$3	(1%)
Exterior roof covering	100	(1%)	0	(0%)	0	(0%)	\$2	(1%)
Insulation within structural area	100	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Other known item first ignited	1,000	(5%)	10	(2%)	50	(4%)	\$12	(3%)
<b>Total excluding fires reported as confined fires</b>	<b>20,900</b>	<b>(100%)</b>	<b>690</b>	<b>(100%)</b>	<b>1,320</b>	<b>(100%)</b>	<b>\$406</b>	<b>(100%)</b>

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 direct property damage to the nearest million dollars. Damage has not been adjusted for inflation. Figures include a proportional share of fires with heat source unknown, fires unknown between smoking material and open flame source, and smoking-material fires with unknown item first ignited. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 4. Trend in Leading Materials First Ignited in Home Smoking-Material Fires, 1980-2005  
Structure Fires Reported to U.S. Fire Departments  
(Excluding Fires Reported as Confined Fires)**

**A. Fires**

<b>Year</b>	<b>Mattress or Bedding</b>	<b>Upholstered Furniture</b>	<b>Trash</b>	<b>Clothing</b>	<b>All Other Items</b>	<b>Percentage That Are Not Mattress, Bedding, or Upholstered Furniture</b>
1980	24,200	21,500	11,200	1,900	12,000	36%
1981	22,100	20,100	10,200	2,000	10,200	35%
1982	17,900	15,800	8,300	1,500	8,900	36%
1983	16,000	13,100	7,100	1,400	7,700	36%
1984	15,500	13,000	7,300	1,200	8,600	37%
1985	15,800	12,000	7,000	1,300	8,800	38%
1986	14,600	11,300	6,700	1,300	8,600	39%
1987	13,300	10,500	6,400	1,200	8,400	40%
1988	12,500	10,100	6,400	1,300	8,600	42%
1989	11,200	8,600	5,400	1,100	7,700	42%
1990	9,500	7,800	5,300	1,100	7,100	44%
1991	9,000	7,300	4,800	1,200	7,600	45%
1992	8,600	6,500	4,500	1,100	7,300	46%
1993	7,900	6,200	4,500	1,100	7,500	48%
1994	7,400	5,900	4,300	1,000	7,800	50%
1995	6,500	5,700	4,100	1,100	8,000	52%
1996	6,600	5,300	4,400	1,100	9,100	55%
1997	5,400	4,700	3,700	1,000	8,400	56%
1998	5,500	4,600	3,700	1,000	8,400	56%
1999	5,800	3,700	5,100	800	13,400	67%
2000	3,800	3,700	3,200	1,000	9,700	65%
2001	4,200	4,100	2,900	800	9,100	61%
2002	4,300	3,400	2,700	700	10,700	65%
2003	3,800	3,400	2,700	800	10,300	66%
2004	3,900	3,500	2,400	700	10,400	65%
2005	3,600	2,900	2,600	700	10,100	67%

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. Figures include a proportional share of fires with heat source unknown, fires unknown between smoking material and open flame source, and smoking-material fires with unknown item first ignited. *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 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 4. Trend in Leading Materials First Ignited in Home Smoking-Material Fires, 1980-2005  
Structure Fires Reported to U.S. Fire Departments (Continued)  
(Excluding Fires Reported as Confined Fires)**

**B. Civilian Deaths**

<b>Year</b>	<b>Mattress or Bedding</b>	<b>Upholstered Furniture</b>	<b>Trash</b>	<b>Clothing</b>	<b>All Other Items</b>	<b>Percentage That Are Not Mattress, Bedding, or Upholstered Furniture</b>
1980	520	1,030	10	70	180	15%
1981	550	1,090	110	80	150	17%
1982	480	960	40	40	150	14%
1983	490	800	50	60	100	14%
1984	380	910	20	30	150	13%
1985	510	740	80	60	180	20%
1986	350	740	30	40	190	20%
1987	370	680	40	70	220	24%
1988	450	820	60	50	180	19%
1989	350	670	20	30	120	15%
1990	320	590	50	40	150	21%
1991	280	450	30	20	90	16%
1992	300	480	30	60	140	22%
1993	340	460	30	20	130	18%
1994	200	400	30	40	160	28%
1995	270	490	50	60	170	27%
1996	350	450	30	70	190	27%
1997	200	440	20	70	130	25%
1998	250	410	20	60	120	23%
1999	200	290	50	0	290	41%
2000	230	310	40	120	190	39%
2001	250	290	30	50	150	30%
2002	200	250	10	30	120	27%
2003	180	320	30	30	130	27%
2004	170	320	40	40	140	31%
2005	190	310	20	30	190	33%

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. Civilian deaths are rounded to the nearest ten. Figures include a proportional share of fires with heat source unknown, fires unknown between smoking material and open flame source, and smoking-material fires with unknown item first ignited. *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 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 4. Trend in Leading Materials First Ignited in Home Smoking-Material Fires, 1980-2005  
Structure Fires Reported to U.S. Fire Departments (Continued)  
(Excluding Fires Reported as Confined Fires)**

**C. Civilian Injuries**

<b>Year</b>	<b>Mattress or Bedding</b>	<b>Upholstered Furniture</b>	<b>Trash</b>	<b>Clothing</b>	<b>All Other Items</b>	<b>Percentage That Are Not Mattress, Bedding, or Upholstered Furniture</b>
1980	1,410	1,910	190	120	560	21%
1981	1,420	1,810	210	110	470	20%
1982	1,260	1,680	250	80	430	21%
1983	1,370	1,670	200	100	330	17%
1984	1,200	1,420	200	80	440	21%
1985	1,210	1,410	200	90	430	21%
1986	1,110	1,230	220	60	370	22%
1987	1,150	1,270	190	90	390	22%
1988	1,300	1,400	210	120	540	24%
1989	1,070	1,090	200	110	500	27%
1990	1,100	1,170	220	80	370	22%
1991	990	1,020	140	130	460	26%
1992	1,170	810	170	140	450	28%
1993	1,020	990	200	80	570	30%
1994	800	860	250	90	380	31%
1995	720	800	130	60	520	32%
1996	780	880	150	190	470	33%
1997	710	650	150	70	400	32%
1998	660	690	140	60	460	33%
1999	920	210	0	0	850	43%
2000	810	510	100	70	610	37%
2001	470	450	110	70	330	36%
2002	360	290	180	30	480	51%
2003	440	380	120	50	390	40%
2004	440	310	100	30	410	42%
2005	410	360	70	50	380	39%

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. Civilian injuries are rounded to the nearest ten. Figures include a proportional share of fires with heat source unknown, fires unknown between smoking material and open flame source, and smoking-material fires with unknown item first ignited. *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 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 4. Trend in Leading Materials First Ignited in Home Smoking-Material Fires, 1980-2005  
Structure Fires Reported to U.S. Fire Departments (Continued)  
(Excluding Fires Reported as Confined Fires)**

**D. Direct Property Damage (in Millions)**

<b>Year</b>	<b>Mattress or Bedding</b>	<b>Upholstered Furniture</b>	<b>Trash</b>	<b>Clothing</b>	<b>All Other Items</b>	<b>Percentage That Are Not Mattress, Bedding, or Upholstered Furniture</b>
1980	\$82	\$124	\$27	\$38	\$43	34%
1981	\$87	\$129	\$32	\$10	\$49	30%
1982	\$75	\$185	\$28	\$6	\$38	22%
1983	\$82	\$106	\$27	\$8	\$44	30%
1984	\$86	\$125	\$31	\$15	\$52	32%
1985	\$101	\$119	\$26	\$7	\$51	28%
1986	\$87	\$115	\$31	\$8	\$60	33%
1987	\$71	\$101	\$33	\$6	\$70	39%
1988	\$89	\$109	\$30	\$9	\$63	34%
1989	\$84	\$104	\$28	\$6	\$55	32%
1990	\$78	\$136	\$35	\$8	\$63	33%
1991	\$105	\$116	\$34	\$12	\$130	44%
1992	\$70	\$73	\$24	\$7	\$58	38%
1993	\$93	\$96	\$30	\$7	\$73	37%
1994	\$69	\$101	\$31	\$13	\$81	42%
1995	\$77	\$106	\$32	\$8	\$85	41%
1996	\$76	\$92	\$37	\$10	\$100	47%
1997	\$69	\$84	\$42	\$10	\$115	52%
1998	\$71	\$86	\$32	\$10	\$109	49%
1999	\$84	\$111	\$51	\$5	\$166	53%
2000	\$133	\$103	\$62	\$30	\$164	52%
2001	\$69	\$109	\$44	\$9	\$134	51%
2002	\$90	\$72	\$61	\$5	\$167	59%
2003	\$82	\$79	\$45	\$9	\$188	60%
2004	\$86	\$75	\$39	\$5	\$165	57%
2005	\$71	\$99	\$58	\$7	\$224	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. Direct property damage is rounded to the nearest million dollars. Damage has not been adjusted for inflation. Figures include a proportional share of fires with heat source unknown, fires unknown between smoking material and open flame source, and smoking-related material fires with unknown item first ignited. Totals may not equal sums because of rounding. *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 4.1 (1980-1998) and Version 5.0 (1999-2005) and from NFPA survey.

