

A PROFILE OF

# FIRE

in the

# UNITED STATES

1989-1998  
TWELFTH EDITION

FEDERAL EMERGENCY MANAGEMENT AGENCY  
UNITED STATES FIRE ADMINISTRATION  
NATIONAL FIRE DATA CENTER



## U.S. FIRE ADMINISTRATION MISSION STATEMENT

As an entity of the Federal Emergency Management Agency, the mission of the U.S. Fire Administration is to reduce life and economic losses due to fire and related emergencies through leadership, advocacy, coordination, and support. We serve the Nation independently, in coordination with other Federal agencies and in partnership with fire protection and emergency service communities. With a commitment to excellence, we provide public education, training, technology, and data initiatives.

Each year, the U.S. Fire Administration publishes a statistical portrait of the fire problem in the United States. This brochure summarizes the Twelfth Edition of *Fire in the United States, 1989–1998*. The analysis addresses the national fire problem and subsets of this problem, such as residential and non-residential fires. The causes of 1998 fires and 10-year trends are shown. Regional and state profiles are included. Casualties to firefighters are also presented.

The primary source of data is the National Fire Incident Reporting System (NFIRS). Its data are based on 13,000 participating fire departments. Other data sources include the National Fire Protection Association (NFPA), National Center for Health Statistics, Consumer Product Safety Commission, Consumer Price Index, Bureau of the Census, and state fire marshals' offices.

Copies of the full report are available from the U.S. Fire Administration, Publications Center, 16825 South Seaton Avenue, Emmitsburg, Maryland 21727. The report may also be ordered on line (<http://www.usfa.fema.gov>). U.S. Fire Administration publications are free.

# NATIONAL FIRE LOSSES

Over the past two decades, the fire problem in the United States has decreased. Fires, deaths, injuries, and economic losses all dropped. Although we are making progress against fire, the problem is still huge, and the United States still has one of the worst fire records, on a per capita basis, in the industrial world.

Millions of fires, thousands of deaths, and tens of thousands of injuries occur each year. All natural disasters combined represent just a fraction of the losses from fire. The economic losses from fire are staggering—billions of dollars. In 1998 alone, fire departments responded to more than 4,800 fires each day. An average of 120 firefighters are injured daily responding to or fighting these fires, and more than 11 people die. Unless the fire is a spectacular blaze, the national media seldom reports these incidents. This report is intended to inform the populace, media, and public officials of the magnitude and seriousness of the U.S. fire problem.

## TRENDS

Ten-year trends are computed using a best-fit trend line, which smooths the fluctuations in year-to-year data. Data used to calculate trends from 1989 to 1998 are from NFPA Annual Surveys. Dollar losses are adjusted to 1998 dollars based on the Consumer Price Index.

In 1998, fires, deaths, injuries, and dollar loss reached new lows, continuing the downward trend measured over the

### 10-YEAR TRENDS FOR PROPERTY FIRES AND LOSSES (percent change)

PROPERTY	FIRES	\$LOSS*	DEATHS	INJURIES
All Properties	-13	-21	-20	-20
Residential Properties	-22	-19	-21	-19
One- and Two-Family Dwellings	-25	-12	-13	-23
Apartments	-9	-1	-25	-5
Other Properties	-21	-15	-67	-15
Non-Residential Properties				
Structures	-17	-49	-37	-28
Mobile Property	-11	+10	-16	-36
Outside	-14	+107	-43	+17
Other	+26	+33	-	-

\*Adjusted to 1998 dollars  
Source: NFPA Annual Surveys and Consumer Price Index

past 10 years. Total fires were down 13%, civilian deaths and injuries down 20%, and dollar loss down 21%. Civilian fire deaths per capita reached a 10-year low at 14.9 deaths per million population. The 10-year per capita trends are similar to those for actual losses: fires declined 21%; civilian deaths and injuries, 27%; and dollar loss, 28%. The per capita improvement is due to the combination of a growing population and decreasing fires and fire losses.

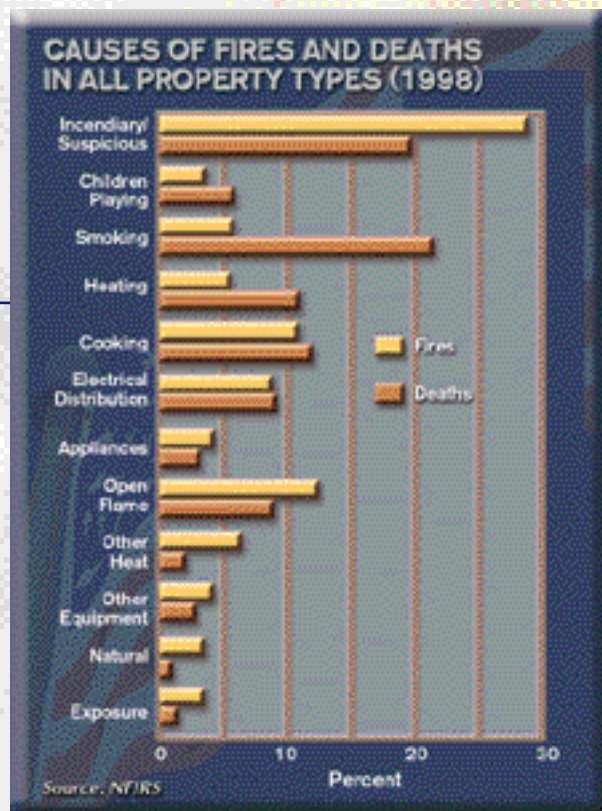
These successes may obscure the magnitude of the fire problem in the United States. In 1998, fire departments responded to nearly 1.8 million fires, or 6,500 fires per million population. These fires resulted in 4,035 civilian deaths and 23,100 injuries (85.5 injuries per million population). Direct dollar losses were estimated at \$8.6 billion, or \$32 for each person in the United States. The total cost of fire is significantly higher—over \$100 billion—when indirect costs are included, such as fire department budgets, built-in fire protection in new buildings, insurance overhead, medical services, and other annual fire protection-related expenses.

