U.S. Fire Administration

Residential Structure and Building Fires

October 2008

FEMA

U.S. Fire Administration

Mission Statement

We provide National leadership to foster a solid foundation for local fire and emergency services for prevention, preparedness, and response.

U.S. Department of Homeland Security

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U.S. Fire Administration

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INTRODUCTION

The residential portion of the fire problem continues to account for the vast majority of civilian casualties. National Fire Protection Association (NFPA) estimates show that, while residential structure fires account for only 25 percent of fires nationwide, they account for a disproportionate share of losses: 83 percent of fire deaths, 77 percent of fire injuries, and 64 percent of direct dollar losses.[1]

Analyses of the residential structure fire problem were published formerly as a chapter in each edition of *Fire in the United States*. The most recent edition of *Fire in the United States*, the fourteenth edition published in August 2007, featured an abbreviated chapter on residential structures. This full report is the most current snapshot of the residential fire problem as reflected in the 2005 National Fire Incident Reporting System (NFIRS) data and the 2005 NFPA survey data. In this report, as in previous chapters in *Fire in the United States*, an attempt has been made to keep the data presentation and analysis as straightforward as possible. It is also the desire of the United States Fire Administration (USFA) to make the report widely accessible to many different users, so it avoids unnecessarily complex methodology.

Terminology

The term "residential", as used in fire data analyses, includes properties commonly referred to as "homes," whether one-, two-, or multifamily properties. Residential refers to a type of property—whether it is a building or other type of structure, or whether the property is the land or real estate itself. Residential properties also include manufactured housing, hotels and motels, residential hotels, dormitories, assisted living facilities, as well as halfway houses for formerly institutionalized individuals (e.g., mental patients, drug addicts, or convicts) that are designed to facilitate their readjustment to private life. The term residential does not include institutional properties such as prisons, nursing homes, juvenile care facilities, or hospitals, though many people may reside there for short or longer periods of time.

The term "residential structures" refers to all built structures on residential properties. Structures include buildings as well as other nonbuilding structures (e.g., breezeways, fences, etc.). The vast majority of residential fires, deaths, and injuries occur in buildings, and that is where prevention efforts are targeted most often. The term "residential buildings" refers to those residential structures that are enclosed, and where people spend the majority of their time.[2]

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[1] These percentages are derived from summary data presented in the NFPA's annual survey and report, *Fire Loss in the United States During 2005*.

[2] USFA uses the structure type data element to determine the type of structure. Buildings include enclosed buildings and fixed portable or mobile structures (often used in conjunction with mobile (manufactured) homes). Residential structures with no structure type noted are included, as these structures frequently are the scene of confined structure heating and cooking fires, which are associated most often with enclosed buildings. These definitions are noted in detail in a later section.

The term "residence" is used interchangeably with "residential building". The term "home" is used infrequently, but also refers to a "residential building". In both instances, the terms exclude any nonbuilding structure.

Throughout this report, the term "fire casualties" refers to deaths and injuries; the term "fire losses" collectively includes fire casualties and dollar loss due to fire. As fire data are collected fire by fire, many of the data elements collected reflect the characteristics of the fire versus the characteristics of the casualties. This report also uses the following terms: "fatal fires" for those fires where one or more civilian fire fatalities occur, "fires with injuries" for those fires where one or more civilian fire injuries occur, and "fires with dollar loss" for those fires where a loss greater than zero was reported.

Organization of Report

This report addresses residential structure fires over the 10-year period from 1996 to 2005, with a focus on 2005 data. It is organized differently from its predecessor chapters in the many editions of *Fire in the United States*.

As NFIRS 5.0 allows analysts to distinguish between buildings and nonbuildings, this report addresses residential structure fires in two major sections. The first section presents an overview of residential structure fires and trends for the residential subsets of one- and two-family structure fires (including mobile homes used as fixed residences, a subset of one- and two-family dwellings), multifamily structure fires (apartments, rowhouses, town houses, condominiums, and tenements), and other residential structure fires such as rooming houses, hotels/motels, and other property types reported as residential.

The second section addresses residential building fires with the above three major subsets applied to residential buildings: one- and two-family, multifamily, and other residences.

The "Resources" section, formerly at the end of each chapter of *Fire in the United States,* is now in one, comprehensive resource list at the following URL: *http://www.usfa.dhs.gov/statistics/reports/fius.shtm*

METHODOLOGY

Residential Structure Fires in 2005 relies on data from the Nation's largest fire incident database, NFIRS; on independent surveys from the NFPA; and on analytic techniques widely accepted by fire data analysts. The primary data source and analytic considerations when using the data are addressed in the following sections.

National Fire Incident Reporting System Data

The fire-related findings in this report are based primarily on analyses of the NFIRS fire incident data for 2005. NFIRS is a State-based, voluntary data collection system administered by the USFA, an agency under the Department of Homeland Security (DHS). From an initial six States in 1976, NFIRS has grown both in participation and in use. Over the life of the system, all 50 States, the District of Columbia, and Native American Tribal Authorities have reported to NFIRS. Participation in NFIRS is voluntary, although some States do require their departments to participate in the State system. Additionally, if a fire department is a recipient of a Fire Act Grant, participation is required.[3]

[3] From the Assistance to Firefighters Grant Program guidance, if the applicant is a fire department, the department must agree to provide information, through established reporting channels, to NFIRS for the period covered by the assistance. If a fire department does not participate currently in the incident reporting system and does not have the capacity to report at the time of the award, the department must agree to provide information to the system for a 12-month period that begins as soon as the department develops the capacity to report. See http://www.firegrantsupport.com/docs/2007AFGguidance.pdf

Not all States necessarily participate each year and, for those that do, reported fire incidents do not reflect all of a State's fire activity. Within a State, the participating fire departments include career, volunteer, and combination career/volunteer departments. These departments serve communities that range from rural hamlets to the largest cities. In addition, not all recorded information is complete. Nonetheless, with over half of all fire departments nationwide reporting fire incidents to NFIRS 5.0, the reporting departments represent a very large sample that enables us to make good estimates of various facets of the fire problem.[4, 5]

In 2005, approximately one million fire incidents and more than 13 million non-fire incidents were added to the database. NFIRS is the world's largest collection of incidents to which fire departments respond.

National Estimates

With the exception of the summary totals from the NFPA surveys at the beginning of each section of residential structures, the numbers in this report are scaled-up national estimates or percentages, not just the raw totals from NFIRS. Many of the estimates are derived by computing a percentage of fires, deaths, injuries, or dollar loss in a particular NFIRS category and multiplying it by the corresponding total number from the NFPA annual survey. For example, the national estimate for the number of residential building fires (Figure 10) was computed by taking the percentage of NFIRS residential structure fires that are building fires and multiplying it by the estimated total number of residential structure fires from the NFPA survey. This methodology is the accepted practice of national fire data analysts.[6]

Ideally, one would like to have all of the data come from one consistent data source. Because the "residential population protected" is not reported to NFIRS by many fire departments and the reliability of that data element is suspect in many other cases, especially where a county or other jurisdiction is served by several fire departments that each report their population protected independently, this data element was not used. Instead, extrapolations of the NFIRS sample to national estimates are made using the NFPA survey for the gross totals of fires, deaths, injuries, and dollar loss.

One problem with this approach is that the proportions of residential fires and fire losses differ between the large NFIRS sample and the NFPA survey sample. Nonetheless, to be consistent with approaches being used by other fire data analysts, the NFPA estimates of fires, deaths, injuries, and dollar loss for residential structures are used as a starting point. The details of the residential fire problem below this level are based on proportions from NFIRS. Because the proportions of fires and fire losses differ between NFIRS and the NFPA estimates, from time to time this approach leads to minor inconsistencies. These inconsistencies will remain until all estimates can be derived from NFIRS alone.

[4] *Fire in the United States 1995-2004, Fourteenth Edition,* United States Fire Administration, August 2007: http://www.usfa.dhs.gov/statistics/reports/fius.shtm

[5] NFIRS 5.0 contains converted NFIRS version 4.1 data and native NFIRS version 5.0 data. USFA uses only NFIRS 5.0 data for its analyses.

[6] John R. Hall and Beatrice Harwood, "The National Estimates Approach to U.S. Fire Statistics," *Fire Technology*, May 1989. Also available at: http://www.nfpa.org/assets/files/PDF/Research/Nationalestimates.pdf

Unknowns

On a fraction of the incident reports or casualty reports sent to NFIRS, the desired information for many data items either is not reported or is reported as "unknown" or "undetermined." Often the total number of blank or unknown entries is larger than some of the important subcategories. For example, 42 percent of the fatal residential structure fires reported in 2005 do not have sufficient data reported to NFIRS to determine cause. The lack of data masks the true picture of the residential fire problem. Many prevention and public education programs use NFIRS data to target at-risk groups or to address critical problems; fire officials use the data in decisionmaking that affects the allocation of firefighting resources; and consumer groups and litigators use the data to assess product fire incidence. When the unknowns are large, the credibility of the data suffers. Fire departments need to be more aware of the effect of incomplete reporting.

Incomplete Loss Reporting

As troublesome as insufficient data for the various NFIRS data items can be, equally challenging is the apparent nonreporting of injuries and property loss associated with the fire incident (although the latter is notoriously difficult to quantify). It is exceedingly rare that a fire department experiences no firefighter injuries of any type. Yet there are fire departments, large and small, that report no firefighter injuries or a minuscule number of them, but report fires. Fire, by its nature, is destructive. Yet there are many reported fires where the flame spread indicates damage but no property loss is indicated. Incomplete reporting of associated civilian deaths is much more difficult to identify, as the numbers of deaths are relatively small. Incomplete reporting of civilian injuries is equally difficult to ascertain, as the injury-per-fire profiles for most departments are within reason.

Adjusted Percentages in Fire Data

In making national estimates of the fire problem, unknown or undetermined data in the NFIRS database are not ignored. Unknown data occur when the information in nonrequired data collection items in NFIRS is not provided (left blank), the coding provided is invalid, or the information is noted as "undetermined." The approach taken in this report is to provide an "adjusted" percentage that is computed using only those incidents for which the valid information was provided for the data item being analyzed. In effect, this distributes the unknown responses in the same proportion as the known responses for the data item, which may or may not be approximately right.

As in past editions of the parent document, *Fire in the United States*, both the reported data and the adjusted data (if unknowns are present) are plotted on the bar charts in this edition. Unless otherwise noted, as in the Smoke Alarms section below, adjusted percentages are used in the text.

Comparing Statistics to Previous Analyses

Differences between the current NFIRS and older versions have, or may have, an effect on the analyses of fire topics. These differences, the result of both coding changes and data element design changes, required revisions to long-standing groupings and analyses. The definitions of some property types,[7] the cause methodology, smoke alarm performance, mutual aid, building data, and streamlined reporting for qualified incidents are among those areas that are approached differently in NFIRS 5.0. As these revisions have

[7] Examples of these property type changes include detached residential garages, which, as a subset of nonresidential storage properties, previously were included under residential structures. They now are included with nonresidential properties. Vacant and under construction now is an attribute of a structure, and no longer is considered a separate property type.

resulted in changes in overall trends—some subtle and some substantial—this edition does not include trends based on previous versions of NFIRS data. Subsequent editions will build on the analyses presented here. This edition does, however, present trends based on data from the NFPA annual surveys.