**Table 5. Smoking-Material Structure Fires, by Property Use**  
**Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments**  
**(Excluding Fires Reported as Confined Fires)**

Property Use	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage (in Millions)	
	Count	(%)	Count	(%)	Count	(%)	Count	(%)
HOMES (including one- or two-family dwellings and apartments)	20,900	(75%)	690	(94%)	1,320	(87%)	\$406	(83%)
One- or two-family dwelling, including manufactured home	14,100	(51%)	500	(68%)	800	(53%)	\$255	(52%)
Apartment	6,800	(25%)	190	(26%)	520	(34%)	\$151	(31%)
Unclassified residential property	700	(2%)	10	(2%)	30	(2%)	\$10	(2%)
Unclassified storage property	600	(2%)	0	(0%)	10	(1%)	\$3	(1%)
Eating or drinking place	600	(2%)	0	(0%)	0	(0%)	\$8	(2%)
Hotel or motel	500	(2%)	0	(0%)	40	(3%)	\$6	(1%)
Boarding house or residential hotel	400	(1%)	10	(2%)	40	(2%)	\$6	(1%)
Vehicle storage facility	400	(1%)	0	(0%)	10	(1%)	\$5	(1%)
Office building	400	(1%)	0	(0%)	0	(0%)	\$7	(1%)
Grocery or convenience store	200	(1%)	0	(0%)	0	(0%)	\$4	(1%)
Manufacturing or processing facility	200	(1%)	0	(0%)	0	(0%)	\$3	(1%)
Nursing home or residential board and care facility	200	(1%)	0	(0%)	20	(1%)	\$1	(0%)
Unclassified store or office	200	(1%)	0	(0%)	0	(0%)	\$4	(1%)
Dormitory, fraternity or sorority house, or barracks	200	(1%)	0	(0%)	10	(1%)	\$3	(1%)
Warehouse	100	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Other known property use	2,100	(8%)	0	(0%)	30	(2%)	\$21	(4%)
None or unknown	100	(1%)	0	(0%)	10	(0%)	\$1	(0%)
<b>Total excluding fires reported as confined fires</b>	<b>27,700</b>	<b>(100%)</b>	<b>730</b>	<b>(100%)</b>	<b>1,520</b>	<b>(100%)</b>	<b>\$490</b>	<b>(100%)</b>

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. Property damage figures have not been adjusted for inflation. Fire statistics include a proportional share of fires with heat source unknown and fires unknown between smoking material and open flame source. Totals may not equal sums because of rounding. Home and non-home statistics calculated separately.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 6. Cause-Related Factors in Smoking-Material Home Fires  
Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments  
(Excluding Fires Reported as Confined Fires)**

**A. Cause**

Cause	Fires	Civilian Deaths	Civilian Injuries	Direct Property Damage (in Millions)
Unintentional	19,700 (94%)	680 (98%)	1,270 (96%)	\$384 (94%)
Intentional	600 (3%)	10 (1%)	40 (3%)	\$14 (3%)
Unclassified cause	400 (2%)	0 (1%)	10 (1%)	\$7 (2%)
Failure of equipment or heat source	100 (1%)	0 (0%)	0 (0%)	\$2 (0%)
Act of nature	0 (0%)	0 (0%)	0 (0%)	\$0 (0%)
Total excluding fires reported as confined fire	20,900 (100%)	690 (100%)	1,320 (100%)	\$406 (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 hundred, civilian deaths and civilian injuries are expressed to the nearest ten and property damage is rounded to the nearest million dollars. Damage has not been adjusted for inflation. Figures include a proportional share of fires with heat source unknown, or unknown between smoking material and open flame, and smoking-material fires with cause unknown or under investigation. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 6. Cause-Related Factors in Smoking-Material Home Fires  
Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments (Continued)  
(Excluding Fires as Confined Fires)**

**B. Factor Contributing to Ignition**

Factor Contributing to Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage	
							(in Millions)	
Abandoned or discarded material	13,800	(66%)	380	(56%)	700	(53%)	\$281	(69%)
Unclassified misuse of material	3,600	(17%)	140	(20%)	330	(25%)	\$60	(15%)
Heat source too close to combustibles	1,800	(9%)	110	(17%)	210	(16%)	\$40	(10%)
Unclassified factor contributed to ignition	1,100	(5%)	50	(8%)	80	(6%)	\$23	(6%)
Improper container or storage	400	(2%)	0	(0%)	10	(1%)	\$5	(1%)
Playing with heat source	200	(1%)	0	(0%)	0	(0%)	\$2	(1%)
High wind	100	(1%)	0	(0%)	0	(0%)	\$4	(1%)
Other known factor contributing to ignition	800	(4%)	40	(6%)	40	(3%)	\$15	(4%)
Total excluding fires reported as confined fires	20,900	(100%)	690	(100%)	1,320	(100%)	\$406	(100%)
Total factor entries	21,800	(104%)	740	(107%)	1,380	(105%)	\$431	(106%)

Note: Multiple factor entries are allowed, which is why the number of factor entries is greater than the number of 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 hundred, civilian deaths and civilian injuries are expressed to the nearest ten and property damage is rounded to the nearest million dollars. Damage has not been adjusted for inflation. Figures include a proportional share of fires with heat source unknown, or unknown between smoking material and open flame source, and smoking-material fires with factor contributing to ignition unknown, blank, none, or not reported. Multiple entries are possible, which is why there are more total entries than total fires. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 6. Cause-Related Factors in Smoking-Material Home Fires  
Annual Average of 2002-2005 Structure Fires Reported to U.S Fire Departments (Continued)  
(Excluding Fires Reported as Confined Fires)**

**C. Human Factor Contributing to Ignition**

Human Factor Contributing to Ignition	Fires		Civilian Deaths		Civilian Injuries		Direct Property Damage	
							(in Millions)	
Asleep	3,000	(14%)	270	(39%)	460	(35%)	\$65	(16%)
Unattended or unsupervised person	1,900	(9%)	30	(4%)	80	(6%)	\$34	(8%)
Possibly impaired by alcohol or drugs	1,700	(8%)	180	(27%)	270	(20%)	\$44	(11%)
Age was a factor	600	(3%)	60	(9%)	80	(6%)	\$16	(4%)
Possibly mentally disabled	400	(2%)	20	(2%)	30	(2%)	\$11	(3%)
Physically disabled	300	(2%)	110	(16%)	90	(6%)	\$6	(2%)
Multiple persons involved	200	(1%)	10	(1%)	20	(1%)	\$5	(1%)
None	13,900	(66%)	200	(29%)	490	(37%)	\$258	(63%)
Total excluding fires reported as confined fires	20,900	(100%)	690	(100%)	1,320	(100%)	\$406	(100%)
Total factor entries	22,000	(105%)	870	(127%)	1,520	(115%)	\$439	(108%)

Note: Multiple factor entries are allowed, which is why the number of factor entries is greater than the number of 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 hundred, civilian deaths and civilian injuries are expressed to the nearest ten and property damage is rounded to the nearest million dollars. Damage has not been adjusted for inflation. Figures include a proportional share of fires with heat source unknown, fires unknown between smoking material and open flame, and smoking-material fires with human factor unknown or not reported. Multiple entries are possible, which is why there are more total entries than total fires. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