The proportions of the fire problem by property type have remained almost constant over the past two decades. Forty-three percent of all fires occur outdoors, about twice the number as the next highest property types—vehicles (24%) and residences (23%). However, outdoor fires result in relatively few deaths or injuries. About one in four calls to a fire department is in response to a vehicle fire.

Each year, 70% to 75% of civilian fire deaths and injuries occur in residences. In 1998, there were nearly 8 deaths and 47 injuries per one thousand fires to individuals in residences. Fire prevention initiatives should be targeted to residential properties.

## CAUSES

The cause of a fire, death, or injury cannot always be determined with certainty. The cause categories used in NFIRS were designed to reflect the causes of structure fires—where the majority of fatal fires occur. These categories have usefulness for other fires as well, but there are limitations. Our present best estimate of fire causes is based on the distribution of fires with known cause across 12 major cause categories. The percentages shown in the adjacent chart reflect these proportional distributions.



Where causes were identified, the leading three causes of fire in 1998 were incendiary/suspicious (28%), open flame (13%), and cooking (12%). Smoking and arson (i.e., “incendiary/suspicious”) were the predominant causes of death (41% combined). One-quarter of all injuries stem from cooking fires, followed by arson (13%) and open flame (10%). Arson accounts for 25% of total dollar loss, followed by electrical distribution (17%). Cooking fires are often the result of the ignition of loose clothing or other nearby flammables and from unattended cooking where grease or oil ignites. Public awareness programs need to continue emphasizing safe methods for extinguishing a cooking fire.

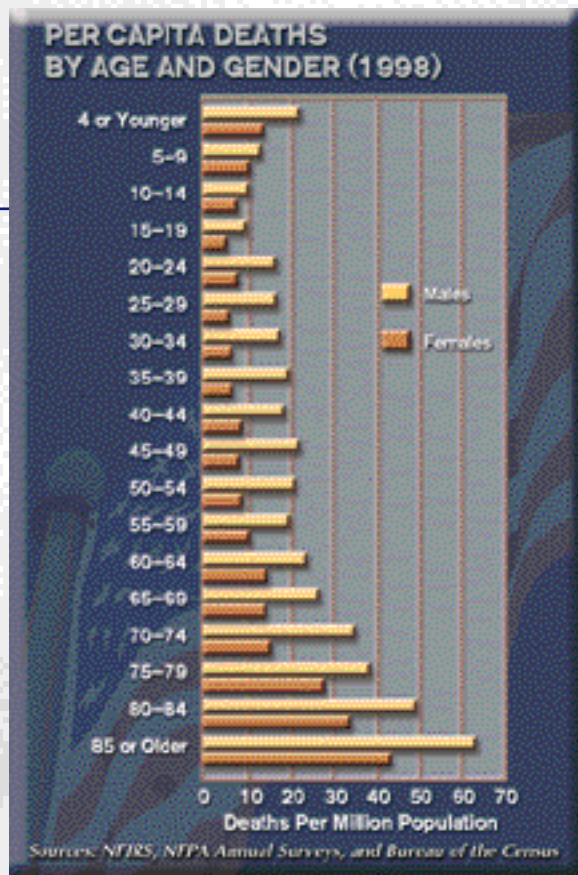
The causes of fire deaths are generally similar for victims of both sexes. The causes of injuries differ by gender. A higher percentage of women are injured in cooking fires than men, though a higher percentage of men die in cooking fires. Men often take greater risks than women in attempting to extinguish a fire. A slightly higher percentage of women die from smoking fires than men.

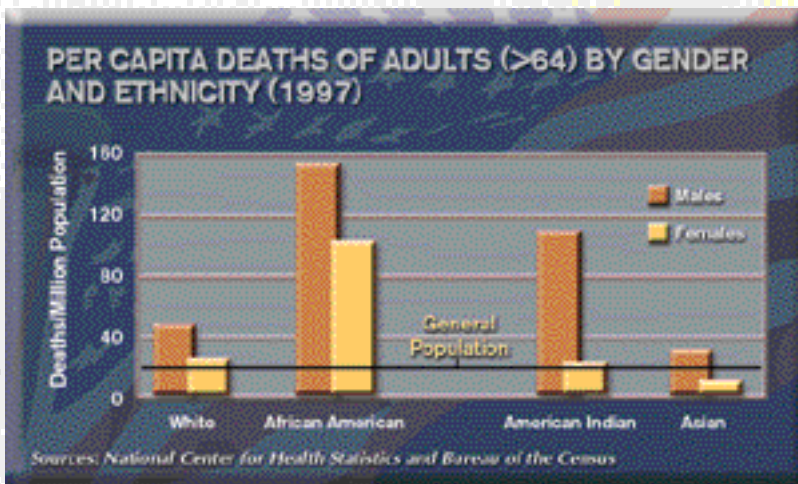
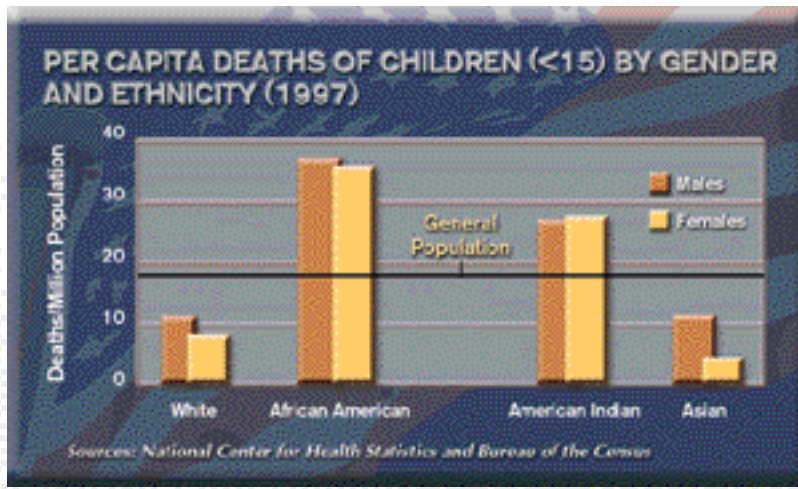
### ETHNIC, GENDER, AND AGE CHARACTERISTICS

Fire losses affect all groups and races, rich and poor, North and South, urban and rural. But the problem is higher for some groups than for others. Individuals living in poverty face a greater risk of fire, death, and injury than the general population. African Americans and American Indians have significantly higher fire deaths per capita than the national average. African American victims also comprise a disproportionate share of total fire deaths (27%) although they comprise 13% of the total population.