Streamlined reporting of confined, low-loss structure fires[8] allows the fire service to capture incidents that either might have gone unreported prior to the introduction of NFIRS 5.0 or were reported, but as a nonfire fire incident, as no loss was involved.[9] Data from this reporting option were investigated in a 2006 USFA report, *Confined Structure Fires*. The addition of these fires results in increased proportions of cooking and heating fires in analyses of fire cause. In other analyses, the inclusion of confined fires may result in larger unknowns than in previous analyses, as detailed reporting of fire specifics (e.g., room of origin) is not required. In 2005, these confined fires accounted for 45 percent of residential structure fires. Nearly 90 percent of these confined residential structure fires were no- or low-loss cooking fires (67 percent) and heating fires (22 percent).

Smoke Alarms

Smoke alarm data collection in NFIRS 5.0 has changed in two significant ways. First, in keeping with the abbreviated reporting for confined fires, smoke alarm performance data for confined structure fires is limited to information on smoke alarm alert notification. Second, for nonconfined structure fire reporting, only incidents reported as buildings are required to provide detailed information on smoke alarm presence, type, operational status, and the like. Because the data items are not wholly compatible for analytic purposes, smoke alarm performance is presented separately for confined and nonconfined fires. Adjustments for unknowns are not presented.

The effectiveness of smoke alarms is understood to be whether the smoke alarm alerted occupants to the fire. In the case of confined fires, effectiveness data are collected by a single data element. In the case of nonconfined fires, data are collected on the presence of alarms, operation of alarms when present, and alerting status for present and operating alarms. Effectiveness then is a combination of alarms present and operating with the successful alerting of occupants.

At the time of publication, a methodology to analyze NFIRS 5.0 smoke alarm data is under review. As smoke alarm data are of great interest to many readers, the NFIRS 5.0 smoke alarm data (e.g., raw NFIRS 5.0 counts) for each residential building category are presented in the Appendix.

[8] Confined structure fires are defined in NFIRS as incident types 113 to 118.

[9] Some fire departments routinely reported such non-loss fires as smoke scares. The result, from a reporting viewpoint, is that the incident was reported but not coded as a fire incident, thereby reducing the number of reported fires in NFIRS.

Trend Data

A frequently asked question is how much a particular aspect of the fire problem has changed over time. The usual response is in terms of a percentage change from one year to another. As we are dealing with real-world data that fluctuate from year to year, a percent change from one specific year to another can be misleading. This is especially true when the beginning and ending data points are extremes—either high or low. For example, Table 1 shows the percent change in residential structure fire deaths from 1996 (4,080 deaths) to 2005 (3,055) would be a decrease of 25.1 percent. Yet, if we were to choose the next year, 1997, as the beginning data point (3,390 deaths), this change would show a much smaller decrease of 9.9 percent. As we are interested in trends in the U.S. fire problem, this report presents the computed best-fit linear trend line (which smoothes fluctuations in the year-to-year data) and presents the change over time based on this trend line. In this example, the overall 10-year trend is a decrease in residential structure fire deaths of 18.1 percent. As noted above, trends that incorporate NFIRS data from the 5.0 system may have subtle changes as a result of the system design, and not a true trend change.

Table 1. Comparison of Percentage Change Indicators

Year	Residential Structure Fire Deaths	Linear Best Fit Trend	Change between 1996 and 2005	Change between 1997 and 2005
1996	4,080	3,558	4,080	
1997	3,390	3,486		3,390
1998	3,250	3,415		
1999	2,920	3,344		
2000	3,445	3,272		
2001	3,140	3,201		
2002	2,695	3,129		
2003	3,165	3,058		
2004	3,225	2,987		
2005	3,055	2,915	3,055	3,055
Percent Change		**-18.1%**	**-25.1%**	**-9.9%**

Sources: Residential structure fire death data, NFPA; analysis, USFA.

Trend data presented in this report are either 10-year trend data for residential structure fires from the NFPA annual surveys (1996–2005) or 3-year national estimate trend data for building fires (2003–2005).

Cause Categories

Since the introduction of NFIRS Version 5.0, the implementation of the cause hierarchy has resulted in a steady increase in the percentage of unknown fire causes. This increase may be due, in part, to the fact that the original cause hierarchy (described in *Fire in the United States 1995-2004, Fourteenth Edition*) was developed to capture the causes identified from the data collected in previous NFIRS versions. It appears that, for some fire incidents, a considerable amount of causal information collected as part of the NFIRS Version 5.0 was not used in the old hierarchy. As a result, these incidents were assigned to the unknown cause category. USFA has developed a modified version of the previous hierarchy of cause groupings for structure fires to address this deficiency (Table 2). The revised schema provides three levels of cause descriptions: a set of more detailed causes (priority cause description), a set of mid-level causes (cause description), and a set of high-level causes (general cause description). The priority cause description and the cause description existed previously as part of the original cause hierarchy, but have been expanded in the revised schema to capture the rest of the 5.0 data. Generally, the mid-level causes are the cause groupings used by USFA analysts.

Table 2. Three-Level Structure Fire Cause Hierarchy

Priority Cause Description (in hierarchical order)	Cause Description	General Cause Description
Exposure	Exposure	Exposure
Intentional	Intentional	Firesetting
Investigation with Arson Module	Investigation with Arson Module	Unknown
Children Playing	Playing with Heat Source	Firesetting
Other Playing		
Natural	Natural	Natural
Fireworks	Other Heat	Flame, Heat
Explosives		
Smoking	Smoking	
Heating	Heating	Equipment
Cooking	Cooking	
Air Conditioning	Appliances	
Electrical Distribution	Electrical Malfunction	Electrical
Appliances	Appliances	Equipment
Special Equipment	Other Equipment	
Processing Equipment		
Torches	Open Flame	Flame, Heat
Service Equipment	Other Equipment	Equipment
Vehicle, Engine		
Unclassified Fuel-Powered Equipment		
Unclassified Equipment w/ Other or Unknown Fuel Source	Unknown	Unknown
Unclassified Electrical Malfunction	Electrical Malfunction	Electrical
Matches, Candles	Open Flame	Flame, Heat
Open Fire		
Other Open Flame, Spark	Other Heat	
Friction, Hot Material		
Ember, Rekindle	Open Flame	

continued on next page

Table 2. (cont'd)

Priority Cause Description (in hierarchical order)	Cause Description	General Cause Description
Other Hot Object	Other Heat	Flame, Heat
Natural Condition, Other	Natural	Natural
Heat Source or Product Misuse	Other Unintentional, Careless	Unknown
Equipment Operation Deficiency	Equipment Misoperation, Failure	Equipment
Equipment Failure, Malfunction		
Trash, Rubbish	Unknown	Unknown
Other Unintentional	Other Unintentional, Careless	
Exposure (Fire Spread, Other)	Exposure	Exposure
Unknown	Unknown	Unknown

Note: Fires are assigned to a cause category in the hierarchical order shown. For example, if the fire is judged to be intentionally set and a match was used to ignite it, it is classified as intentional and not open flame, because intentional is higher on the list.

The causes of fires are often a complex chain of events. To make it easier to grasp the "big picture," 16 mid-level categories of fire causes such as heating, cooking, and playing with heat source are used by the USFA here and in many other reports. The alternative is to present scores of detailed cause categories or scenarios, each of which would have a relatively small percentage of fires. For example, heating includes subcategories such as misuse of portable space heaters, wood stove chimney fires, and fires involving gas central heating systems. Experience has shown that the larger categories are useful for an initial presentation of the fire problem. A more detailed analysis can follow.

Fires are assigned to one of the 16 mid-level cause groupings using a hierarchy of definitions approximately as shown in Table 3.[10] A fire is included in the highest category into which it fits on the list. If it does not fit the top category, then the second one is considered, and if not that one, the third, and so on. (See Table 2 Note for examples.)

The cause categories displayed in the graphs are listed in the same order to make comparisons easier from one to another. The y-scale varies from figure to figure, depending on the largest percentage that is shown; the y-scale on a figure with multiple charts, however, is always the same.

The cause categories used throughout most of this report were designed to reflect the causes of structure fires—where the majority of fatal fire deaths occur. While these categories have usefulness for the other property types, there are limitations. For example, in vehicle fires, these limitations are such that the cause categories are not used. In the future, USFA also plans to investigate and develop cause categories for vehicle and outside fires.

An additional problem to keep in mind when considering the rank order of causes in this report is that sufficient data to categorize the cause were not reported to NFIRS for all fatal fires in the database. The rank order of causes might be different than shown here if the cause profile for the fires whose causes were not reported to NFIRS were substantially different from the profile for the fires whose causes were reported. However, there is no information available to indicate that there is a major difference between the known causes and the unknown causes, and so our present best estimate of fire causes is based on the distribution of the fires with known causes.

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[10] The structure fire cause hierarchy and specific definitions in terms of the NFIRS 5.0 codes may be found at (http://www.usfa.dhs.gov/fireservice/nfirs/tools/fire_cause_category_matrix.shtm). The hierarchy involves a large number of subcategories that are later grouped into the 16 mid-level cause categories, then the 8 high-level cause groupings.

Table 3. Mid-Level Cause Groupings

Cause Category	Definition
Exposure	Caused by heat spreading from another hostile fire
Intentional	Cause of ignition is intentional or fire is deliberately set
Investigation with Arson Module	Cause is under investigation and the case status on the NFIRS Arson Module is either open, closed, inactive, closed with arrest, or closed with exceptional clearance
Playing with Heat Source	Includes all fires caused by individuals playing with any materials contained in the categories below as well as fires where the factors contributing to ignition include playing with heat source. Children playing fires are included in this category
Natural	Caused by the sun's heat, spontaneous ignition, chemicals, lightning, static discharge, high winds, storms, high water including floods, earthquakes, volcanic action, and animals
Other Heat	Includes fireworks, explosives, flame/torch used for lighting, heat or spark from friction, molten material, hot material, heat from hot or smoldering objects
Smoking	Cigarettes, cigars, pipes, and heat from undetermined smoking materials
Heating	Includes confined chimney or flue fire, fire confined to fuel burner/boiler malfunction, central heating, fixed and portable local heating units, fireplaces and chimneys, furnaces, boilers, water heaters as source of heat
Cooking	Includes confined cooking fires, stoves, ovens, fixed and portable warming units, deep fat fryers, open grills as source of heat
Appliances	Includes televisions, radios, video equipment, phonographs, dryers, washing machines, dishwashers, garbage disposals, vacuum cleaners, handtools, electric blankets, irons, hairdryers, electric razors, can openers, dehumidifiers, heat pumps, water-cooling devices, air conditioners, freezers and refrigeration equipment as source of heat
Electrical Malfunction	Includes electrical distribution, wiring, transformers, meter boxes, power switching gear, outlets, cords, plugs, surge protectors, electric fences, lighting fixtures, electrical arcing as source of heat
Other Equipment	Includes special equipment (radar, x-ray, computer, telephone, transmitters, vending machine, office machine, pumps, printing press, gardening tools, or agricultural equipment), processing equipment (furnace, kiln, other industrial machines), service, maintenance equipment (incinerator, elevator), separate motor or generator, vehicle in a structure, unspecified equipment
Open Flame, Spark (Heat From)	Includes torches, candles, matches, lighters, open fire, ember, ash, rekindled fire, backfire from internal combustion engine as source of heat
Other Unintentional, Careless	Includes misuse of material or product, abandoned or discarded materials or products, heat source too close to combustibles, other unintentional (mechanical failure/malfunction, backfire)
Equipment Misoperation, Failure	Includes equipment operation deficiency, equipment malfunction
Unknown	Cause of fire undetermined or not reported

Source: USFA.