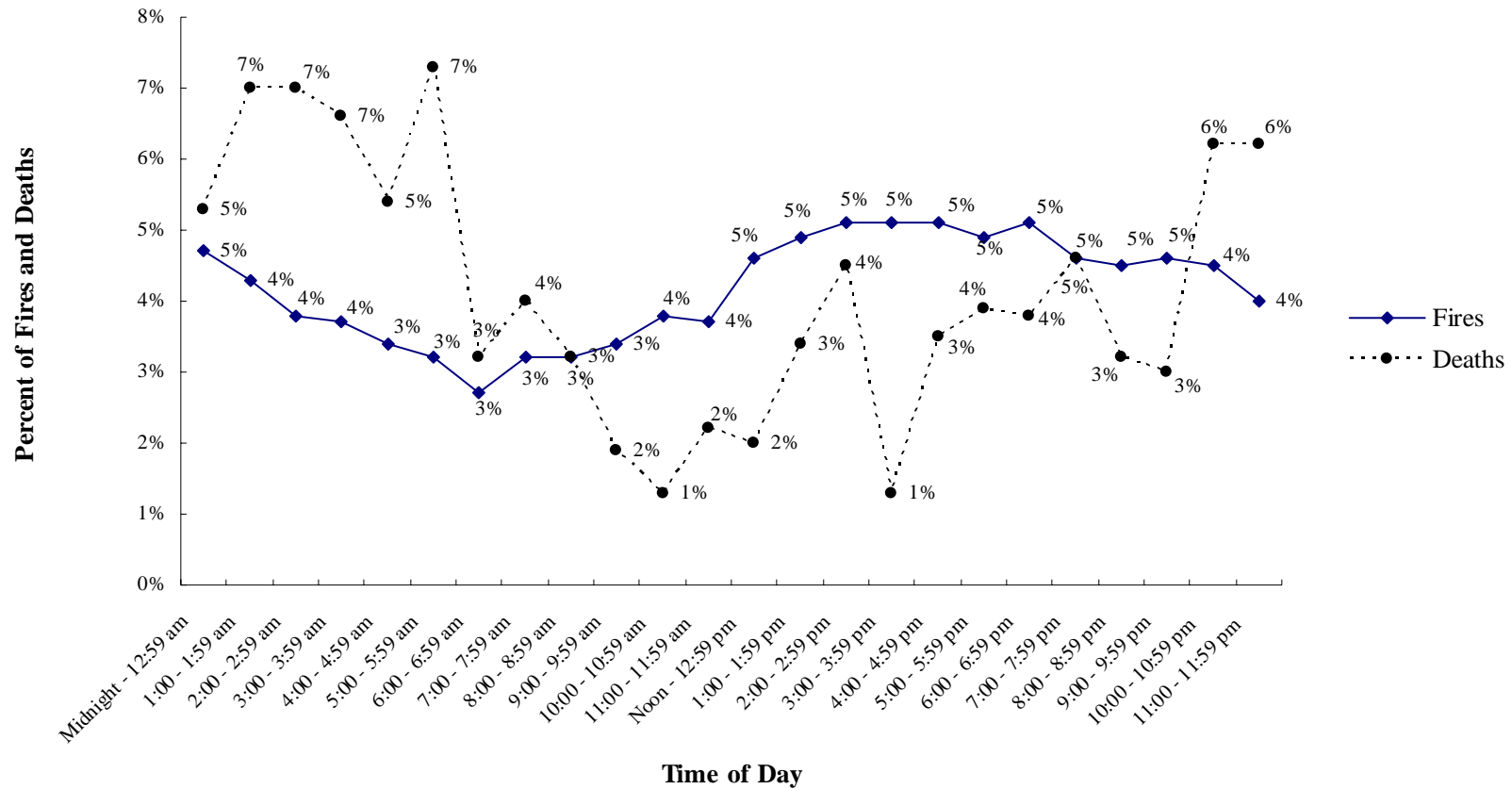
**Table 7. Smoking-Material Fires in Homes, by Area of Fire Origin**  
**Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments**  
**(Excluding Fires Reported as Confined Fires)**

Area of Origin	Fires		Civilian		Civilian		Direct Property	
			Deaths		Injuries		Damage (in Millions)	
Bedroom	5,700	(27%)	210	(31%)	600	(45%)	\$115	(28%)
Living room, family room or den	2,500	(12%)	250	(36%)	310	(24%)	\$63	(15%)
Exterior balcony or unenclosed porch	2,200	(10%)	0	(0%)	40	(3%)	\$51	(13%)
Unclassified function area	1,300	(6%)	110	(15%)	130	(10%)	\$34	(8%)
Kitchen	1,000	(5%)	30	(4%)	40	(3%)	\$16	(4%)
Bathroom	900	(4%)	10	(1%)	30	(2%)	\$7	(2%)
Exterior wall surface	900	(4%)	0	(0%)	10	(1%)	\$13	(3%)
Courtyard, patio, porch, or terrace	800	(4%)	10	(2%)	20	(2%)	\$22	(6%)
Garage	800	(4%)	0	(0%)	30	(2%)	\$23	(6%)
Exterior stairway, ramp or fire escape	600	(3%)	0	(0%)	0	(0%)	\$7	(2%)
Unclassified outside area	400	(2%)	0	(0%)	0	(0%)	\$9	(2%)
Unclassified structural area	400	(2%)	20	(2%)	20	(1%)	\$5	(1%)
Unclassified means of egress	300	(1%)	0	(1%)	0	(0%)	\$2	(0%)
Substructure area or crawl space	300	(1%)	0	(1%)	10	(1%)	\$5	(1%)
Unclassified area of origin	300	(1%)	10	(1%)	10	(1%)	\$3	(1%)
Wall assembly	200	(1%)	0	(1%)	0	(0%)	\$2	(0%)
Laundry area	200	(1%)	0	(0%)	10	(1%)	\$2	(1%)
Entrance way or lobby	200	(1%)	0	(0%)	10	(1%)	\$2	(0%)
Closet	200	(1%)	0	(0%)	10	(1%)	\$2	(0%)
Interior stairway or ramp	200	(1%)	0	(1%)	10	(1%)	\$4	(1%)
Trash chute or container	100	(1%)	0	(0%)	0	(0%)	\$3	(1%)
Unclassified storage area	100	(1%)	0	(0%)	0	(0%)	\$1	(0%)
Ceiling/floor assembly or crawl space	100	(1%)	10	(2%)	0	(0%)	\$2	(1%)
Exterior roof surface	100	(1%)	0	(0%)	0	(0%)	\$2	(0%)
Attic or ceiling/roof assembly or concealed space	100	(1%)	0	(0%)	0	(0%)	\$3	(1%)
Other known area of origin	800	(4%)	10	(1%)	30	(2%)	\$10	(2%)
Total excluding fires reported as confined fires	20,900	(100%)	690	(100%)	1,320	(100%)	\$406	(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 hundred, civilian deaths and civilian injuries are expressed to the nearest ten and direct property damage is rounded to the nearest million dollars. Damage has not been adjusted for inflation. Figures include a proportional share of fires with heat source unknown, or unknown between smoking material and open flame, and smoking-material fires with unknown area of origin. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