The risk of death in fire is higher among the very young (under age 15) and older adults (over 64). African Americans and American Indians in these age groups suffer extremely high loss rates. Older American Indians have a fire risk of over three times that of the general population. African American risk is six times higher.

When these two age groups are broken into subgroups, the “youngest” young and “oldest” old are at much higher risk than the following two charts indicate. In 1997, for example, African American males under the age of 5 had a death rate of 68 per million



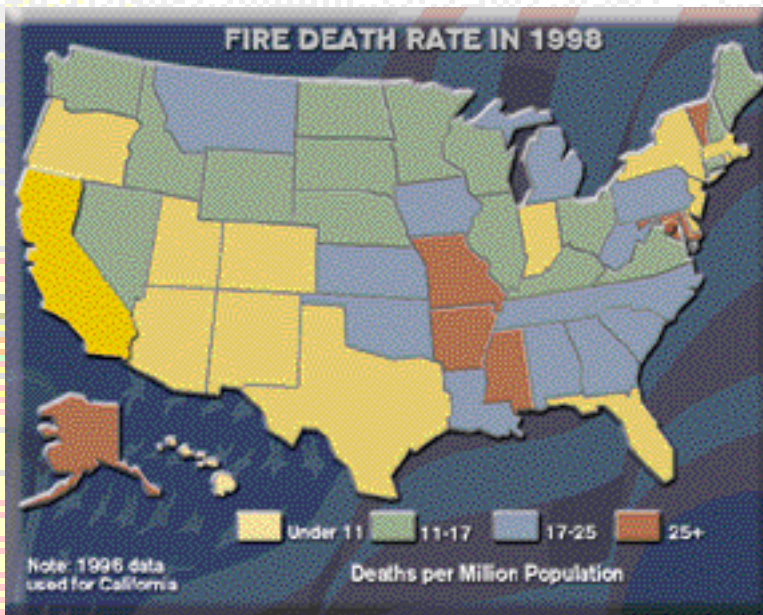


population, and those over the age of 84 had a startling death rate of 434 per million population. Because of the elevated risk to children and older adults and because the older adult population is increasing rapidly, the U.S. Fire Administration is focusing on programs that will cut these death rates in half by 2005.

Males suffer 50% more fatalities than women overall. Within the 20 to 50 age group, they are three times more likely to perish in a fire. It is believed that males in this age group are greater risk takers during fires, have a greater chance of being intoxicated, are greater users of flammable liquids, and are less safety conscious than women. Adults aged 20 to 44 are at highest risk of fire injuries.

## REGIONAL AND STATE PROFILES

The fire problem varies from region to region and state to state because of variations in climate, socioeconomic status, education, demographics, and other factors. The Southeast and Alaska consistently have the highest number of deaths per capita in the United States, and have a rate that is among the highest in the world. As shown on the



map, blocks of contiguous states often have similar profiles. Determining the commonality among these similar states might provide useful insights into the fire problem or its solution.

The ten states with the largest number of fire deaths are not surprisingly the highest population states. Although California, Texas, and New York have a high number of fire deaths, their deaths per capita are well below the national average of 14.9 per million population. The back

cover foldout presents the fire death rate for each state over 10 years and compares it with the national average.

Cooking was the leading cause of residential fires in 29 of the 43 states that reported to NFIRS in one or more of the years 1996–98. Heating was the leading cause of fires in 10 states, most of which are in cold weather areas of the country. The leading cause of deaths in more than half the states was smoking; 30% of the states reported either heating or arson as the leading cause of deaths.

The 10-year trend of fire deaths is down in 42 states (including the District of Columbia). The nine states whose trends are upward are small population states where one or two additional deaths in any one year can significantly affect the trend line. The trend for deaths per capita is down in 46 states, 26 of which have a 30% or better downward trend.

Fire prevention programs, outreach programs, and other fire-related initiatives have been instituted at local, county, and state levels. These programs include the distribution of free smoke alarms, development of fire education information on children's Web

pages, provision of instructional materials for educators on juvenile firesetting, and many others. Most state fire marshal offices have Web sites that are very informative and include current programs. The Web addresses and summaries of many of these programs are included in the Twelfth Edition of *Fire in the United States, 1989-1998*.

## STATE FIRE SUMMARY

State	1998		10-Year Trends (% change)	
	Number of Deaths	Deaths/ Million Population	Deaths	Deaths Per Capita
Alabama	85	20	-25	-31
Alaska	24	39	+11	-1
Arizona	36	8	6	-23
Arkansas	75	30	-8	-16
** California	191	6	-49	-53
Colorado	27	7	-1	-18
Connecticut	38	12	+37	+37
Delaware	7	9	-20	-28
D.C.	10	19	-26	-12
Florida	132	9	-31	-42
Georgia	140	18	-26	-38
Hawaii	13	11	+41	+38
Idaho	19	15	+16	-9
Illinois	189	16	-46	-49
Indiana	51	9	-51	-54
Iowa	52	18	-29	-31
Kansas	58	22	-29	-33
Kentucky	65	17	-27	-32
Louisiana	101	23	-23	-25
Maine	15	12	-53	-54
Maryland	78	15	-20	-26
Massachusetts	59	10	-39	-40
Michigan	213	22	-16	-21
Minnesota	52	11	-28	-34
Mississippi	105	38	-3	-4