NFIRS fire data can be analyzed in many ways, such as by the heat source, equipment involved in ignition, factors contributing to ignition, or many other groupings. The hierarchy used in this report has proved to be useful in understanding the fire problem and targeting prevention, but other approaches certainly are useful too. Because the NFIRS database stores records fire-by-fire, and not just in summary statistics, a very wide variety of analyses is possible.

When Fires Occur

NFIRS collects information on the date and time the fire alarm was received by the fire department. It is important to note that the time the alarm was received is **not** the same as the time when the fire started. For many reasons, such as in the case of a long-smoldering fire, there may be a significant time lag between fire ignition and fire department notification. This observation is especially noteworthy for any analysis that attempts to determine how long a fire burned freely before the fire department arrived—in this case, what can be derived is the response time from the fire department receipt of alarm to the first apparatus arrival on the fire scene.

Nonetheless, for the purposes of this report, the time of the fire alarm is used as a reasonable approximation for the general time the fire started. The text associated with each section on time of fire alarm presumes this to be the case.

Rounding

Percentages on each chart are rounded to one decimal point. Textual discussions cite these percentages as whole numbers. Thus, 13.4 percent is rounded to 13 percent and 13.5 percent is rounded to 14 percent.

National estimates are rounded as follows: fires are rounded to the nearest 100 fires, deaths to the nearest 5 deaths, injuries to the nearest 25 injuries, and loss to the nearest million dollars.

Differences Between National Fire Incident Reporting System and National Fire Protection Association Data

There is an inconsistency between the NFIRS 5.0 data and the NFPA annual survey data. While NFIRS 5.0 and NFPA both show declines in deaths and injuries per fire, the NFIRS decline is much more prominent. In addition, NFIRS 5.0 dollar loss per fire is 10 to 15 percent lower than that of NFPA.[11] This issue is discussed further in *Fire in the United States in* 2004, Appendix A.

[11] As NFIRS 5.0 now captures a large number of small, low-loss fires (confined fires) thought to be unreported previously, these differences in loss rates per fire may not be surprising.

Unreported Fires

NFIRS includes only fires to which the fire service responded. In some States, fires attended by State fire agencies (such as forestry) are included; in other States, they are not.

NFIRS includes fires from all States, but does not include incidents from many fire departments within participating States. However, if the fires from the reporting departments are reasonably representative, this omission does not cause a problem in making useful national estimates for any but the smallest subcategories of data.

An enormous number of fires are not reported to the fire service at all. Most are believed to be small fires in the home or in industry that go out by themselves or are extinguished by the occupant. Based on a study done in the early 1970s, these unreported fires collectively cause a great deal of property loss and a large number of injuries requiring medical attention. The latest study of this problem was a report published by the Consumer Product Safety Commission (CPSC) in 1985.[12] The CPSC recently conducted the 2004–2005 Residential Fire Survey, however, the published findings were not released in time to be included in this report.

Perhaps the most disturbing type of unreported fire is one that is not submitted by fire departments that are participating in NFIRS. Some departments submit information on most, but not all, of their fires. Sometimes the confusion is systematic, as when no-loss cooking fires or chimney fires are not reported. Sometimes it is inadvertent, such as when incident reports are lost or accidentally not submitted. The information that is received is assumed to be the total for the department and is extrapolated as such. Although there was no measure of the extent of this problem in the past, NFIRS 5.0 provides fire departments with the capability to report this information in a simplified, more straightforward manner.

Residential Structures and Residential Buildings

As noted previously, NFIRS 5.0 allows for the differentiation between buildings and nonbuildings. In NFIRS, a structure is a built object and can include platforms, tents, connective structures (e.g., bridges), and various other structures (e.g., fences, underground work areas, etc.). This distinction between building and nonbuilding is particularly important when determining the effectiveness of non-behavior-based fire safety mechanisms such as smoke alarms and residential sprinklers. These important components of early fire detection apply to buildings and not necessarily to these other types of structures. To facilitate analysis of these components and to acknowledge that prevention efforts generally are focused on buildings, USFA separates residential buildings from the rest of the residential structures.

[12] *1984 National Sample Survey of Unreported Residential Fires: Final Technical Report*, prepared for the U.S. Consumer Product Safety Commission, Contract No. C–83–1239, Audits & Surveys, Inc., Princeton, NJ (1985).

Residential Structures

For the purposes of this report, residential structure fires are defined as fires that occur in structures on residential properties.[13] In terms of NFIRS data, these fires are defined as:

- Incident types 111 to 123:

  111–Building fire;
  112–Fires in structure other than in a building;
  113–Cooking fire, confined to container;
  114–Chimney or flue fire, confined to chimney or flue;
  115–Incinerator overload or malfunction, fire confined;
  116–Fuel burner/boiler malfunction, fire confined;
  117–Commercial compactor fire, confined to rubbish;
  118–Trash or rubbish fire, contained;
  120–Fire in mobile property used as a fixed structure, other;
  121–Fire in mobile home used as fixed residence;
  122–Fire in motor home, camper, recreational vehicle; and
  123–Fire in portable building, fixed location.

  (Note that incident types 113 to 118 do not specify if the structure is a building.)

- Property use 400 to 499:

  400–Residential, other;
  419–1 or 2 family dwelling;
  429–Multifamily dwelling;
  439–Boarding/Rooming house, residential hotels;
  449–Hotel/Motel, commercial;
  459–Residential board and care;
  460–Dormitory-type residence, other;
  462–Sorority house, fraternity house; and
  464–Barracks, dormitory.

Residential Buildings

Residential building fires are a subset of residential structure fires. They are defined as residential structure fires where the structure type is a building or, for mobile homes, a fixed structure. By definition, this excludes non-building structures. Previous USFA analyses demonstrated that confined structure fire incidents with full incident reporting primarily occurred in buildings. To accommodate the confined fire incident types with abbreviated incident reporting, the incident also is assumed to be a building if the structure type is not specified. In terms of NFIRS data, residential building fires are, therefore, defined as:

[13] USFA analyses on fires do not include aid runs, to avoid the double counting of fires. That is, analyses exclude those fire incidents where mutual or automatic aid is given.

- Incident types:

  111–Building fire;
  112–Fires in structure other than in a building;[14]
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  460–Dormitory-type residence, other;
  462–Sorority house, fraternity house; and
  464–Barracks, dormitory.

- Structure type:

  1–Enclosed building;
  2–Fixed portable or mobile structure; and
  Structure type not specified (null entry).

RESIDENTIAL STRUCTURES

The residential structure portion of the fire problem continues to account for the vast majority of civilian casualties. NFPA estimates reflect that 83 percent of fire deaths and 77 percent of fire injuries occur in residential structures.[15]

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[14] Preliminary findings noted that the fires coded as 112s appear to be buildings. A more detailed look at these incident types is required to determine whether they were coded correctly.

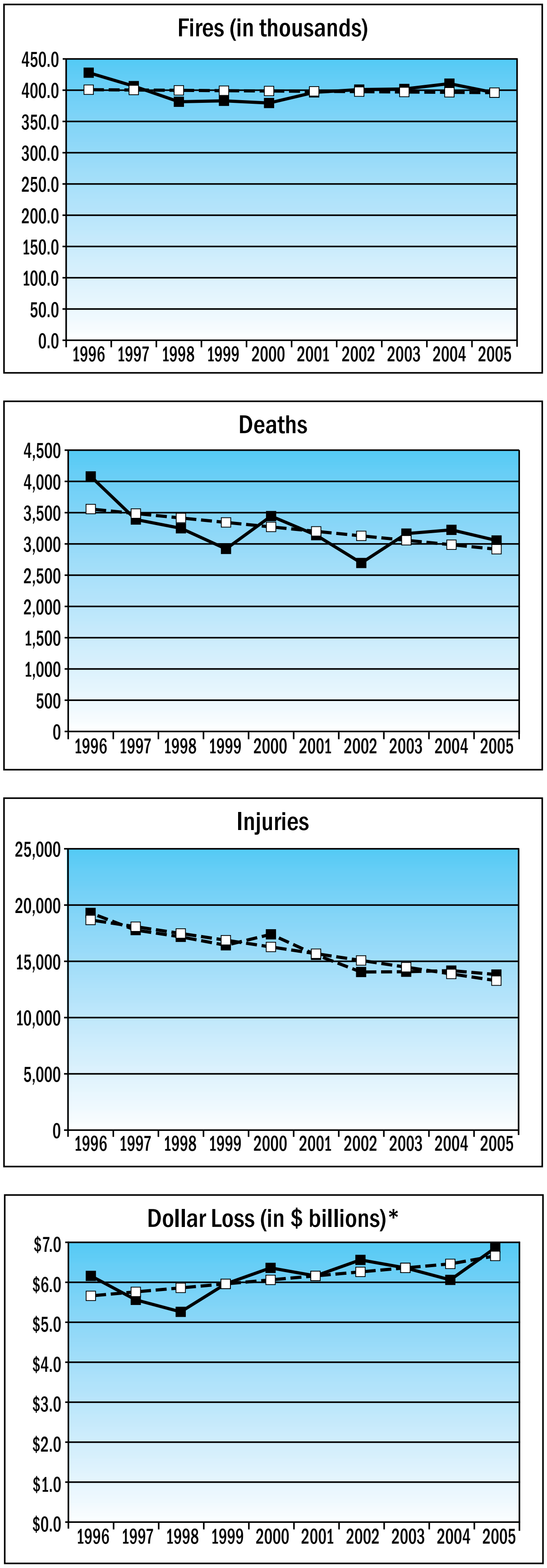
[15] Michael J. Karter, *Fire Loss in the United States During 2005*, NFPA, September 2006. These percentages are derived from summary data presented in this report.