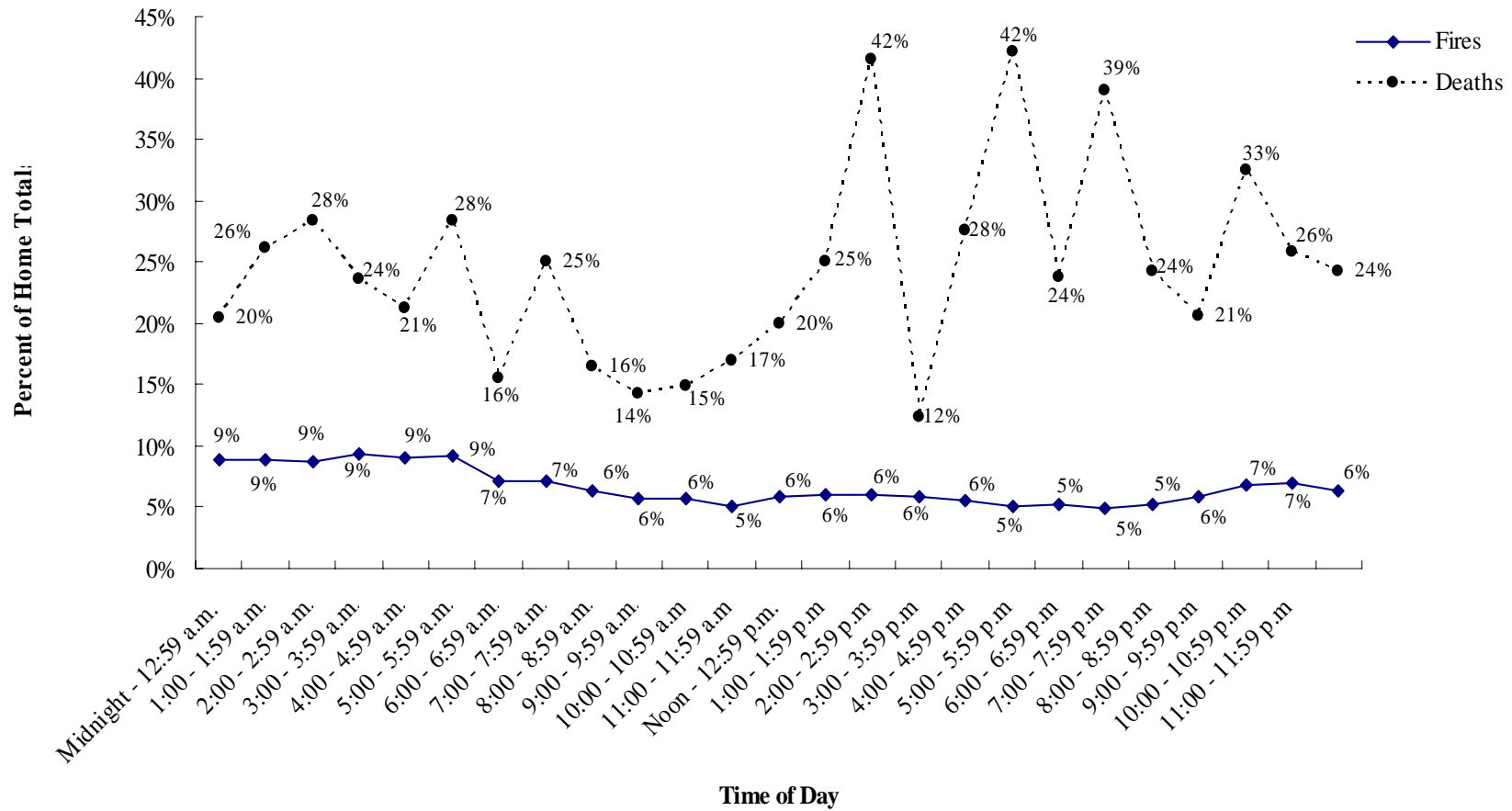
**Figure 6A. Smoking-Material Home Structure Fires and Deaths, by Time of Day, 2002-2005**



Note: Time refers to alarm time to fire department, not ignition time.

Source: Data from NFIRS Version 5.0 and NFPA survey.

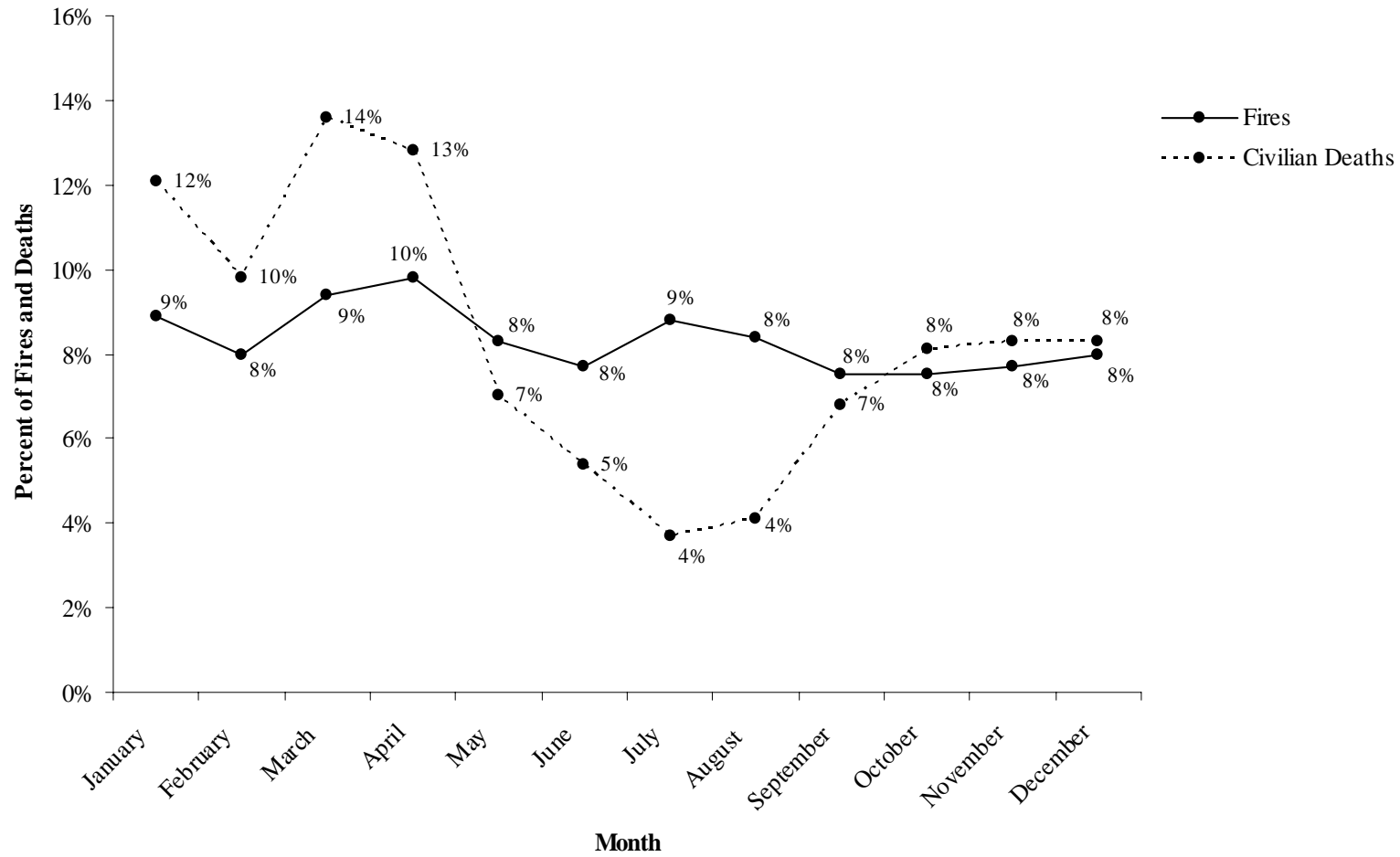
**Figure 6B. Smoking-Material Home Structure Fires and Deaths as Percentage of Total Fires and Deaths, by Time of Day, 2002-2005**



Note: Time refers to alarm time to fire department, not ignition time.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Figure 7. Smoking-Material Home Structure Fires and Deaths, by Month, 2002-2005**



Source: NFIRS and NFPA survey.

**Table 8. Trends in the Smoking-Material Fire Problem in Other Countries**

**A. Canada, 1990-2002 (all properties; statistics include matches and lighters when used as smoking materials)**

Year	Fires	Civilian Deaths	Civilian Injuries	<u>Direct Property Damage (in Millions)</u>		
				In Canadian Dollars	In U.S. Dollars	in 2005 U.S. Dollars*
1990	7,300	170	510	\$130	\$112	\$167
1991	5,900	130	340	\$95	\$83	\$119
1992	6,300	110	450	\$96	\$80	\$111
1993	5,300	130	390	\$87	\$68	\$92
1994	6,400	90	450	\$91	\$66	\$88
1995	8,000	140	470	\$105	\$76	\$98
1996	7,300	170	420	\$115	\$84	\$105
1997	6,600	180	390	\$126	\$91	\$110
1998	6,600	140	320	\$101	\$68	\$82
1999	6,100	160	310	\$93	\$63	\$74
2000	8,300	160	560	\$118	\$80	\$90
2001	8,900	150	450	\$134	\$87	\$96
2002	7,700	140	470	\$132	\$84	\$91

\*Converted using the Consumer Price Index.

Note: Canada statistics include proportional shares of fires with cause unknown or unknown between smoking materials and open flame. After 1999, unknowns are combined with miscellaneous; they are split based on the split in 1999. After 2000, smoking materials are combined with open flame; they are split based on the split in 2000.

Source: Canadian provincial fire commissioners annual reports.