*(Continued)*



## STATE FIRE SUMMARY (cont'd)

State	1998		10-Year Trends (% change)	
	Number of Deaths	Deaths/ Million Population	Deaths	Deaths Per Capita
Missouri	139	26	-19	-25
Montana	22	25	-10	-20
Nebraska	25	15	+7	+1
Nevada	24	14	+80	+20
New Hampshire	14	12	-52	-57
New Jersey	65	8	-49	-52
New Mexico	14	8	-23	-36
New York	159	9	-64	-65
North Carolina	130	17	-31	-40
North Dakota	7	11	-13	-13
Ohio	154	14	-14	-17
Oklahoma	59	18	-47	-51
Oregon	28	9	+3	-11
Pennsylvania	245	20	-16	-18
Rhode Island	1	1	-20	-18
South Carolina	69	18	-38	-44
South Dakota	12	16	-48	-52
Tennessee	128	24	-17	-27
Texas	143	7	-48	-57
Utah	16	8	-50	-61
Vermont	15	25	+225	+202
Virginia	90	13	-22	-31
Washington	73	13	-3	-19
West Virginia	45	25	-20	-21
Wisconsin	65	12	-33	-38
Wyoming	7	15	-51	-55

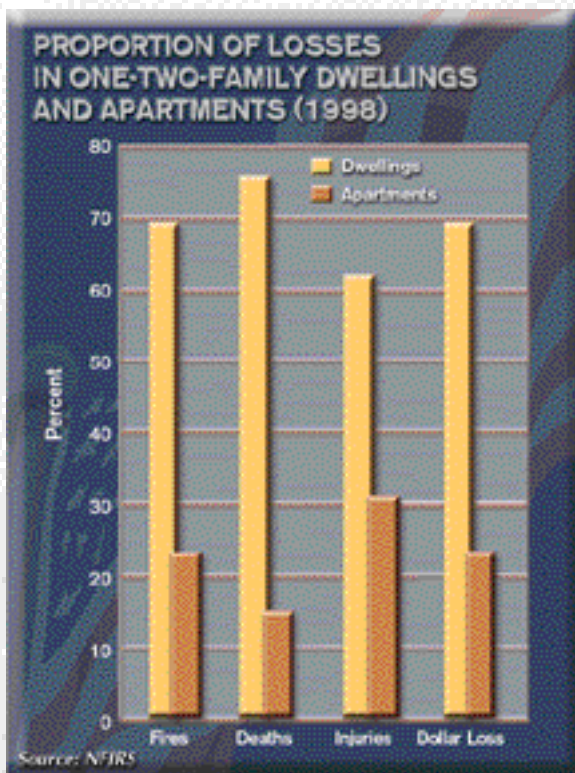
\* Five states participated in NFIRS for only 2 years, and two states participated for 1 year.

\*\* 1996 state fire marshal data used.

Sources: State fire marshals' offices and Bureau of the Census.

# RESIDENTIAL PROPERTIES

Residential properties include one- and two-family dwellings, apartments, hotels/motels, manufactured housing, dormitories, and other properties where people live temporarily. Residential properties are where most civilians and firefighters are injured or die from fires. An average of 3,800 civilians die each year in residential fires; property losses exceed \$4 billion. Even though the residential problem is severe, the 10-year trends continue downward—between 19% and 22% for each of the four measures.



The majority of the U.S. population lives in one- or two-family dwellings, and these properties dominate the 1998 residential statistics. But the risk of injury per capita is higher to apartment dwellers probably because the total space and number of exits are significantly less in apartment units than in one- and two-family dwellings. Deaths in manufactured housing decreased considerably in 1997 and 1998. Nevertheless, the number of deaths per manufactured housing fire is still considerably higher than in other residential structures.

Cooking is the leading cause of fires and injuries, smoking is the leading cause of deaths, and arson is the leading cause of dollar losses in residences. These rankings have remained unchanged since 1990. Heating was the leading cause of fires in 1989, but it has been halved since then because the use of alternative heat sources has greatly diminished.

One- and two-family homes have a higher percentage of heating fires than the rest of residences. Fireplaces and other alternative heating sources are more likely to be used. Additionally, homeowners are responsible for the maintenance of their own heating systems and may be less qualified than professionals who maintain apartment and hotel/motel heating plants.

Smoking accounts for one-quarter of all residential fire deaths, but the percentage has been declining. There are more than twice as many injuries (29%) due to cooking fires than to the next highest causes of injuries—arson and smoking at 12% each.

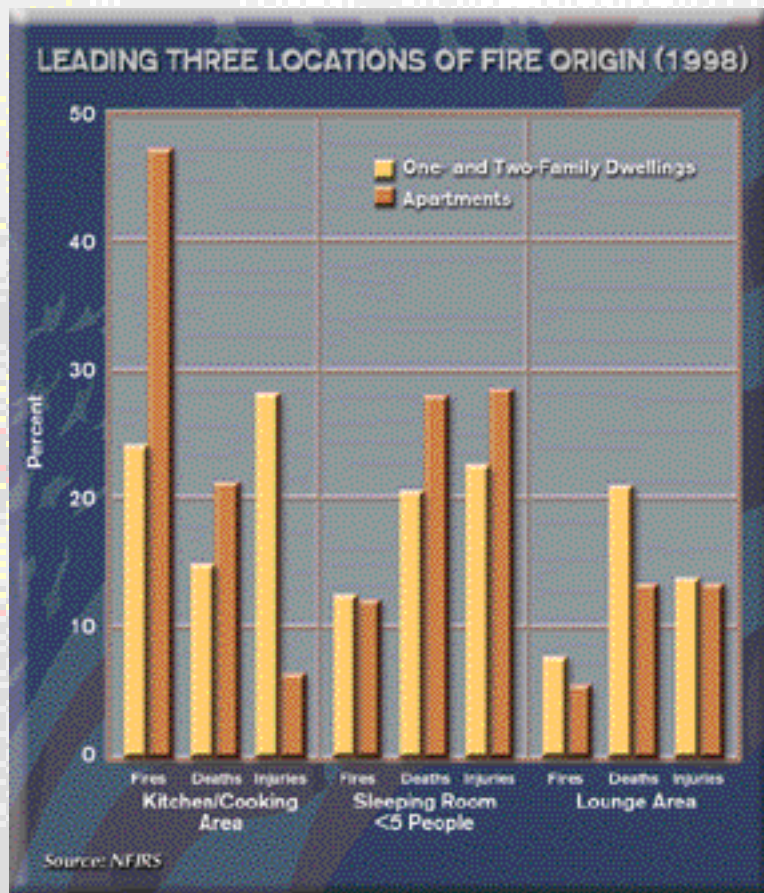
### LEADING CAUSES RESIDENTIAL FIRES AND FIRE LOSSES (1998)

Rank	Fires	Deaths	Injuries	Dollar Loss
1	Cooking	Smoking	Cooking	Arson
2	Arson	Arson	Arson	Electrical
3	Heating	Cooking	Smoking	Heating

Source: NFIRS

Fires do not occur uniformly throughout the day. They peak from 5 to 8 p.m., during dinner preparation. Fire incidents drop at night when people sleep, but deaths are at their highest during this period. A large portion of these deaths are caused by smoking or arson. Fires and fire deaths are higher in the winter months when heating systems add to other causes.