Overview of Trends

Figure 1, based on the NFPA annual surveys of fire departments, shows the 10-year trend in residential structure fires, deaths, injuries, and dollar loss. The trend in number of residential structure fires, deaths, and injuries declined 1, 18, and 29 percent, respectively. These decreases continue the downward trends estimated in past editions of this report. The decreases would be even greater if they were weighted against the number of residences that existed in 1996 versus the much higher number in 2005. Property losses trended upward 17 percent between 1996 and 2005. This increase may be attributed to the change in the way property loss is estimated. Current loss estimates often include the value of the loss associated with the building or structure contents in addition to the loss associated with the building (or structure). Previously, this distinction was not implemented, and one overall estimate was provided.

As well, these trends would appear lower if presented as per capita rather than in the absolute, because the population increased by an estimated 10 percent over the 10-year period. Therefore, an upward trend that is less than the population increase or any downward trend reflects an improvement to the overall fire problem.

Figure 1. Trends in Residential Structure Fires and Fire Losses (1996–2005).



Sources: NFPA and Consumer Price Index.

FIRES (IN THOUSANDS)

Year	Value
1996	428.0
1997	406.5
1998	381.5
1999	383.0
2000	379.5
2001	396.5
2002	401.0
2003	402.0
2004	410.5
2005	396.0
10-Year Trend (%)	–1.2%

DEATHS

Year	Value
1996	4,080
1997	3,390
1998	3,250
1999	2,920
2000	3,445
2001	3,140
2002	2,695
2003	3,165
2004	3,225
2005	3,055
10-Year Trend (%)	–18.1%

INJURIES

Year	Value
1996	19,300
1997	17,775
1998	17,175
1999	16,425
2000	17,400
2001	15,575
2002	14,050
2003	14,075
2004	14,175
2005	13,825
10-Year Trend (%)	–28.9%

DOLLAR LOSS (IN $BILLIONS)*
*ADJUSTED TO 2005 DOLLARS

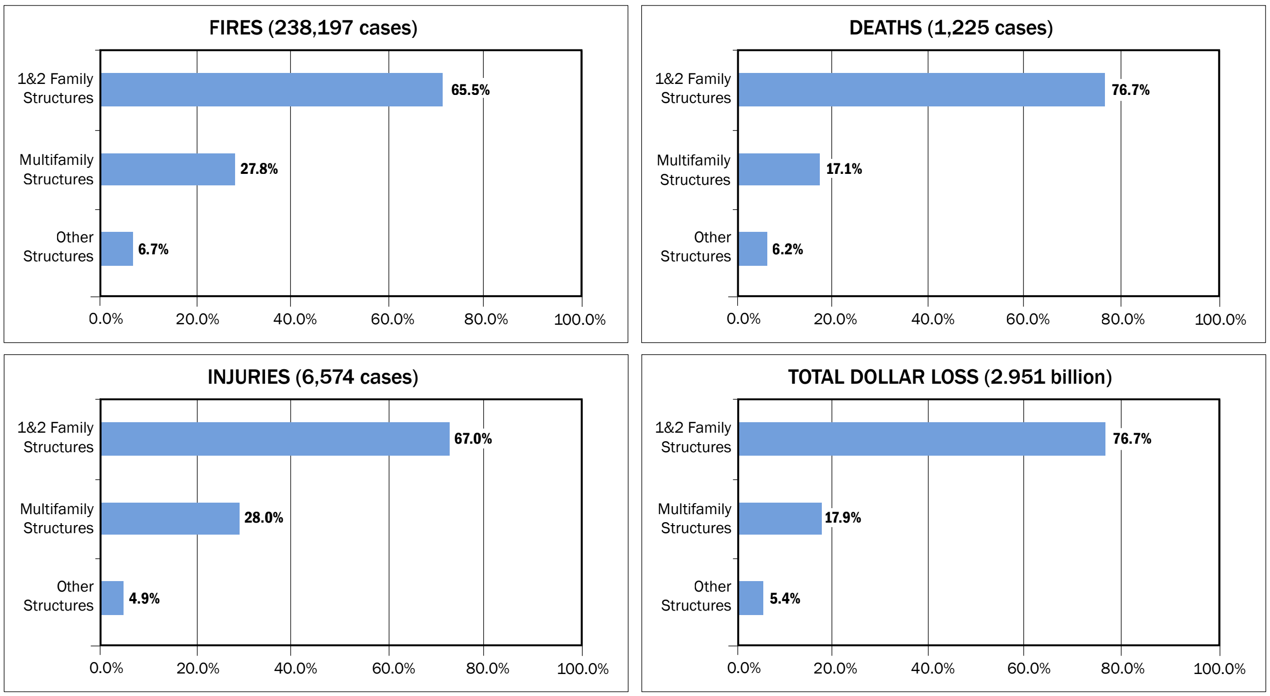
Year	Value
1996	$6.2
1997	$5.6
1998	$5.3
1999	$6.0
2000	$6.4
2001	$6.2
2002	$6.6
2003	$6.4
2004	$6.1
2005	$6.9
10-Year Trend (%)	17.1%

Between 2003 and 2005, fires in residential structures resulted in an annual average of 3,100 civilian deaths, 14,000 injuries, and property losses amounting to $6.3 billion. Because of these statistics, the fire problem in residential structures is of significant concern.

Types of Residential Structures

Figure 2 shows the relative proportions of fires and losses among the three major residential structure categories in 2005. Each of these categories is discussed in subsequent sections of this report. The percentages shown have been relatively consistent over the years.

Figure 2. Residential Structure Fires and Fire Losses by Property Type (2005).



Source: 2005 NFIRS 5.0.

The majority of the U.S. population lives in one- and two-family residences.[16] It is not surprising then that structure fires on one- and two-family residential properties dominate the residential structure statistics: 66 percent of residential structure fires, 77 percent of residential structure fire fatalities, 67 percent of residential structure fire injuries, and 77 percent of residential structure fire dollar loss. Manufactured housing, a subset of one- and two-family structures, is included in these statistics.[17]

[16] The U.S. Census Bureau shows that in 2005, 75 percent (83.3 million) of households lived in one-unit attached and detached structures or mobile homes (http://factfinder.census.gov/servlet/STTable?_bm=y&-geo_id=01000US&-qr_name=ACS_2005_EST_G00_S2504&-ds_name=ACS_2005_EST_G00_&-redoLog=false&-format= for occupied housing). Household size is estimated at 2.6 people per household (http://factfinder.census.gov/servlet/ACSSAFFFacts?_submenuId=factsheet_1&_sse=on). Thus, 83.3 million households x 2.6 people per household = 216.5 million. With the 2005 U.S. population given as 296.5 million, (http://www.census.gov/popest/states/tables/NST-EST2006-01.xls), approximately 73.0 percent of the population lives in what NFIRS defines as one- and two-family housing.

[17] In this report, manufactured housing includes only mobile homes or motor homes situated on semipermanent sites and used as fixed residences.

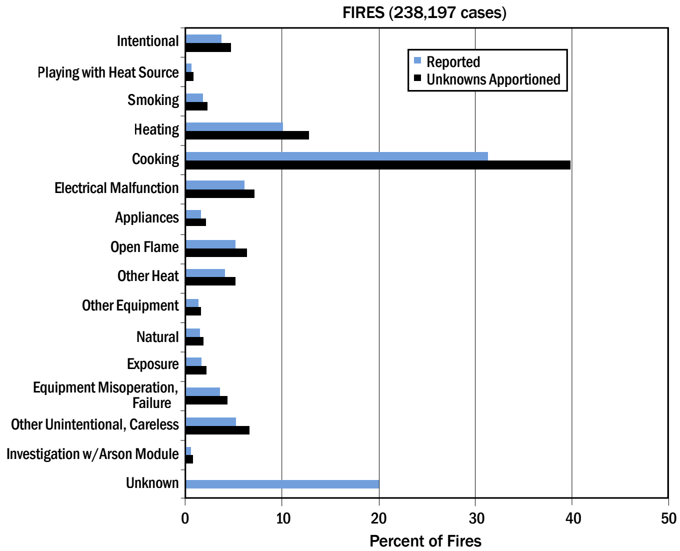
Multifamily structures account for 28 percent of residential structure fires, 17 percent of residential deaths, 28 percent of injuries, and 18 percent of residential dollar loss. The relatively high incidence of injuries in multifamily structures may be because the total space is significantly less in multifamily structures than in one- and two-family structures, and people are more quickly exposed to fire products than in a house. Other factors also may influence multifamily injuries: Potential deaths could become injuries because many multifamily structures (e.g., apartments) may be built to stricter codes, sprinklers may be installed, or smoke alarms may be hardwired to a fire station, which generates an automatic fire department response when the alarm sounds.

Other residential structures account for between 5 and 7 percent of the residential fire problem in the various measures.

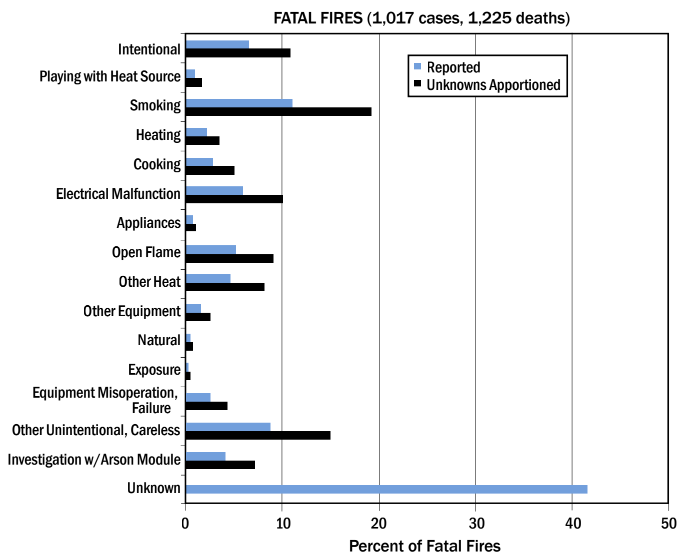
Causes of Residential Structure Fires

Figure 3 shows the causes of fires, fatal fires, fires with injuries, and fires with dollar loss in 2005. These statistics are driven by the one- and two-family dwelling property type, which accounts for the majority of residential fires. Larger differences from the overall residential causes are found as one looks at the smaller subcategories of residences—multifamily structures and other residential structures. These differences are explored later in the report.