**Table 8. Trends in the Smoking-Material Fire Problem in Other Countries  
(Continued)**

**B. United Kingdom, 1993-2005 (dwellings)**

<b>Year</b>	<b>Fires</b>	<b>Civilian. Deaths</b>	<b>Civilian Injuries</b>
1993	5,500	200	1,730
1994	5,400	180	1,660
1995	5,100	190	1,660
1996	5,200	200	1,740
1997	5,000	200	1,820
1998	4,900	200	1,670
1999	4,900	150	1,620
2000	4,000	170	1,560
2001	4,400	160	1,540
2002	3,900	150	1,450
2003	4,300	160	1,440
2004	3,600	140	1,290
2005	3,200	140	1,100

Source: *Fire Statistics United Kingdom* series (which has published statistics for lighted tobacco products separate from lighters only since 1993).

**Table 8. Trends in the Smoking-Material Fire Problem in Other Countries  
(Continued)**

**C. Japan, 1990-2004 (all structures)**

Year	Fires	Deaths	Direct Property Damage		
			In Japanese Yen (Billions)	in U.S.Dollars (Millions)	in 2005 U.S. Dollars (Million)
1990	3,500	160	12.152	\$84	\$126
1991	3,600	170	13.201	\$98	\$140
1992	3,700	180	12.312	\$97	\$135
1993	3,600	220	14.807	\$133	\$180
1994	3,800	210	14.804	\$145	\$191
1995	3,700	210	14.915	\$159	\$203
1996	3,800	210	15.069	\$139	\$173
1997	3,800	230	14.120	\$117	\$142
1998	3,600	210	11.568	\$88	\$106
1999	3,700	230	13.084	\$115	\$135
2000	3,800	220	12.833	\$119	\$135
2001	3,700	230	11.798	\$97	\$107
2002	3,600	250	11.873	\$95	\$103
2003	3,300	230	10.302	\$89	\$94
2004	3,500	NA	9.733	\$90	\$93

\*Converted using the Consumer Price Index.

NA – Not available at press time.

Source: Analysis of Japanese fire statistics by Dr. Ai Sekizawa.



## Victim Patterns for Smoking-Material Fires

**The decline in smoking-material fires is partly due to a decline in the number of smokers.**

Table 9 shows a substantial decline in the fraction of the adult population who smoke. Even though the population grows every year, the number of smokers has declined. From 1985 to 2004, the combined percentage of adults who smoke (working from the percents by gender) declined from 30% to 21%. Applying these percentages to the adult populations for those years, the number of smokers declined by about 5 million. Combining those results with the cigarette consumption statistics from Table 2, the daily consumption per smoker has declined from 1.6 packs per smoker per day in 1985 to 1.2 packs per smoker per day in 2004.

**Older adults are at highest risk of death or injury from home smoking-material fires, even though they are less likely to smoke than younger adults.**

Children and others under age 18 have the lowest home smoking-material fire death risks, although the fire death risk for children under age 5 is nearly as high as for young adults aged 18 to 29. For adults, death rates rise with age, but people age 75 to 84 and over have the highest rates, higher than the rate for people age 85 and over. (See Table 10.)

The child victims of smoking-material fires reflect children who smoke but even more reflect children living in households with adults who smoke.

The NFPA/USFA study cited earlier conducted a special study of well-documented fatal home smoking-material fires and found that the smoker whose smoking materials ignited the fires is the only person present in just over half of fatal cigarette fires.\* Even for these 54% of cases, smokers may not live alone and may be influenced by others in the behaviors that led to ignition. In the 46% of cases where someone else is present, it was not known whether those others had characteristics that would affect their ability to exert such influence effectively.

The same special study of well-documented fatal home smoking-material fires found that one fatal victim in four (24%) is **not** the smoker whose cigarette started the fire.\* Therefore, if others are present, they have both a direct and an indirect stake in taking action to prevent hostile fires from taking place.

The relationships of these victims to the smokers is useful to know because it may bear on the willingness and ability of these others to serve as “watchers” for the smokers, as well as the willingness of the smokers to accept help or advice from these others.

Of the fatal victims who were not the smokers whose smoking materials ignited the fires:

- 34% were children of the smokers (that is, the smokers were the parents of the victims, but some of these victims were themselves adults).
- 25% were neighbors (often from other apartment units in the same building) or friends of the smokers.
- 14% were spouses or partners of the smokers.

\*John R. Hall, Jr., Marty Ahrens, Kimberly Rohr, Sharon Gamache, and Judy Comoletti, Behavioral Mitigation of Smoking Fires Through Strategies Based on Statistical Analysis, EME-2003-CA-0310, available from the U.S. Fire Administration at <http://www.usfa.dhs.gov/research/other/smoking-mitigation.shtm>, 2006.

- 13% were parents of the smokers.
- 14% had other relationships (e.g., sibling, niece or nephew, uncle or aunt, roommate, passerby).

The high risk of death for older adult smokers may be even higher than Table 8 indicates, because the percentage of people over age 65 who are current smokers is less than half of the percentage for 18- to 64-year-olds. (See Table 8B.) While one cannot assume that all victims of smoking-material fires are themselves smokers, this large disparity in the likelihood of being a smoker, running counter to the risk of dying in a smoking-material fire, suggests that the risk of death for older smokers may be much higher than Table 8 indicates.

**Male death and injury rates from home smoking-material fires are much higher than female rates – and by more than the difference in smoking propensity.**

The 2002-2004 differences between the percentages of U.S. men and women who smoke range from 4.3 to 4.7 percentage points, or higher by 22-23%. (See Table 8A.) In 2002-2005, male death rates from smoking material home fires were higher than female rates by 31%, and male injury rates were higher by 32%. (See Table 11.) Again, even allowing for the fact that not all victims of smoking-material fires are themselves the smokers who caused the fire, it appears that male smokers have a risk of death and injury due to smoking material fires that is considerably higher than the risk for female smokers.

**Most fatal victims of home smoking-material fires are located in the area or room of fire origin when fire begins.**

Three-fourths (72%) of fatal victims of home smoking-material fires are in the same area or room as the fire. (See Table 12.)

Smoke alarms, sprinklers, and compartmentation barriers all require time after ignition to be effective. For a victim recorded as “involved with ignition and in the area of origin,” the fire begins so close to him or her that it is very difficult to survive long enough for active or passive fire protection to save him or her.

The same NFPA/USFA study cited earlier found that, from 1994 through 1998, smoking-material home fire deaths were almost three times as likely as other-cause home fire deaths to involve a victim intimate with ignition (29% versus 11%).\* NFIRS Version 5.0 does not distinguish intimate with ignition as a victim location, which means it is not possible to update these statistics.

**More than two-fifths of fatal home smoking-material fire victims were sleeping when injured, but one-third were taking protective action.**

Fatal victims who were sleeping were 42% of the total, while fatal victims who were attempting to escape, to fight fire, or to rescue collectively totaled 32%. For non-fatal victims, those taking action totaled 53% of total injuries, compared to 27% for those who were sleeping. (See Table 13.)

\*John R. Hall, Jr., Marty Ahrens, Kimberly Rohr, Sharon Gamache, and Judy Comoletti, Behavioral Mitigation of Smoking Fires Through Strategies Based on Statistical Analysis, EME-2003-CA-0310, available from the U.S. Fire Administration at <http://www.usfa.dhs.gov/research/other/smoking-mitigation.shtm>, 2006.

**Most home smoking-material fire victims had some condition that reduced their ability to respond effectively to fire, with sleeping the primary such condition.**

Most victims of residential smoking-material fires were either asleep or slowed by alcohol or other drug impairment or disability prior to the fire. (See Table 14.) Impairment is much more likely with smoking-material fires than with other fires. The percentage of victims with possible alcohol impairment was 26% for smoking-material home fires in 2002-2005, compared to 11% for all other home structure fires. The percentage with possible drug impairment was 13% for smoking-material home fires in 2002-2005, compared to 4% for all other home structure fires.

Alcohol impairment is historically under-reported, as indicated by the few state and local studies that have focused on this issue, many of which have had access to autopsy tests on blood alcohol levels. Alcohol was said to be a factor in almost half of the Tallahassee area smoking fire deaths and in 62% of Minnesota's 1996-2002 smoking fire deaths. \*

The NFPA/USFA study cited earlier examined smoker vs. non-smoker health-related characteristics, using a survey of risk characteristics conducted periodically by the U.S. Centers for Disease Control and Prevention (CDC).\*\* The survey showed smokers drank more or more often than do non-smokers, by three of the four measures analyzed:

- According to the CDC, smokers defined as those who have smoked at least 100 cigarettes in their lifetimes were more likely than nonsmokers to have consumed five or more alcoholic drinks at one occasion (29% versus 19%). These smokers also averaged one more drink per occasion than non-smokers (3.7 versus 2.8 drinks per occasion). These statistics indicate that smokers are more likely than non-smokers to have alcohol-impaired judgment and ability when they drink.