The areas of the home where fires occur most often have remained consistent over 10 years. Kitchens, bedrooms, and lounge areas (e.g., living rooms, dens, family rooms) are the areas where most fires, deaths, and injuries occur. Nearly twice as many fires originate in apartment kitchens as in one- and two-family dwelling kitchens. More than half of residential property deaths occur in the sleeping or lounge area.



# NON-RESIDENTIAL PROPERTIES

Non-residential properties include structures such as industrial and commercial properties, institutions, educational establishments, and vacant and under construction properties; mobile properties; and outside properties. Each category has a different profile.

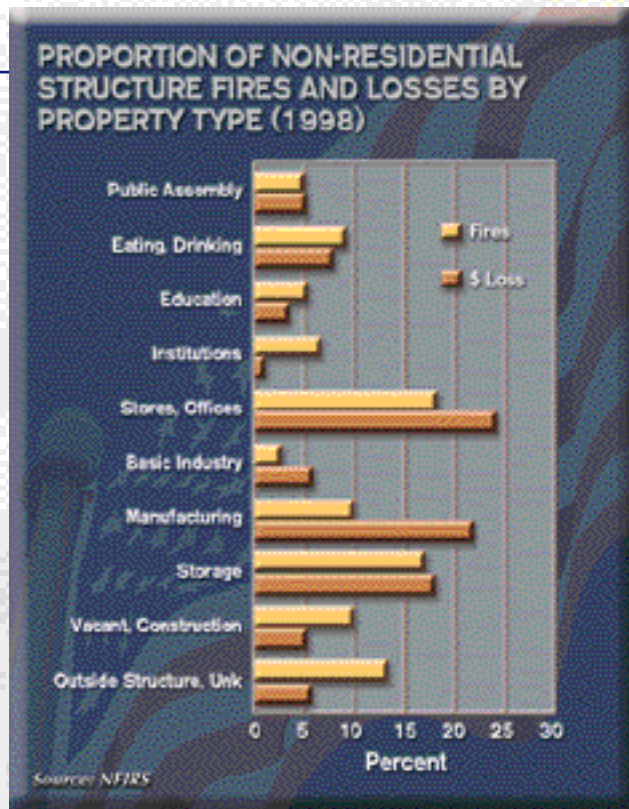
## STRUCTURES

Much of the effort in fire prevention, both public and private, has focused on protecting non-residential structures. The results have been highly effective, especially relative to the residential fire problem. Over the last 10 years, non-residential structures accounted for only 8%–9% of fires, 4%–7% of deaths, and 11%–14% of injuries. These properties, however, account for a large annual dollar loss, 31%–47%, primarily because non-residential structures generally have higher value than residential structures.

Within the non-residential structures category, stores/offices had both the largest percentage of fires (19%) and the highest percentage of dollar loss (24%) in 1998. Storage and manufacturing property types were also major contributors to total fires and dollar loss. Combined, these three structure types accounted for 46% of non-residential fires and 65% of dollar losses.

Arson is the leading cause of fires in six of the ten non-residential structure types, and the leading cause of dollar loss in eight property types. As would be expected, cooking is a major factor in eating establishments.

Fire incidents rise throughout the workday and peak in the late afternoon. This may be due to workers tiring on their job and becoming more accident prone or careless, but this needs to be studied. Dollar losses, however, peak at night and early morning hours, due largely to arson.

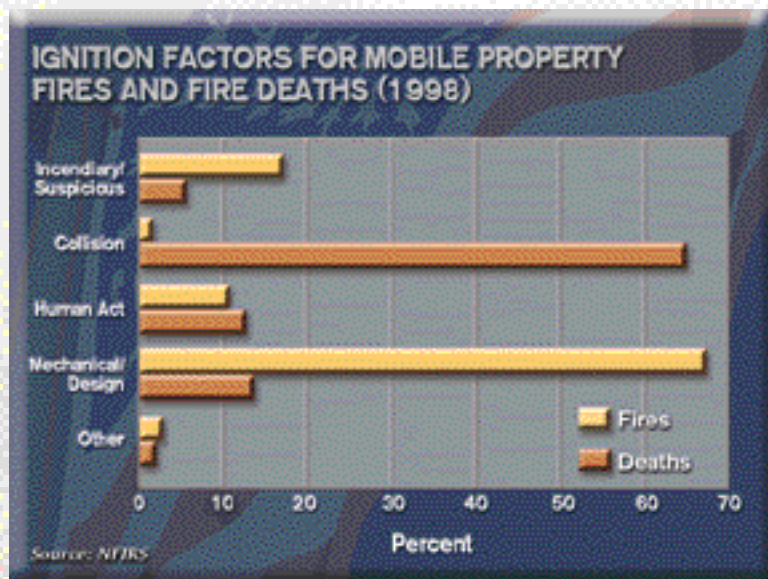


## MOBILE PROPERTIES

Mobile properties include highway vehicles (cars and trucks); rail, water, and air transport; and heavy equipment and other vehicles. Cars and trucks dominate the mobile property category with 82 percent of all mobile fires. The fire service responds to more vehicle fires than to residential fires. They also respond to tens of thousands of calls to vehicle accidents in which there was no fire and that are not reported to NFIRS.

The numbers of fires, deaths, and injuries in mobile properties have a 10-year downward trend (-11%, -16%, and -36%, respectively). Two aviation accidents in 1996 resulted in 339 fire deaths; otherwise, the death trend would have shown a much sharper decline. Mobile property dollar loss trended up 10% due to the higher cost of newer vehicles and of their repair.