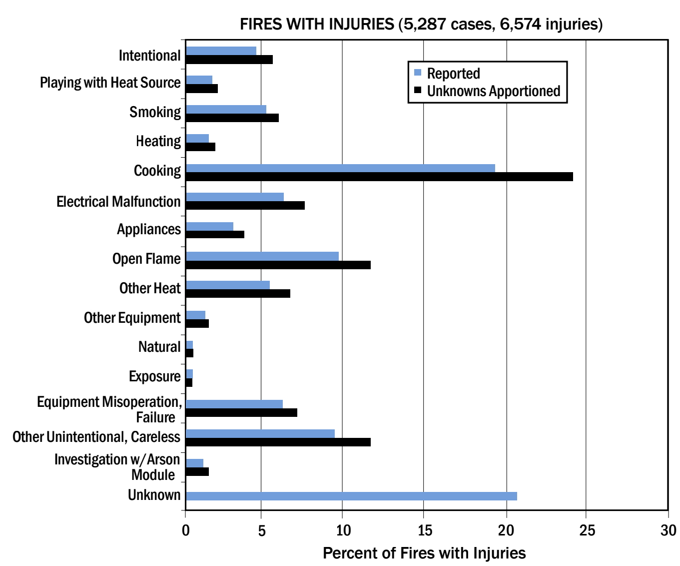
Figure 3. Fire Cause for Residential Structure Fires and Fire Losses (2005).



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	3.9	4.9
Playing with Heat Source	0.6	0.8
Smoking	1.9	2.4
Heating	10.1	12.7
Cooking	31.9	39.9
Electrical Malfunction	6.3	7.9
Appliances	1.8	2.3
Open Flame	5.1	6.4
Other Heat	4.1	5.2
Other Equipment	1.3	1.6
Natural	1.5	1.9
Exposure	1.6	2.1
Equipment Misoperation, Failure	3.5	4.4
Other Unintentional, Careless	5.3	6.7
Investigation w/Arson Module	0.6	0.8
Unknown	20.0	

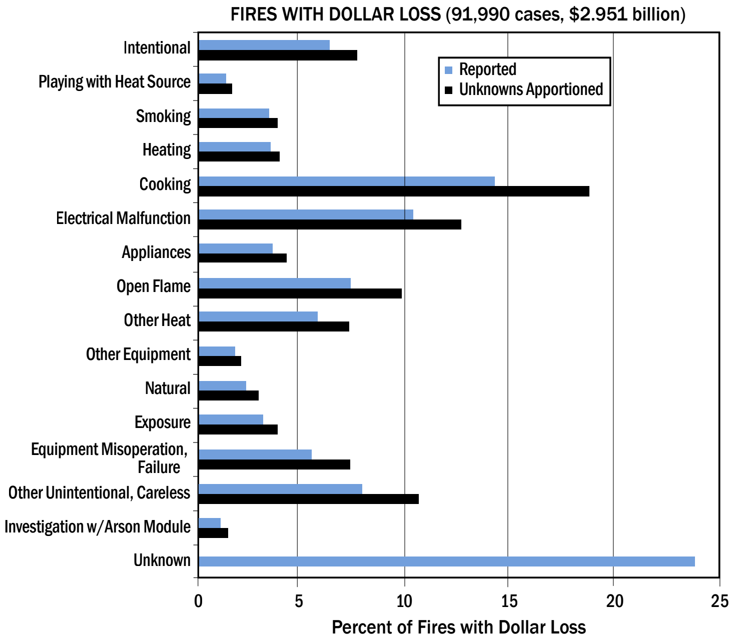


Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	6.6	11.3
Playing with Heat Source	1.0	1.7
Smoking	11.2	19.2
Heating	2.1	3.5
Cooking	2.9	5.1
Electrical Malfunction	6.0	10.3
Appliances	0.7	1.2
Open Flame	5.3	9.1
Other Heat	4.8	8.2
Other Equipment	1.6	2.7
Natural	0.5	0.8
Exposure	0.3	0.5
Equipment Misoperation, Failure	2.6	4.4
Other Unintentional, Careless	8.8	15.0
Investigation w/Arson Module	4.1	7.1
Unknown	41.6	



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	4.8	6.0
Playing with Heat Source	1.9	2.4
Smoking	5.7	7.2
Heating	1.9	2.4
Cooking	19.2	24.2
Electrical Malfunction	6.5	8.1
Appliances	3.0	3.8
Open Flame	9.7	12.2
Other Heat	6.0	7.5
Other Equipment	1.4	1.7
Natural	0.5	0.7
Exposure	0.5	0.6
Equipment Misoperation, Failure	6.9	8.6
Other Unintentional, Careless	9.7	12.2
Investigation w/Arson Module	1.9	2.4
Unknown	20.4	

Figure 3 (cont'd)



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	6.3	8.2
Playing with Heat Source	1.2	1.5
Smoking	3.2	4.2
Heating	3.0	4.0
Cooking	14.2	18.6
Electrical Malfunction	10.4	13.5
Appliances	3.2	4.2
Open Flame	7.5	9.8
Other Heat	5.8	7.6
Other Equipment	1.5	1.9
Natural	2.3	3.0
Exposure	3.0	3.9
Equipment Misoperation, Failure	5.7	7.4
Other Unintentional, Careless	8.1	10.6
Investigation w/Arson Module	1.2	1.5
Unknown	23.5	

Source: 2005 NFIRS 5.0.

With the introduction of limited reporting of confined, low-loss structure fires in NFIRS 5.0, the cause profiles for structure fires, especially residential structure fires, have undergone an important change. This reporting feature allows the fire service to capture incidents where the fire was confined to the vessel or object of origin and caused little or no loss. These are fires that are thought to have gone unreported prior to the introduction of NFIRS 5.0, or were reported, but as a nonfire fire incident, as no loss was involved. Confined fires, generally of three types (cooking, heating-related (primarily chimney), or trash-related), now account for 45 percent of residential structure fires. Cooking confined fires account for two-thirds of confined fires.

Cooking has been the leading cause of residential fires for most of the years since the inception of NFIRS. In 2005, largely as a result of these confined cooking fires, cooking fires (40 percent) were triple that of the next leading cause, heating. Heating passed cooking for a few years in the late 1970s when there was a surge in the use of alternative space heaters and wood stoves, but that heating problem has long since subsided. Cooking is the leading cause of fires with injuries (24 percent), with fires caused by open flames (candles, matches, and the like) and other unintentional or careless causes as the second leading cause (12 percent each). Many cooking fires come from unattended cooking where grease or oil ignites, or flammable materials near burners catch fire. The number of these fires can be reduced by emphasizing the importance of vigilance while cooking and by informing the public how to extinguish small cooking fires (e.g., cover with a pot lid, douse it with baking soda). Wearing loose-fitting clothing such as bathrobes can be dangerous around cooking areas.

Heating (13 percent), the second leading cause of residential fires, includes those fires where the equipment involved in ignition is central heating, fireplaces, portable space heaters, fixed room heaters, wood stoves, and water heating. The central heating and water heater portions of the problem have remained relatively steady, while the portable space heater and wood-burning stove portion of the problem, along with chimney fires, rose very sharply from the late 1970s to the early 1980s but has since abated.

Smoking continues to be the leading cause of residential structure fatal fires, accounting for 19 percent of these fires. The percentage of smoking deaths has decreased, but that decrease, in part, reflects the difference in coding methodologies between NFIRS 4.1 and NFIRS 5.0. Smoking ranks ninth in fires, seventh in fires with injuries, and eighth in fires with dollar loss.

Cooking and electrical malfunction are the first and second leading causes in fires with dollar loss.

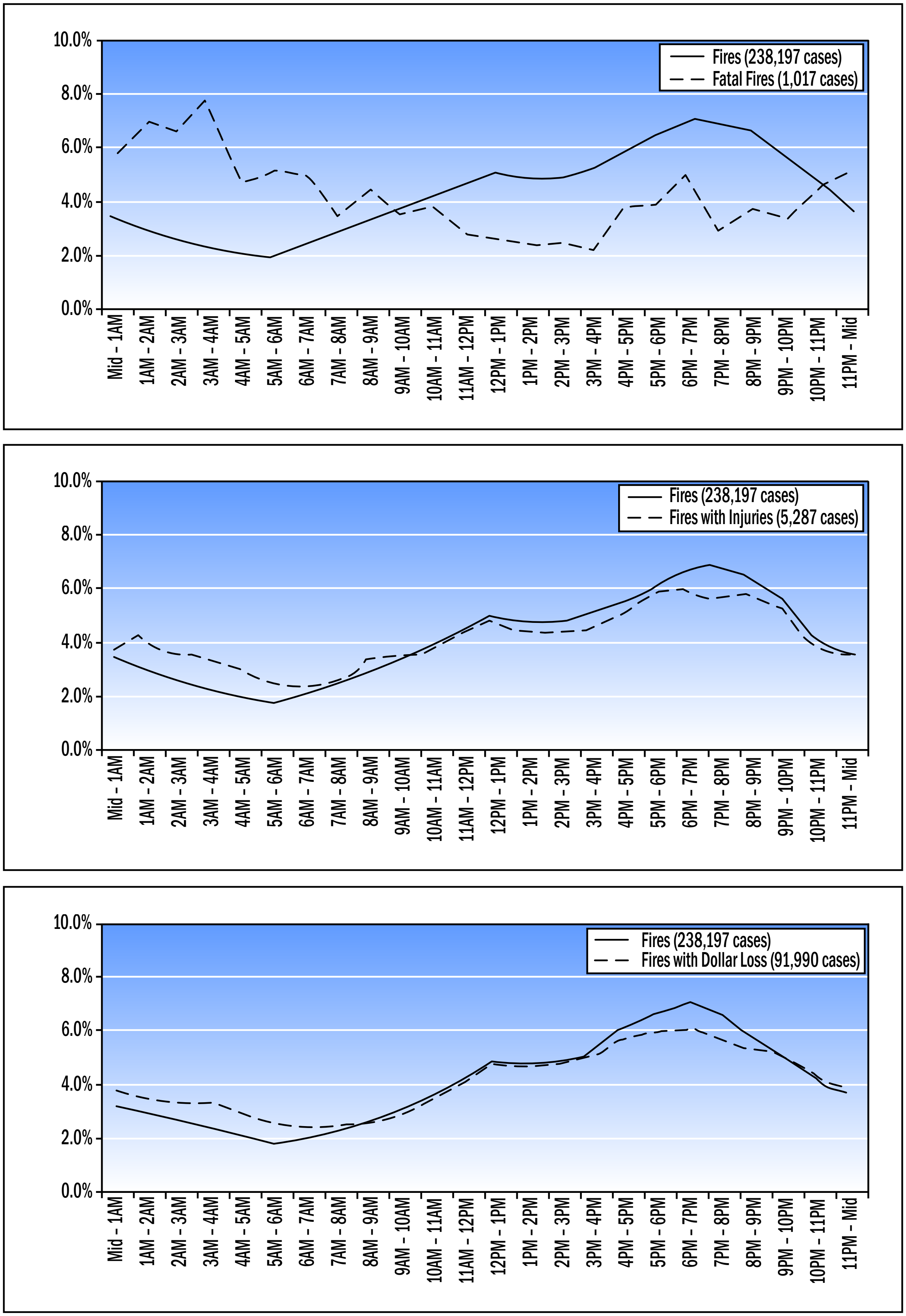
When Fires Occur

Time of Fire Alarm

Fires do not occur uniformly throughout the day, as shown in Figure 4. Residential structure fire incidents peak from 5 p.m. to 8 p.m., during dinner preparation. Although fire incidents drop when people sleep, fatal fires are at their highest late at night and in the early morning. Forty-six percent of residential fatal fires start between 10 p.m. and 6 a.m. The peak night hours are from 3 a.m. to 4 a.m., when most people are in deep sleep.[18] Early morning (1 a.m. to 4 a.m.) fatal fires are attributed to smoking, intentionally set fires, and open flame. These three fire causes account for 48 percent of the early morning fatal fires. Fires with injuries occur more uniformly throughout the day than do fatal fires, and tend to somewhat track fire incidence. Fires with injuries plateau during dinner and early evening hours when people cook, and peak slightly around noon. Fires with dollar loss also track somewhat with the number of fires, except from midnight to 6 a.m. and 4 p.m. to 10 p.m., when there is a slight separation between the two measures. These patterns for fires and losses are largely unchanged from previous years.