Alcohol use is one of several conditions, including use of legal medications or illegal drugs and ordinary drowsiness, that can lead to a loss of control of a burning tobacco product. This danger was the subject of one of the seven educational messages recommended by the project:

To prevent a deadly cigarette fire, you have to be alert. You won't be if you are sleepy, have been drinking, or have taken medicine or other drugs.

Here are more CDC survey findings, cited in the NFPA/USFA study, regarding physical disabilities and limitations for which the gap between smokers and non-smokers is largest.

- According to the CDC, smokers defined as those who have smoked at least 100 cigarettes in their lifetimes were more likely than nonsmokers to have the following physical handicaps or limitations:

\* Thomas C. Quillen, *An Analysis of Civilian Fire Deaths in Tallahassee (Leon County), Florida, 1983-1994: Strategic Analysis of Community Risk Reduction*, report of research for National Fire Academy Executive Fire Officer program, January 1995; and *Case Study: Contribution of Alcohol to Fire Fatalities in Minnesota*, Topical Fire Research Series, Vol. 3, Issue 4, U.S. Fire Administration, July 2003.

\*\*John R. Hall, Jr., Marty Ahrens, Kimberly Rohr, Sharon Gamache, and Judy Comoletti, *Behavioral Mitigation of Smoking Fires Through Strategies Based on Statistical Analysis*, EME-2003-CA-0310, available from the U.S. Fire Administration at <http://www.usfa.dhs.gov/research/other/smoking-mitigation.shtm>, 2006.

<b>Handicap/Limitation</b>	<b>Smoker</b>	<b>Nonsmoker</b>
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Ever told you have arthritis	35%	28%
Activity limitation due to physical, mental, or emotional problems	21%	14%
Limitations due to arthritis or other joint symptoms	30%	26%
Never exercised in the past month	28%	23%

- According to the CDC, smokers defined as everyday or someday smokers were more likely than nonsmokers to have the following physical handicaps or limitations:

<b>Handicap/Limitation</b>	<b>Smoker</b>	<b>Nonsmoker</b>
Ever told you have arthritis	31%	27%
Activity limitation due to physical, mental, or emotional problems	21%	18%
Limitations due to arthritis or other joint symptoms	32%	30%
Never exercised in the past month	35%	23%

One of the measures of disability for which smokers differed very little from non-smokers was health problems that require the use of special equipment, such as canes or wheel chairs.

Here are survey findings regarding pre-existing physical conditions for which the gap between smokers and non-smokers is largest:

- According to the CDC, smokers defined as those who have smoked at least 100 cigarettes in their lifetimes were more likely than nonsmokers to have the following physical conditions that could make them more susceptible to harm from a defined exposure to fire effects:

<b>Physical Condition</b>	<b>Smoker</b>	<b>Nonsmoker</b>
High blood cholesterol	37%	31%
High blood pressure	30%	27%

- According to the CDC, smokers defined as everyday or someday smokers were more likely than nonsmokers to have the following physical conditions that could make them more susceptible to harm from a defined exposure to fire effects:

<b>Physical Condition</b>	<b>Smoker</b>	<b>Nonsmoker</b>
High blood cholesterol	32%	28%
High blood pressure	23%	21%

Smokers differed little from non-smokers for asthma and diabetes.

The NFPA/USFA project cited earlier also included a study of fatal fires from NFPA's Fire Incident Data Organization (FIDO) from a year in which FIDO captured most fatal fires.\* This study found that 7% of fatal victims of smoking-material fires who were themselves the smokers whose smoking materials started the fires were under treatment with medical oxygen. The combination of smoking and use of medical oxygen is so dangerous that it became the subject of one of the seven recommended educational messages from the project:

**Smoking should not be allowed in a home where oxygen is used.**

**Fewer people smoke, proportionally, in the U.S. than in most other countries of at least one million population, and this is even more true for males.**

Among countries of at least one million population, the proportion of the population that smokes ranges from a high of 52% to a low of 4%, with the U.S., at 24%, having a higher smoking rate than roughly one-third of the countries. (See Table 15.) Smoking rates for men range from a high of 68% to a low of 7%, with the U.S., at 26%, higher than only 13 countries with lower male smoking rates. These rates are taken mostly from the late 1990s.

Bearing in mind the earlier finding that the fire risk to male smokers appears to be considerably greater than to female smokers, it is notable that, in most countries, smoking rates are not as similar for the two sexes as they are in the U.S. and Canada. There is a four percentage point gap in the U.S. (26% of males smoke vs. 22% of females), and in Canada, as shown in Table 11. Only 12 countries have male and female smoker rates that are closer. The highest female smoker rates are in Guinea (44% vs. 60% for men and the highest overall smoking rate of 52%), Yugoslavia (42% vs. 52% for men), and Venezuela (39% vs. a fairly similar 42% for men). Norway is the only country known to have a higher female smoking rate than male (by only 1 percentage point, 32% and 31%, respectively), and Sweden and New Zealand are the only countries where rates are known to be the same for both sexes (19% and 25%, respectively).

Japan has a lower smoking fire death rate than the U.S., even though they have a much higher smoking rate, and even more so for high-risk males. This is a reminder that smoking behavior is only one of the factors driving smoking fire rates.

\*John R. Hall, Jr., Marty Ahrens, Kimberly Rohr, Sharon Gamache, and Judy Comoletti, Behavioral Mitigation of Smoking Fires Through Strategies Based on Statistical Analysis, EME-2003-CA-0310, available from the U.S. Fire Administration at <http://www.usfa.dhs.gov/research/other/smoking-mitigation.shtm>, 2006.

**Table 9. Percent of U.S. Population Who Are Currently Smoking**

**A. Trends by Age or Sex**

<b>Sex</b>	<b>1970</b>	<b>1985</b>	<b>1990</b>	<b>1995</b>	<b>1997</b>	<b>1998</b>
Male	44.3%	33.2%	28.0%	26.5%	25.5%	25.9%
Female	30.8%	28.0%	22.9%	22.9%	21.3%	22.1%
<b>Sex</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
Male	24.2%	25.2%	24.7%	24.8%	23.7%	23.0%
Female	20.9%	21.1%	20.8%	20.1%	19.4%	18.7%

Note: 1970 populations include 17 years old and over, 1985 populations include 20 years old and over, and 1990 and after include 18 years old and over. Tables 9A and 9B are based on different databases and have slightly different totals for all male and all female smokers. Neither database has figures for all ages and all sexes combined.

Sources: For 1970 and 1985, U.S. Centers for Disease Control, Office of Smoking and Health, *Reducing the Health Consequences of Smoking, 1989*. For 1990-2004 *Statistical Abstract of the United States, 2001, 2003, 2004-2005, 2006, and 2007*. From 1992 on, the definition of current smoker changed to add people who smoke “some days” to the previous definition of people who have smoked at least 100 cigarettes and now smoke.

**Table 9. Percent of U.S. Population Who Are Currently Smoking (Continued)**

**B. Trends by Age and Sex**

<b>Male</b>	<b>1995</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
18 - 24	27.8%	28.5%	30.4%	32.4%	26.3%	25.6%
25 - 34	29.5%	29.0%	27.2%	27.5%	28.7%	26.1%
35 - 44	31.5%	30.2%	27.4%	29.7%	28.1%	26.5%
45 - 64	27.1%	26.4%	26.4%	24.5%	23.9%	25.0%
65 or older	14.3%	10.2%	11.5%	10.1%	10.1%	9.8%
All age groups over 18	27.0%	25.7%	25.2%	25.2%	24.1%	23.4%
<b>Female</b>	<b>1995</b>	<b>2000</b>	<b>2001</b>	<b>2002</b>	<b>2003</b>	<b>2004</b>
18 - 24	21.8%	25.1%	23.4%	24.6%	21.5%	21.5%
25 - 34	26.4%	22.5%	23.0%	21.6%	21.3%	21.0%
35 - 44	27.1%	26.2%	25.7%	23.7%	24.2%	21.6%
45 - 64	24.0%	21.6%	21.4%	21.1%	20.2%	19.8%
65 or older	11.5%	9.3%	9.2%	8.6%	8.3%	8.1%
All age groups over 18	22.6%	21.0%	20.7%	20.0%	19.2%	18.5%

Note: Tables 9A and 9B are based on different databases and have slightly different totals for all male and all female smokers. Neither database has figures for all ages and all sexes combined.