Two-thirds of mobile property fires were attributed to mechanical or design problems, including broken fuel lines, faulty catalytic converters, blown tires, and overheating. In contrast, the majority of structure fires are accidental. Two-thirds of vehicle fire deaths were the result of fire after a collision. The cause of fatalities associated with a mobile property accident is often difficult to determine (e.g., the result of the mechanical forces or the fire that ensued).



Carelessness (human act) accounts for 14% of vehicle fire deaths and 30% of injuries. Human acts include distractions while driving (cell phone use, dropped cigarettes, eating/drinking) and misuse of flammable liquids while servicing the car.

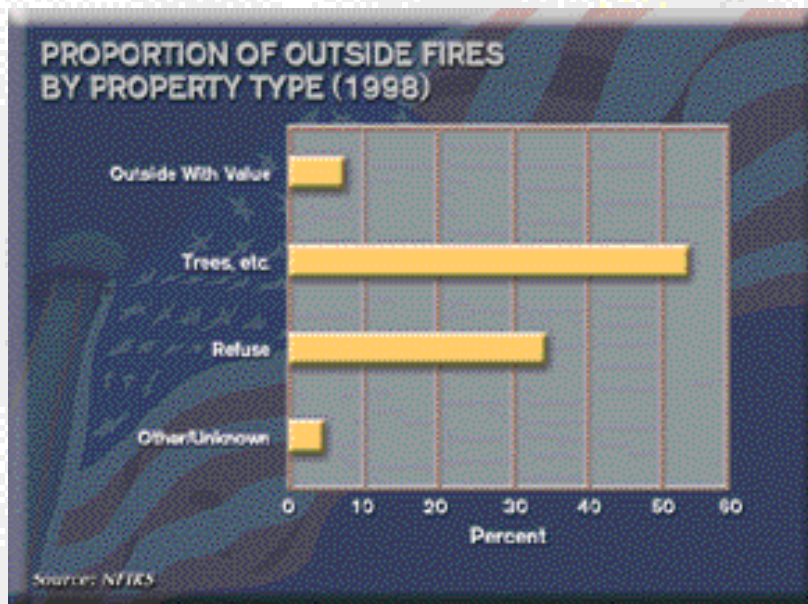
NFIRS reports show that 17% of mobile property fires are due to incendiary/suspicious origin. Many vehicle fires are not investigated for arson by the fire service, so this percentage may be understated. Insurance companies do investigate the most obvious arson fires before paying claims, but their findings are not necessarily reflected in the database.

## OUTSIDE PROPERTIES

Outside property fires include those outside of the structure where the burning material has a value and where the fire is confined to trees, brush, grass, or refuse. A subset of outside fires is wildland fires. Outside fires represent a significant portion of the yearly activity by the fire service.

Outside fires have averaged 800,000 each year over the past 10 years. In 1998, 43% of all fires were outside fires. Arson is reported as the leading cause of outside fires, although determining the cause of such fires is usually difficult. Many outside arson fires are believed to be caused by children.

The 10-year trends for outside properties are -14% for fires, -45% for deaths (due in part to the very small number of deaths each year), +17% for injuries, and +107% for dollar loss. The huge jump in the dollar loss is due to \$690 million from two timber fires, one in 1992 and one in 1998. Setting a dollar loss to most outside fires is difficult and varies widely from year to year. Outside fires may also have considerable indirect costs, such as the financial impact on agricultural communities where a fire destroys crops.



# SMOKE ALARMS AND SPRINKLERS

The greater use of smoke alarms is thought to account for a significant part of the decrease in reported fires and deaths. Surveys indicate that over 90% of U.S. households have at least one smoke alarm. Households that have reported fires are less likely to have working smoke alarms.

**SMOKE ALARM PRESENCE IN RESIDENCES (1998)**

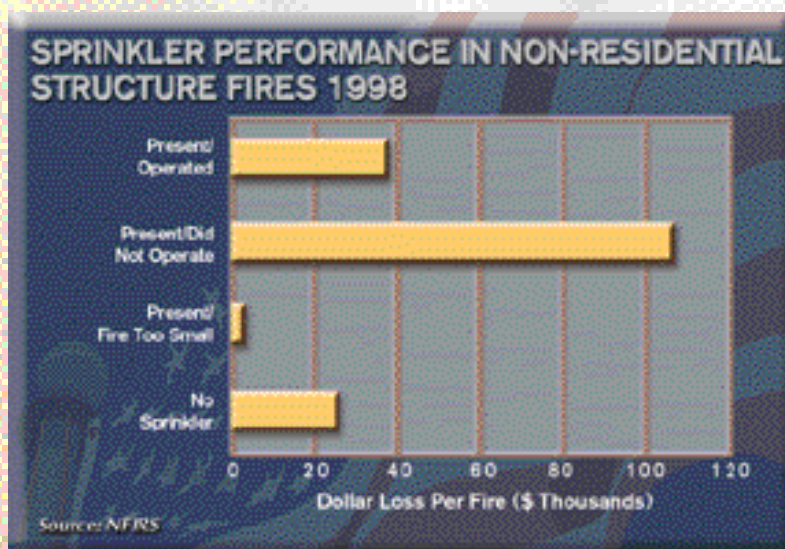
Residential Property Type	Present, Operated	Present, Did Not Operate	No Alarm
<b>FIRES/DEATHS (percent)</b>			
All Residences	27/18	15/12	28/33
1- and 2-Family Dwellings	22/15	15/11	31/35
Apartments	40/31	22/19	19/19

Source: NFIRS

Installed alarms did not operate in 16% of the residences in which there was a fire and in 12% in which there was a fatality. Either the alarm had been deliberately disconnected or it had no working battery.

Smoke alarms were present and operated in 39% of the apartment fires overall and in 31% of the apartment fires in which a death occurred. Here, the hallway or apartment alarm may have operated only after the victim had been overcome. Also, apartments may offer fewer ways to escape than one- and two-family residences.