[18] Stage 3 and 4 sleep, typically called "deep sleep," occurs most often in the earlier sleep cycles. The National Institute of Neurological Disorders notes that "…It is very difficult to wake someone during stages 3 and 4, which together are called *deep sleep*... People awakened during deep sleep do not adjust immediately and often feel groggy and disoriented for several minutes after they wake up…" (http://www.ninds.nih.gov/disorders/brain_basics/understanding_sleep.htm). An informative graphic of the typical sleep cycle that shows the prevalence of deep sleep in the first 4 to 5 hours of sleep can be found at http://www.helpguide.org/life/sleeping.htm or http://hil4ry.files.wordpress.com/2007/09/sleep_cycle-01.jpg

Figure 4. Time of Fire Alarm of Residential Structure Fires and Fires with Losses (2005).

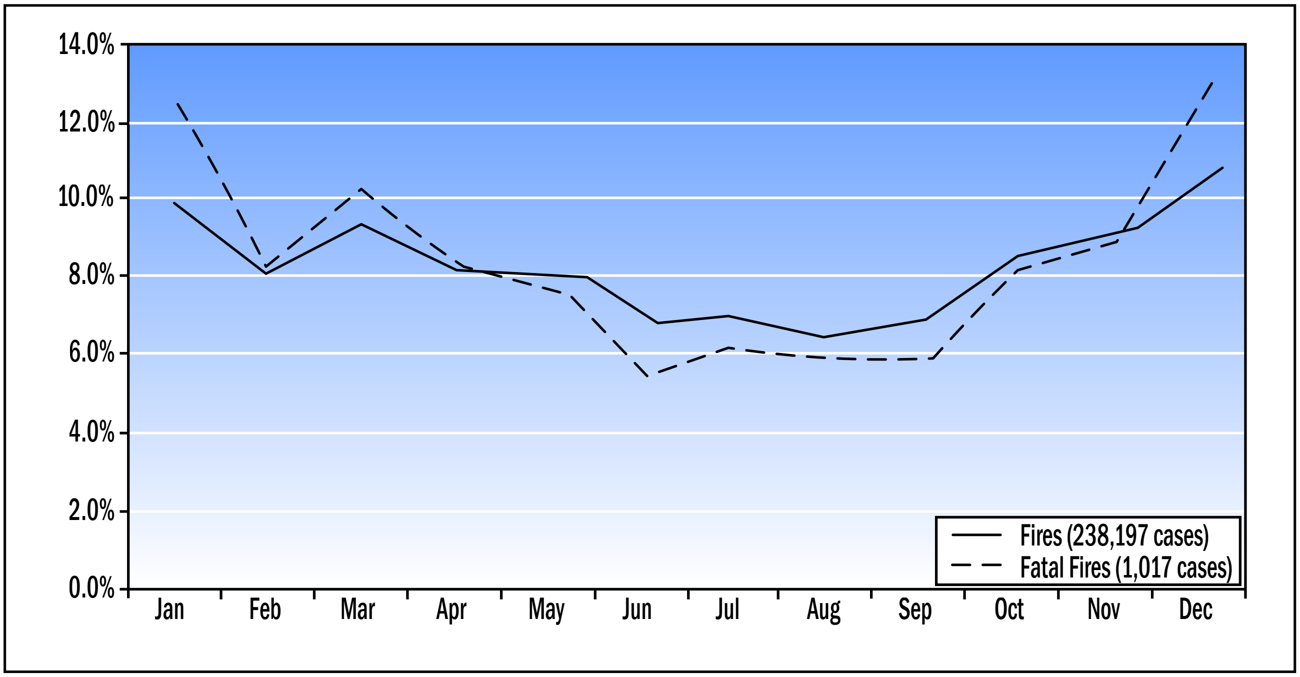


Source: 2005 NFIRS 5.0.

Month of Year

The number of residential structure fires increases considerably in the winter months, with the largest numbers of fires in December and January. Fatal fires follow a similar but more pronounced pattern. Fatal fires are most frequent during winter months, when heating systems add to other causes. Thirty-four percent of all fatal fires occur in the quarter of the year from December through February (Figure 5). This is essentially the same pattern as in 2001.

Figure 5. Month of Year of Residential Structure Fires and Fatal Fires (2005).

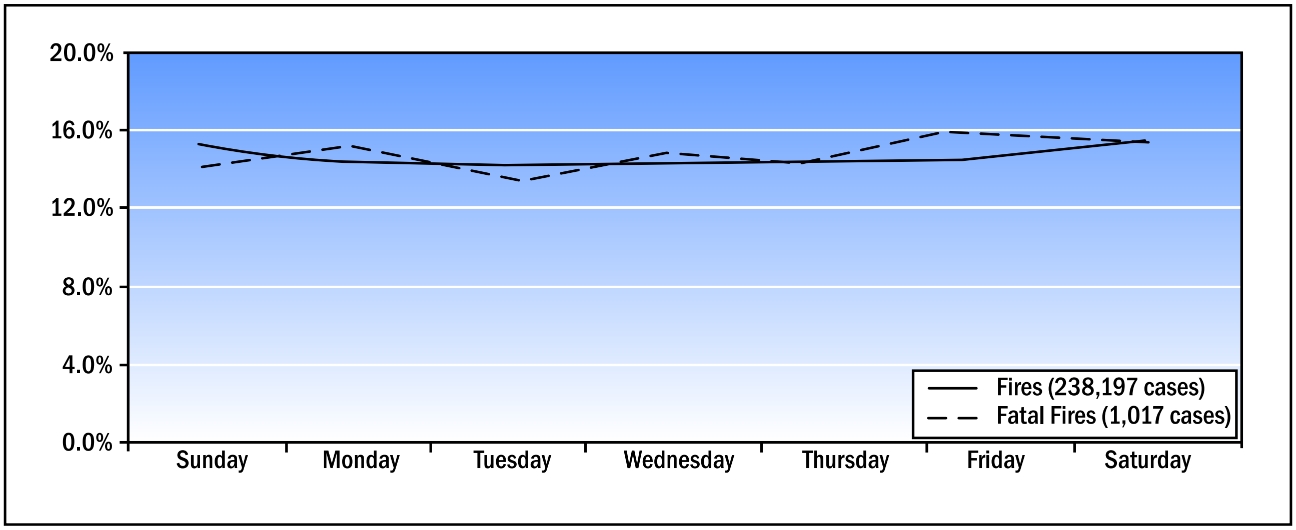


Source: 2005 NFIRS 5.0.

Day of Week

There is a slight difference in the incidence of residential structure fires by day of the week (Figure 6). Fires are lowest during weekdays, with a slight increase on the weekends. Fatal fires do not exhibit a consistent trend, but do appear to be lowest on Sundays and Tuesdays and highest on Fridays and Saturdays.

Figure 6. Day of Week of Residential Structure Fires and Fatal Fires (2005).



Source: 2005 NFIRS 5.0.

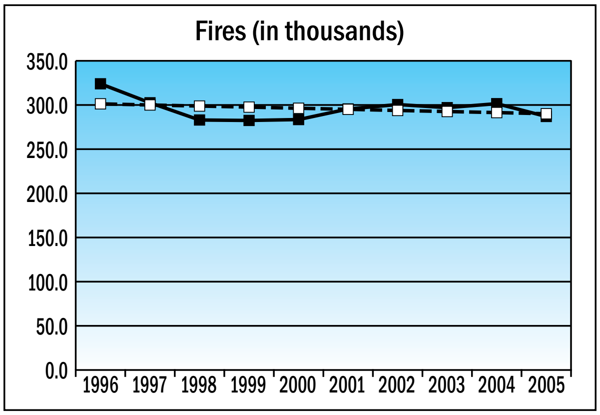
One- and Two-Family Residential Structures

As noted previously, the residential structure fire profile is dominated by one- and two-family residential properties. Manufactured housing (mobile homes used as fixed residences) is included here in the profile for one- and two-family structures.

Trends

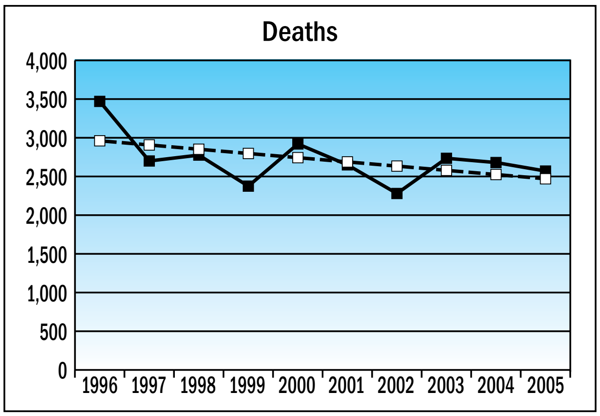
As with the residential structure trends, one- and two-family fires, deaths, and injuries declined during the 10-year period (4, 17, and 24 percent respectively), and dollar loss increased (19 percent) as shown in Figure 7. The increased use of smoke alarms is thought to be a major factor in the reduction in the number of reported fires. Fires detected early often are extinguished before they are reported to the fire department, so the number of reported fires decreases. When smoke alarms are not present, the fire burns longer before detection and does more damage.

Figure 7. Trends in One- and Two-Family Residential Structure Fires and Fire Losses (1996–2005).