Sources: *Statistical Abstract of the United States, 2001, 2003, 2004-2005, 2006, and 2007*. From 1992 on, the definition of current smoker changed to add people who smoke "some days" to the previous definition of people who have smoked at least 100 cigarettes and now smoke.

**Table 10. Casualties in Home Structure Fire Involving Smoking Materials, by Age of Victim  
Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments  
(Excluding Fires Reported as Confined Fires)**

Age	Average 2003-2004		Annual Average		Death Rate per Million Persons	Annual Average		Injury Rate per Million People
	Population (in Millions)		Civilian Deaths			Civilian Injuries		
4 and under	19.9	(7%)	10	(2%)	0.7	30	(2%)	1.6
5 to 9	19.7	(7%)	10	(1%)	0.4	10	(1%)	0.4
10 to 14	21.2	(7%)	0	(1%)	0.2	10	(1%)	0.7
15 to 17	12.4	(4%)	0	(0%)	0.1	30	(2%)	2.3
18 to 29	48.4	(17%)	40	(5%)	0.8	220	(16%)	4.5
30 to 49	86.8	(30%)	170	(25%)	2.0	440	(33%)	5.1
50 to 64	47.8	(16%)	220	(32%)	4.6	300	(23%)	6.3
65 to 74	18.4	(6%)	110	(15%)	5.8	160	(12%)	8.9
75 to 84	12.9	(4%)	100	(15%)	7.9	100	(8%)	8.0
85 and over	4.8	(2%)	30	(4%)	6.2	20	(1%)	3.3
Total	292.2	(100%)	690	(100%)	2.4	1,320	(100%)	4.5
14 and under	60.8	(21%)	20	(4%)	0.4	50	(4%)	0.9
65 and over	36.1	(12%)	240	(34%)	6.6	280	(21%)	7.8
75 and over	17.7	(6%)	130	(19%)	7.4	120	(9%)	6.7

Note: These are fires reported to U.S. municipal fire departments and so exclude fires reported only to Federal or state agencies, 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. Civilian deaths and injuries are rounded to the nearest ten and include a proportional share of fires where the heat source was unknown or unknown between smoking material and open flame source, and home smoking-fire casualties where victim age was unknown. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey, *Statistical Abstract of the United States*, Washington: U.S. Department of Commerce, Bureau of the Census, 2004-2006.

**Table 11.**  
**Casualties in Home Structure Fires Involving Smoking Materials, by Age and Sex of Victim**  
**Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments**  
**(Excluding Fires Reported as Confined Fires)**

Age	Average 2003-2004 Population (in Millions)		Annual Average Civilian Deaths		Death Rate per Million People	Annual Average Civilian Injuries		Injury Rate per Million People
<b>Male</b>								
4 and under	10.2	(7%)	10	(2%)	0.7	20	(3%)	1.9
5 to 9	10.1	(7%)	10	(2%)	0.7	0	(0%)	0.3
10 to 14	10.8	(8%)	0	(0%)	0.2	10	(1%)	0.6
15 to 17	6.3	(4%)	0	(0%)	0.0	20	(2%)	2.8
18 to 29	24.9	(17%)	20	(6%)	0.9	140	(18%)	5.5
30 to 49	43.3	(30%)	90	(24%)	2.1	270	(36%)	6.2
50 to 64	23.1	(16%)	150	(38%)	6.4	160	(22%)	7.1
65 to 74	8.4	(6%)	40	(10%)	4.7	80	(11%)	9.6
75 to 84	5.2	(4%)	50	(13%)	9.9	40	(5%)	7.5
85 and over	1.5	(1%)	20	(4%)	11.5	10	(1%)	4.7
Total	143.8	(100%)	390	(100%)	2.7	740	(100%)	5.2
14 and under	31.1	(22%)	20	(4%)	0.5	30	(4%)	0.9
65 and over	15.1	(10%)	110	(28%)	7.2	130	(17%)	8.4
75 and over	6.7	(5%)	70	(18%)	10.3	50	(6%)	6.8
<b>Female</b>								
4 and under	9.7	(7%)	10	(2%)	0.6	10	(2%)	1.2
5 to 9	9.6	(6%)	0	(0%)	0.0	0	(1%)	0.5
10 to 14	10.3	(7%)	0	(1%)	0.2	10	(1%)	0.7
15 to 17	6.0	(4%)	0	(1%)	0.3	10	(2%)	1.7
18 to 29	23.6	(16%)	20	(5%)	0.6	80	(14%)	3.5
30 to 49	43.5	(29%)	80	(26%)	1.8	170	(29%)	3.9
50 to 64	24.6	(17%)	70	(24%)	2.9	140	(24%)	5.7
65 to 74	10.0	(7%)	70	(22%)	6.7	80	(14%)	8.3
75 to 84	7.7	(5%)	50	(17%)	6.5	60	(11%)	8.3
85 and over	3.3	(2%)	10	(4%)	3.8	10	(2%)	2.6
Total	148.4	(100%)	300	(100%)	2.1	580	(100%)	3.9
14 and under	29.7	(20%)	10	(2%)	0.3	20	(4%)	0.8
65 and over	21.1	(14%)	130	(43%)	6.2	160	(27%)	7.4
75 and over	11.0	(7%)	60	(21%)	5.7	70	(13%)	6.6

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. Civilian deaths and civilian injuries are rounded to the nearest ten and include a proportional share of home fire casualties where the heat source was unknown or unknown between smoking material and open flame, and home smoking-fire casualties where victim age or sex was unknown. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey, *Statistical Abstract of the United States*, Washington: U.S. Department of Commerce, Bureau of the Census, 2004-2006.

**Table 12. Casualties in Home Structure Fires, Involving Smoking Materials,  
by Location of Victim at Ignition  
Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments  
(Excluding Fires Reported as Confined Fires)**

<b>Location</b>	<b>Civilian Deaths</b>		<b>Civilian Injuries</b>	
In area of origin and involved (includes intimately involved with ignition)	440	(65%)	660	(50%)
In area of origin and not involved	60	(8%)	260	(19%)
Not in area of origin	190	(28%)	400	(30%)
Unclassified location	0	(0%)	0	(0%)
<b>Total</b>	<b>690</b>	<b>(100%)</b>	<b>1,320</b>	<b>(100%)</b>

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. Civilian deaths and injuries are rounded to the nearest ten and include a proportional share of home fire casualties where the heat source was unknown or unknown between smoking material and open flame source and home smoking-fire casualties where victim location was unknown. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 13. Casualties in Home Structure Fires Involving Smoking Materials,  
by Activity of Victim When Injured  
Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments  
(Excluding Fires as Confined Fires)**

<b>Activity</b>	<b>Civilian Deaths</b>		<b>Civilian Injuries</b>	
Sleeping	290	(42%)	360	(27%)
Attempting to escape	180	(26%)	330	(25%)
Unable to act	100	(15%)	60	(4%)
Unclassified activity	40	(5%)	80	(6%)
Attempting to fight fire	20	(4%)	280	(21%)
Returning to vicinity of fire	20	(3%)	80	(6%)
Acting irrationally	20	(3%)	40	(3%)
Attempting rescue	10	(2%)	100	(7%)
<b>Total</b>	<b>690</b>	<b>(100%)</b>	<b>1,320</b>	<b>(100%)</b>

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. Civilian deaths and injuries are rounded to the nearest ten and include a proportional share of fires with heat source unknown or unknown between smoking material and open flame, and home smoking-material fire casualties with victim activity unknown. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey

**Table 14. Casualties in Home Structure Fires Involving Smoking Materials,  
by Human Factor Before Injury of Victim  
Annual Average of 2002-2005 Structure Fires Reported to U.S. Fire Departments  
(Excluding Fires Reported as Confined Fires)**

<b>Factor</b>	<b>Civilian Deaths</b>		<b>Civilian Injuries</b>	
Asleep	330	(47%)	510	(38%)
Possibly impaired by alcohol	180	(26%)	210	(16%)
Physically disabled	140	(21%)	100	(8%)
Possibly impaired by other drug or chemical	90	(13%)	80	(6%)
Unattended or unsupervised person	40	(6%)	30	(2%)
Possibly mentally disabled	40	(6%)	40	(3%)
Unconscious	20	(3%)	10	(1%)
Physically restrained	0	(0%)	10	(0%)
None	140	(20%)	560	(42%)
<b>Total fires excluding confined fires</b>	<b>690</b>	<b>(100%)</b>	<b>1,320</b>	<b>(100%)</b>
<b>Total factor entries</b>	<b>980</b>	<b>(141%)</b>	<b>1,540</b>	<b>(116%)</b>

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. Civilian deaths and injuries are rounded to the nearest ten and include a proportional share of fires with heat source unknown or unknown between smoking material and open flame, and home smoking-material fire casualties with human factor before injury listed as unknown, blank or not reported. Totals may not equal sums because of rounding.