Residential sprinklers were found in just 1.5% of residences that had reported fires in



1998. This might understate the actual numbers installed in residences since an operating sprinkler could have extinguished the fire before a call was placed to the fire department.

A higher percentage of apartments experiencing fires had sprinklers installed than in one- and two-family dwellings (6.5% vs. 0.5%). Sprinkler installations have been increasing in apartment buildings, but there is no noticeable increase in their use in other residences.

The use of sprinklers in non-residential structures is also increasing. In 1998, 17% of the non-residential structures that had fire were equipped with sprinklers, an increase of 4% since 1996. The economic loss was three times greater when a sprinkler system did not operate than when it did.

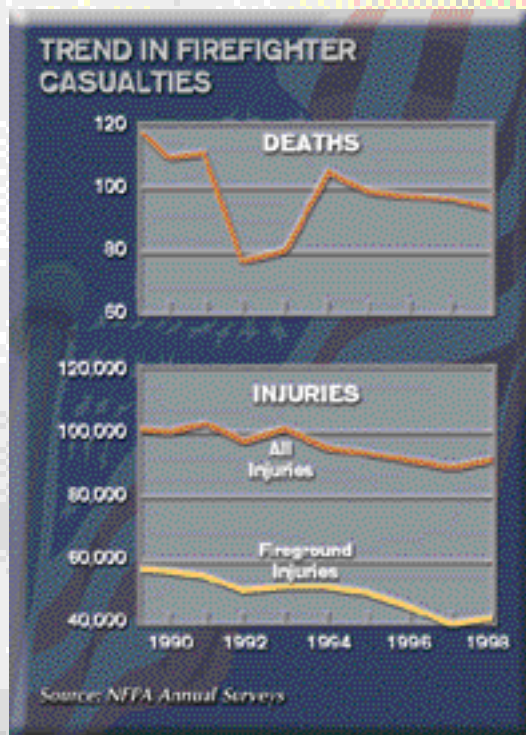
Smoke alarms and sprinklers are important tools in the prevention of casualties. The analysis suggests that the public must be educated to the proper maintenance of smoke alarms and that sprinklers installed in residences could greatly diminish fire losses.

## **FIREFIGHTER DEATHS AND INJURIES**

Firefighting is an extremely hazardous occupation. Ninety-one firefighters died while on duty in 1998 and 87,000 were injured.

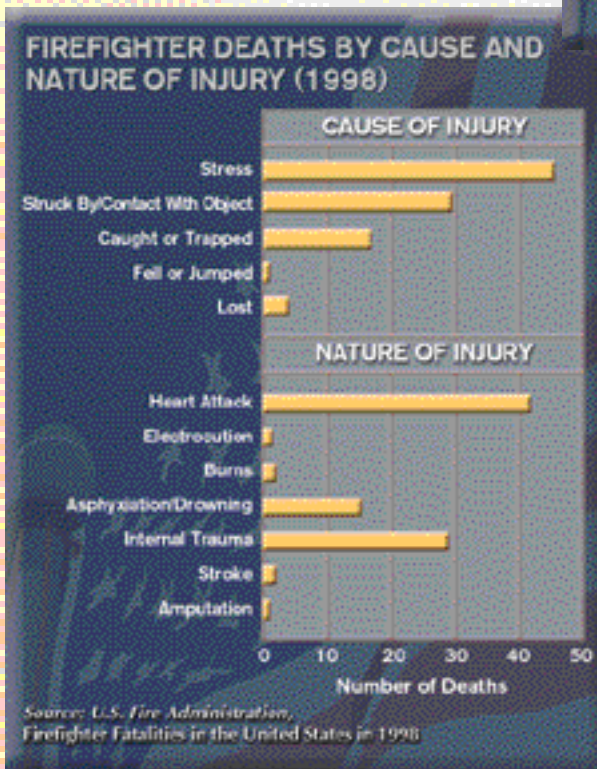
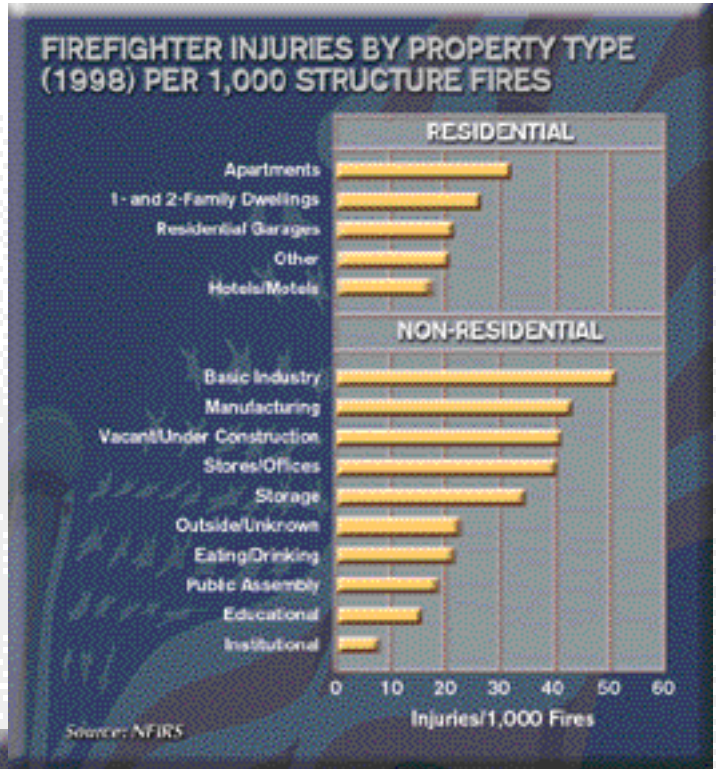
Forty-two firefighter deaths occurred during fireground activities—17 while fighting residential structure fires, 11 fighting commercial fires, and 14 at other locations. The fatalities included 37 career firefighters and 54 volunteers. The 91 deaths is the third lowest in the past 20 years, and the 10-year trend is down 17%.