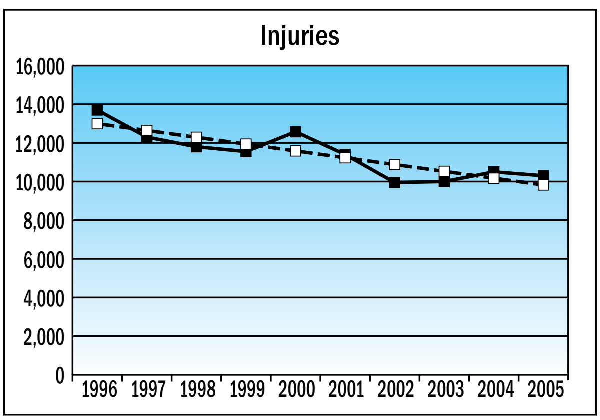
FIRES (IN THOUSANDS)

Year	Value
1996	324.0
1997	302.5
1998	283.0
1999	282.5
2000	283.5
2001	295.5
2002	300.5
2003	297.0
2004	301.5
2005	287.0
10-Year Trend (%)	–3.7%



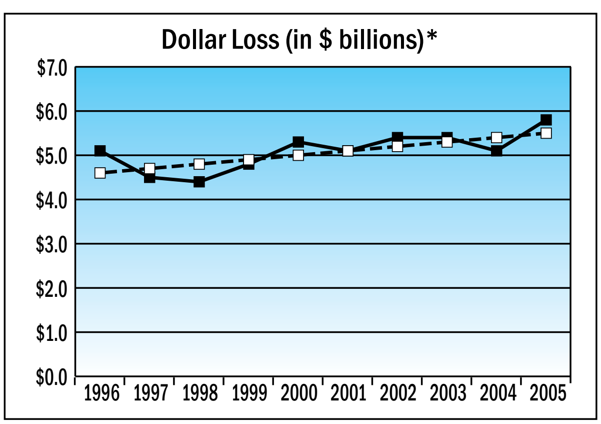
DEATHS

Year	Value
1996	3,470
1997	2,700
1998	2,776
1999	2,375
2000	2,920
2001	2,650
2002	2,280
2003	2,735
2004	2,680
2005	2,570
10-Year Trend (%)	-16.6%



INJURIES

Year	Value
1996	13,700
1997	12,300
1998	11,800
1999	11,550
2000	12,575
2001	11,400
2002	9,950
2003	10,000
2004	10,500
2005	10,300
10-Year Trend (%)	–24.4%



DOLLAR LOSS (IN $BILLIONS)*
*ADJUSTED TO 2005 DOLLARS

Year	Value
1996	$5.1
1997	$4.5
1998	$4.4
1999	$4.8
2000	$5.3
2001	$5.1
2002	$5.4
2003	$5.4
2004	$5.1
2005	$5.8
10-Year Trend (%)	19.4%

Sources: NFPA and Consumer Price Index.

Multifamily Residential Structures

Multifamily residential structures include those structures on apartment, town house, rowhouse, condominium, and tenement properties.[19] Multifamily residential structures tend to be regulated by stricter building codes than one- and two-family structures. Many multifamily residences are rental properties, often falling under more stringent fire prevention statutes. Many of these properties have a homogeneous socioeconomic mix of residents. They may have more low-income families in housing projects, more high-income families in luxury highrises, or they may be centers of living for the elderly. In large cities, all of these groups are represented in these properties.

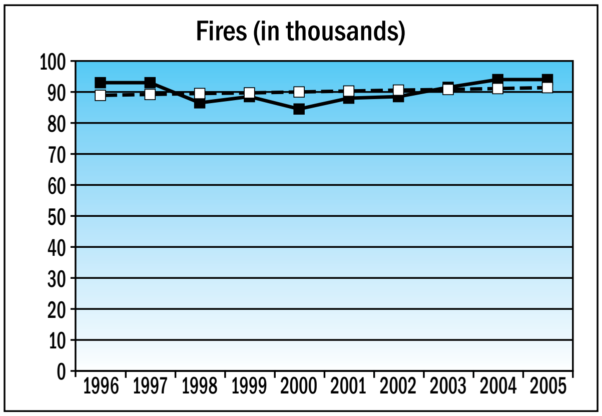
Trends

Figure 8 shows the 10-year trends in multifamily residential structure fires and losses. The number of multifamily fires increased (3 percent), while fire deaths and injuries declined. Fire deaths dropped by 25 percent; injuries were down 43 percent. Multifamily fire injuries reached their lowest level in 2005, with 3,000 injuries. Dollar losses resulting from multifamily residential structure fires continued the upward trends shown in the previous 10-year period (1992–2001): adjusted dollar losses were up 9 percent in multifamily residential structures.

The declines in multifamily deaths and injuries may be due to compliance with stricter building codes, the required presence of smoke alarms, and the increase in the number of sprinkler systems. More detailed studies of socioeconomic and demographic changes over time might reveal some of the factors involved in fire incidence.

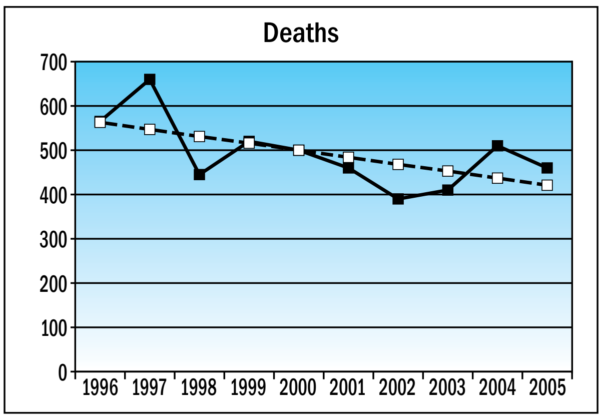
[19] In previous reports, apartments, apartment-style condominiums, and tenement properties were a separate category. Town house and rowhouse properties were included in the one- and two-family category.

Figure 8. Trends in Multifamily Residential Structure Fires and Fire Losses (1996–2005).



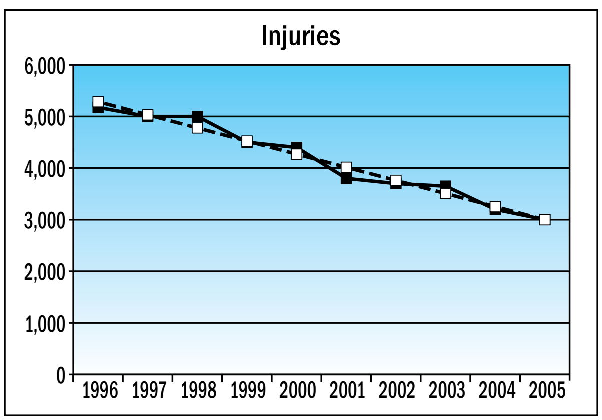
FIRES (IN THOUSANDS)

Year	Value
1996	93.0
1997	93.0
1998	86.5
1999	88.5
2000	84.5
2001	88.0
2002	88.5
2003	91.5
2004	94.0
2005	94.0
10-Year Trend (%)	**2.7%**



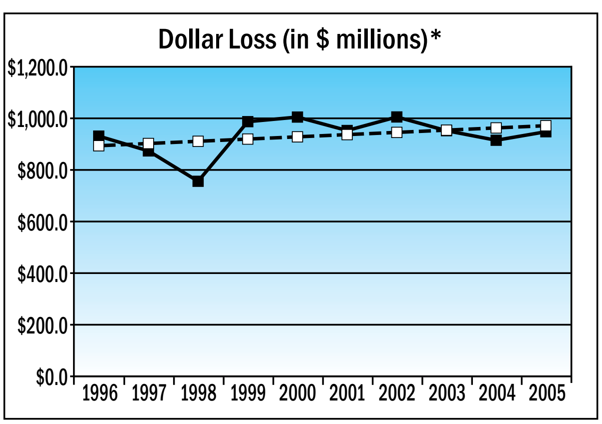
DEATHS

Year	Value
1996	565
1997	660
1998	445
1999	520
2000	500
2001	460
2002	390
2003	410
2004	510
2005	460
10-Year Trend (%)	**–25.2%**



INJURIES

Year	Value
1996	5,175
1997	5,000
1998	5,000
1999	4,500
2000	4,400
2001	3,800
2002	3,700
2003	3,650
2004	3,200
2005	3,000
10-Year Trend (%)	**–43.3%**



DOLLAR LOSS (IN $MILLIONS)*
***ADJUSTED TO 2005 DOLLARS**

Year	Value
1996	$931.1
1997	$873.7
1998	$756.0
1999	$987.1
2000	$1,004.9
2001	$952.8
2002	$1,005.3
2003	$952.1
2004	$915.0
2005	$948.0
10-Year Trend (%)	**8.7%**

Sources: NFPA and Consumer Price Index.

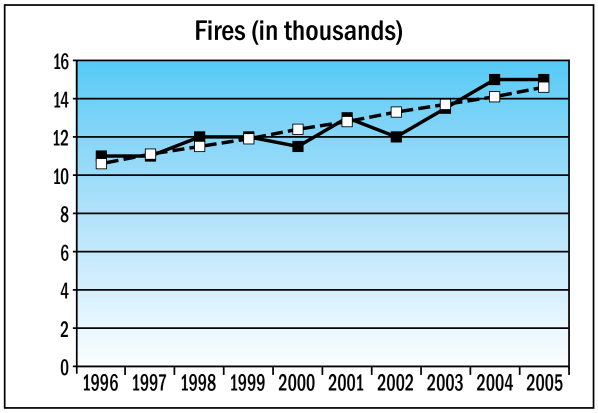
Other Residential Structures

Other residential structure properties include rooming houses, dormitories, home hotels, halfway houses, hotels and motels, and miscellaneous and unclassified structures reported as residences. This category does not include homes for the elderly, prisons, orphanages, or other institutions as these categories are considered "institutional" structures.

Trends

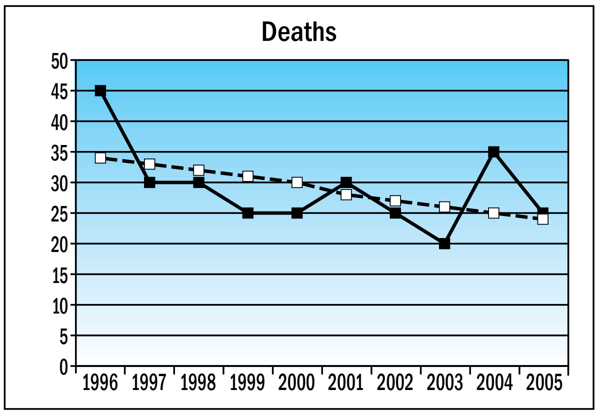
Figure 9 shows a large 10-year increase (38 percent) in the number of other residential fires while showing a substantial decrease in the number of fire deaths (30 percent). Injuries increased by 16 percent, reversing the downward trend shown in the *Fourteenth edition of Fire in the United States*. Fire deaths ranged from 20 to 45 a year; injuries ranged from 375 to 525. Adjusted dollar loss has trended down 5 percent over 10 years, with a low of $116 million in 1996 and a high of $169 million in 2000.

Figure 9. Trends in Other Residential Structure Fires and Fire Losses (1996–2005).