Source: Data from NFIRS Version 5.0 and NFPA survey.

**Table 15. Smoking Rates in Selected Countries**

Country	Percentage Who Smoke		
	Total	Male	Female
Guinea	52%	60%	44%
Namibia	50%	65%	35%
Kenya	49%	67%	32%
Bosnia and Herzegovina	48%	NA	NA
Yugoslavia	47%	52%	42%
Mongolia	47%	68%	26%
Yemen	45%	60%	29%
Turkey	44%	60-65%	20-24%
Romania	44%	62%	25%
Slovakia	43%	55%	30%
Lebanon	41%	46%	35%
Venezuela	41%	42%	39%
Argentina	40%	47%	34%
Albania	39%	60%	18%
Bangladesh	39%	64%	24%
Nepal	39%	48%	29%
Panama	38%	56%	20%
Greece	38%	47%	29%
Laos	38%	41%	15%
Kyrgyzstan	38%	60%	16%
Georgia	38%	61%	15%
Cuba	37%	48%	26%
Benin	37%	NA	NA
Cambodia	37%	66%	8%
Papua	37%	46%	28%
Russian Federation	37%	63%	10%
Bulgaria	37%	49%	24%
Macedonia	36%	40%	32%
Cameroon	36%	NA	NA
China	36%	67%	4%
Hungary	36%	44%	27%
Ukraine	35%	51%	19%
Republic of (South) Korea	35%	65%	5%
Germany	35%	39%	31%
Tunisia	35%	62%	8%

**Table 15. Smoking Rates in Selected Countries (Continued)**

Country	Percentage Who Smoke		
	Total	Male	Female
Mexico	35%	51%	18%
Uganda	35%	52%	17%
Poland	35%	44%	25%
France	35%	39%	30%
Brazil	34%	38%	29%
Kazakhstan	34%	60%	7%
Switzerland	34%	39%	28%
Lithuania	33%	51%	16%
Spain	33%	42%	25%
<b>Japan</b>	<b>33%</b>	<b>53%</b>	<b>13%</b>
Netherlands	33%	37%	29%
Croatia	33%	34%	32%
Myanmar	33%	44%	22%
Armenia	33%	64%	1%
Philippines	32%	54%	11%
Moldova	32%	46%	18%
Estonia	32%	44%	20%
Ecuador	32%	46%	17%
Ireland	32%	32%	31%
Norway	32%	31%	32%
Indonesia	31%	59%	4%
Tanzania	31%	50%	12%
Latvia	31%	49%	13%
Denmark	31%	32%	29%
Bolivia	30%	43%	18%
Syria	30%	51%	10%
Belarus	30%	55%	5%
Uzbekistan	29%	49%	9%
Jordan	29%	48%	10%
Czech Republic	29%	36%	22%
Peru	29%	42%	16%
Israel	29%	33%	24%
Belgium	28%	30%	26%
Guatemala	28%	38%	18%
Viet Nam	27%	51%	4%

**Table 15. Smoking Rates in Selected Countries (Continued)**

Country	Percentage Who Smoke		
	Total	Male	Female
South Africa	27%	42%	11%
<b>United Kingdom</b>	<b>27%</b>	<b>27%</b>	<b>26%</b>
Malaysia	26%	49%	4%
Algeria		25%	44%
Slovenia	25%	30%	20%
Trinidad and Tobago	25%	42%	8%
El Salvador	25%	38%	12%
<b>Canada</b>	<b>25%</b>	<b>27%</b>	<b>23%</b>
New Zealand	25%	25%	25%
Italy	25%	32%	17%
Austria	25%	30%	19%
Mauritius	24%	45%	3%
<b>United States of America</b>	<b>24%</b>	<b>26%</b>	<b>22%</b>
Honduras	24%	36%	11%
Finland	24%	27%	20%
Thailand	23%	44%	3%
Uruguay	23%	32%	14%
Iraq	23%	40%	5%
Pakistan	23%	36%	9%
Zambia	23%	35%	10%
Columbia	22%	24%	21%
Chile	22%	26%	18%
Ivory Coast	22%	42%	2%
Botswana	21%	NA	NA
Dominican Republic	21%	24%	17%
Lesotho	20%	39%	1%
Australia	20%	21%	18%
Sweden	19%	19%	19%
Portugal	19%	30%	7%
Sierra Leone	19%	NA	NA
Egypt	18%	35%	2%
Morocco	18%	35%	2%
Zimbabwe	18%	34%	1%
Gambia	18%	34%	2%
Costa Rica	18%	29%	7%

7%

**Table 15. Smoking Rates in Selected Countries (Continued)**

Country	Percentage Who Smoke		
	Total	Male	Female
India	16%	29%	3%
Ghana	16%	28%	4%
Ethiopia	16%	NA	NA
Azerbaijan	16%	30%	1%
Kuwait	16%	30%	2%
Iran	15%	27%	3%
Singapore	15%	27%	3%
Paraguay	15%	24%	6%
Jamaica	15%	NA	NA
Malawi	15%	20%	9%
Turkmenistan	14%	27%	1%
Sri Lanka	14%	26%	2%
Sudan	13%	24%	1%
Saudi Arabia	12%	22%	1%
Haiti	10%	11%	9%
United Arab Emirates	9%	18%	<1%
Nigeria		9%	15%
Oman	9%	16%	2%
Rwanda	6%	7%	4%
Senegal	5%	NA	NA
Libya	4%	NA	NA

NA: Not available

Note: Percentages are based on some definition of adulthood and some definition of smoking frequency and recency; definitions may vary between countries. Countries shown in bold are those for which fire statistics are given in this report.

Source: Dr. Judith MacKay and Dr. Michael Eriksen, the Tobacco Atlas, World Health Organization, Brighton, UK, 2002, Table A. Actual year of data varies but is usually late 1990's.

## **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.**

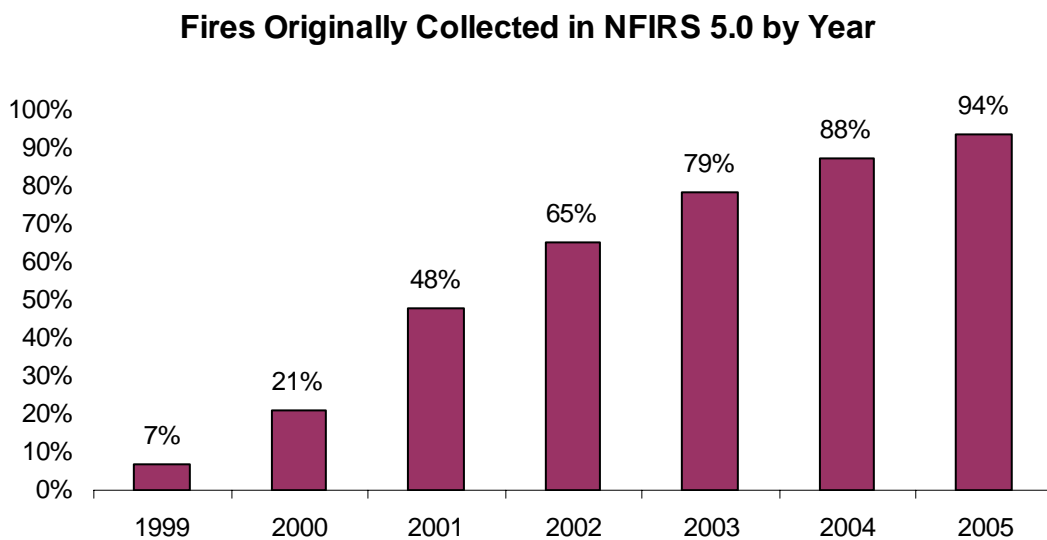


Figure 1 shows the percentage of fires originally collected in the NFIRS 5.0 system. Each year's release version of NFIRS data also includes data collected in older versions of NFIRS that were converted to NFIRS 5.0 codes.

For 2002 data on, analyses are based on scaling ratios using only data originally collected in NFIRS 5.0:

NFPA survey projections  
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:

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

**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

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

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.