Forty-six deaths were in urban/suburban areas, 38 in rural areas, and 7 in federal or state parks/wildland areas. Heart attacks were the primary factor in 42% of all deaths. To reduce the potential for incidence of heart attacks and strokes, the USFA recommends the implementation of effective firefighter health and wellness programs, including medical evaluations of all firefighters and a physical fitness program, and the availability of emergency medical care and equipment at every fire scene.





Firefighter injuries totaled 87,500 in 1998, 43,000 of which were on the fireground. These injuries are the lowest number since NFPA Annual Survey statistics have been recorded. The 10-year injury trend on the fireground is down 28%. Nevertheless, firefighters suffer twice the number of fire injuries each year as the civilian population. There were more than twice as many firefighters injured in residential properties than in non-residential properties (60% vs. 25%), and nearly three times more injuries in one- and two-family dwellings than in apartments (51% vs. 18%).



Firefighters are nearly 10 times more likely to be injured in a structure fire than in all other fires combined. Overall, 10 firefighters are injured per 1,000 fires; in structures this climbs to 28 injuries per 1,000 fires.

Sixty percent of injured firefighters are between the ages of 25 and 44. Typically, the leading causes of injury among younger firefighters relates to smoke inhalation and trauma, and among older firefighters strains and sprains are more common. These results relate to physical fitness variations with age, to the effect of age on assignments, and perhaps to the bravado of younger firefighters.

# THE NATIONAL PICTURE

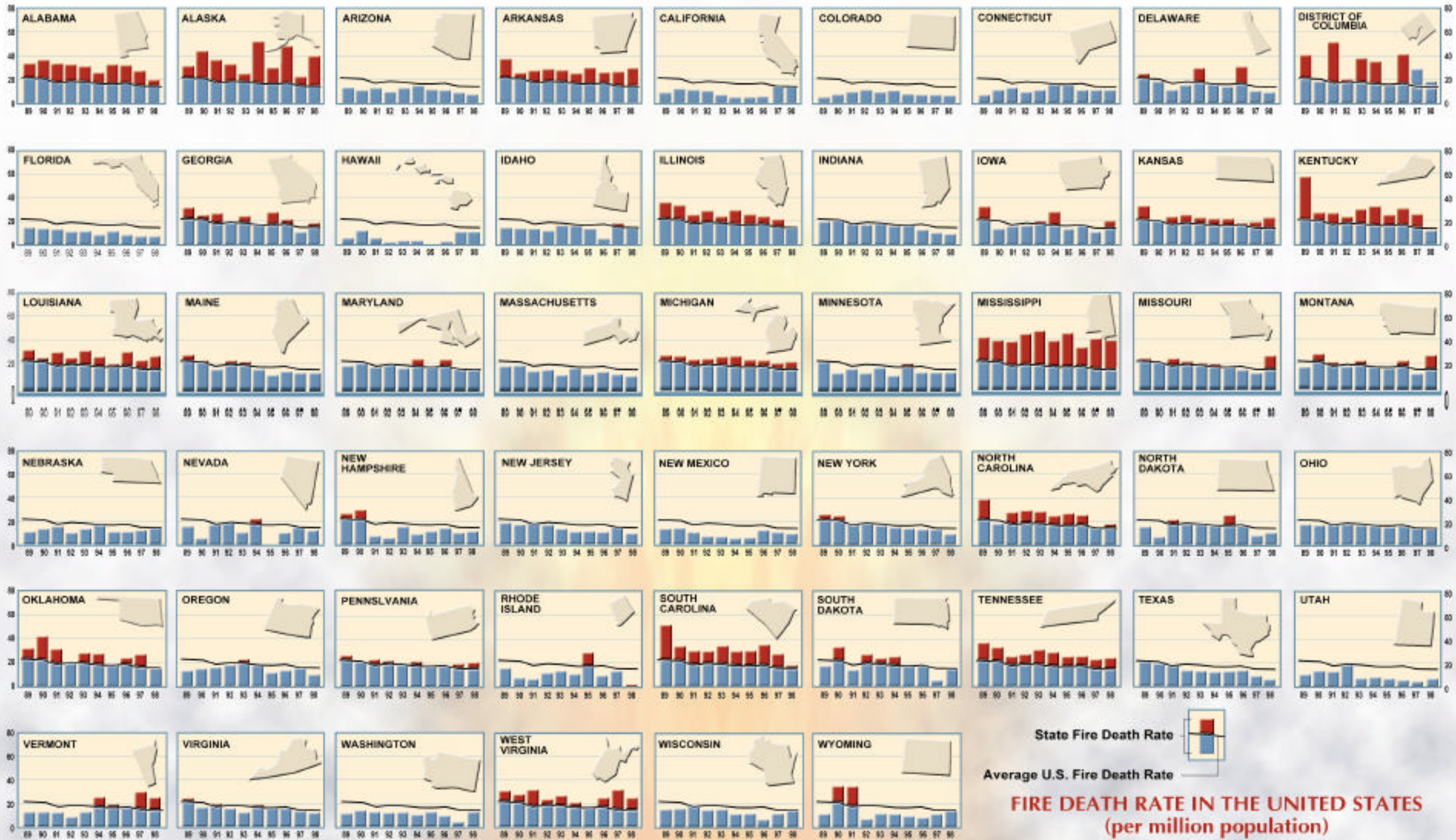
As shown by nearly every measure in this brochure, the United States' fire problem is improving. What is not clear, at least quantitatively, is which of the following factors have had the most influence on this result:

- Smoke alarms, whose usage has become nearly universal over the past two decades.
- Sprinklers, which quickly combat incipient fires, especially in non-residential structures and more recently in apartments. Public education programs could better inform homeowners of the value of sprinklers in residences.
- Fire codes, which have been strengthened.
- Construction techniques and materials, which have been specifically targeted to fire prevention.
- Public education at the community, county, state, and federal levels, which seems to be increasing.
- Firefighter equipment and training, which have improved.

With a clearer understanding of the relative importance of these factors, resources could be better targeted at those that have the most impact in lessening the U.S. fire problem.

\* \* \*

USFA's National Fire Data Center has published hundreds of analytical and statistical reports that address a wide range of subjects relating to fire in the United States. These reports are free of charge and may be ordered or downloaded at <http://usfa.fema.gov/usfapubs>.



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