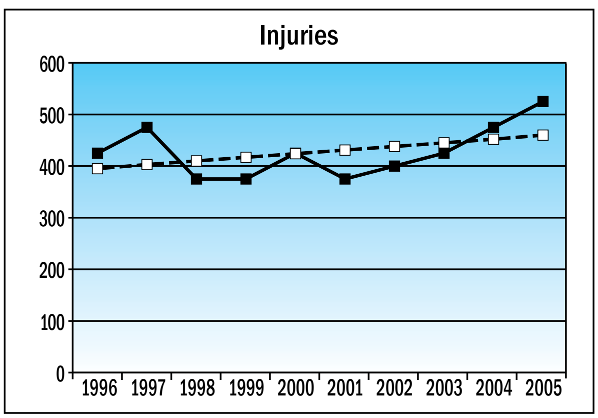
FIRES (IN THOUSANDS)

Year	Value
1996	11.0
1997	11.0
1998	12.0
1999	12.0
2000	11.5
2001	13.0
2002	12.0
2003	13.5
2004	15.0
2005	15.0
10-Year Trend (%)	37.5%



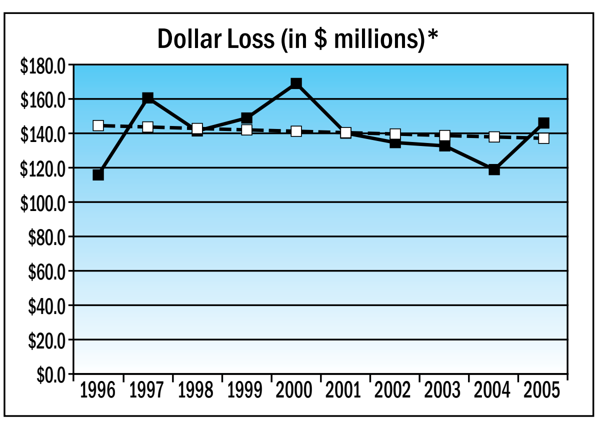
DEATHS

Year	Value
1996	45
1997	30
1998	30
1999	25
2000	25
2001	30
2002	25
2003	20
2004	35
2005	25
10-Year Trend (%)	–30.3%



INJURIES

Year	Value
1996	425
1997	475
1998	375
1999	375
2000	425
2001	375
2002	400
2003	425
2004	475
2005	525
10-Year Trend (%)	16.2%



DOLLAR LOSS (IN $MILLIONS)*
*ADJUSTED TO 2005 DOLLARS

Year	Value
1996	$115.8
1997	$160.6
1998	$141.4
1999	$148.9
2000	$169.0
2001	$140.1
2002	$134.6
2003	$132.7
2004	$118.9
2005	$146.0
10-Year Trend (%)	-5.1%

Sources: NFPA and Consumer Price Index.

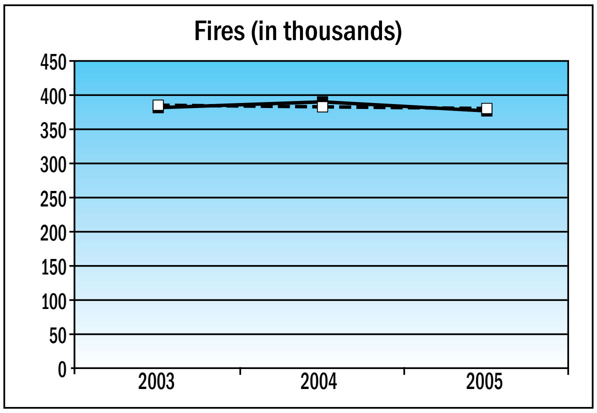
RESIDENTIAL BUILDINGS

Residential building fires comprise the vast majority of fires and fires with losses in residential structures. Fires in residential buildings account for 95 percent of residential structure fires and fatal fires, 97 percent of residential structure fires with injuries, and 95 percent of fires with dollar loss. Residential building losses are disproportionate to the numbers of fires that occur. During the period from 2003 to 2005, an estimated 382,500 residential building fires were reported each year. This estimate reflects 24 percent of all fires, yet these fires cause 78 percent of fire deaths, 75 percent of fire injuries, and 54 percent of dollar loss, adjusted for inflation.

Overview of Trends

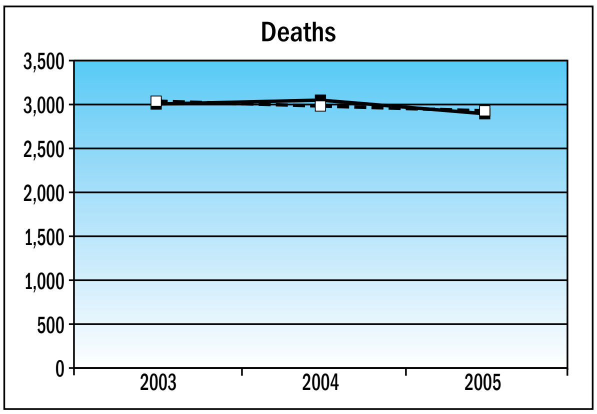
Figure 10, based on national estimates of the residential building fire problem, shows the 3-year trend in residential building fires, deaths, injuries, and dollar loss. The trends in numbers of residential fires, deaths, and injuries declined 1, 4, and 0 percent, respectively. Dollar loss increased by 8 percent.

Figure 10. Trends in Residential Building Fires and Fire Losses (2003–2005).



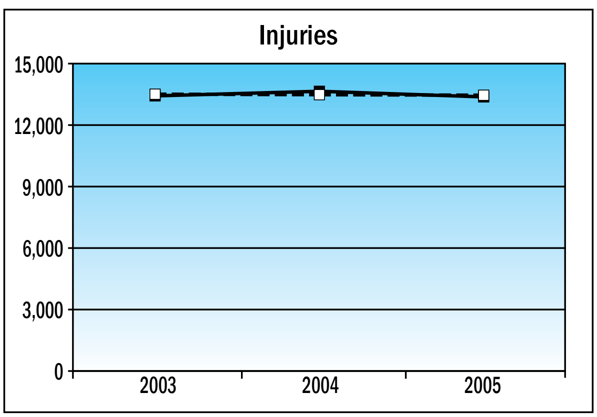
FIRES (IN THOUSANDS)

Year	Value
2003	381.3
2004	389.8
2005	376.5
3-Year Trend (%)	–1.2%



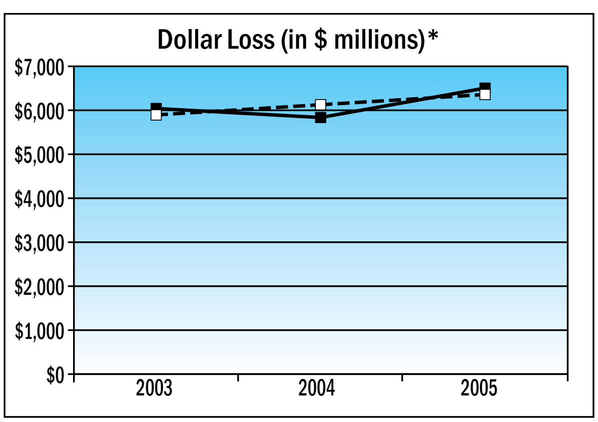
DEATHS

Year	Value
2003	3,005
2004	3,050
2005	2,895
3-Year Trend (%)	–3.6%



INJURIES

Year	Value
2003	13,425
2004	13,650
2005	13,375
3-Year Trend (%)	–0.4%



DOLLAR LOSS (IN $MILLIONS)*
*ADJUSTED TO 2005 DOLLARS

Year	Value
2003	$6,041
2004	$5,836
2005	$6,505
3-Year Trend (%)	7.9%

Sources: 2003–2005 NFIRS 5.0, NFPA, and Consumer Price Index.

Causes

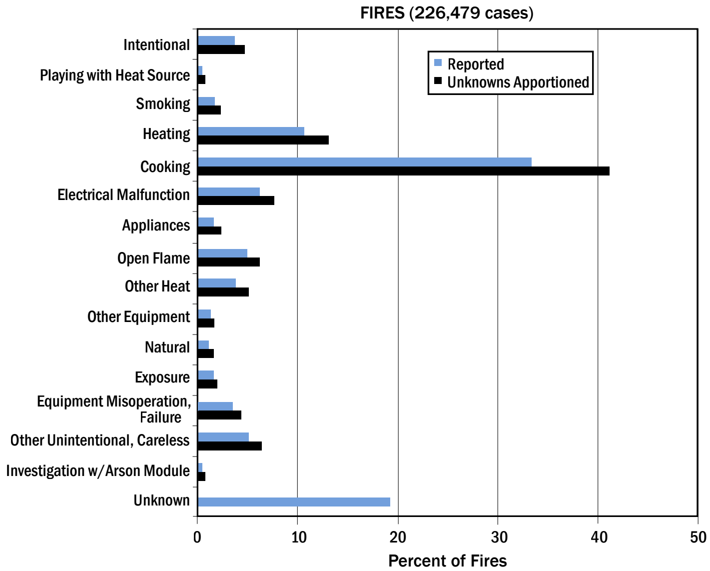
It is important to note that the leading causes are different, depending on what measure is used, as can be seen from Figure 11, which shows the causes of fires, fatal fires, fires with injuries, and fires with dollar loss in 2005. As with structure fires, these statistics are driven by the one- and two-family dwelling property type (one- and two-family residences account for 65 percent of residential building fires).

As in the past, cooking is the leading cause of residential building fires (41 percent). Confined cooking fires (discussed earlier in this report) are a large portion of cooking fires, making cooking more than three times that of the next leading cause, heating. As a result of the prevalence of cooking fires, more cooking fires result in property loss than any other cause. Cooking is also the leading cause of fires that injure civilians. Twenty-five percent of fires that result in injuries are cooking fires.

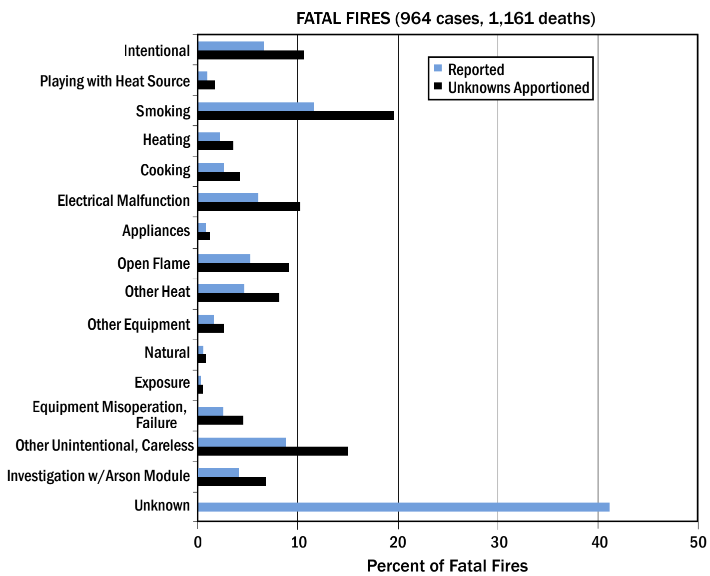
Fires involving cooking and electrical malfunction are the first and second leading causes of fires with dollar loss, respectively.

Smoking is the leading cause of fatal residential building fires, accounting for 20 percent of these fatal fires. Similar to residential structures, smoking fires rank sixth in fires with injuries and ninth in both fires and fires with dollar loss.

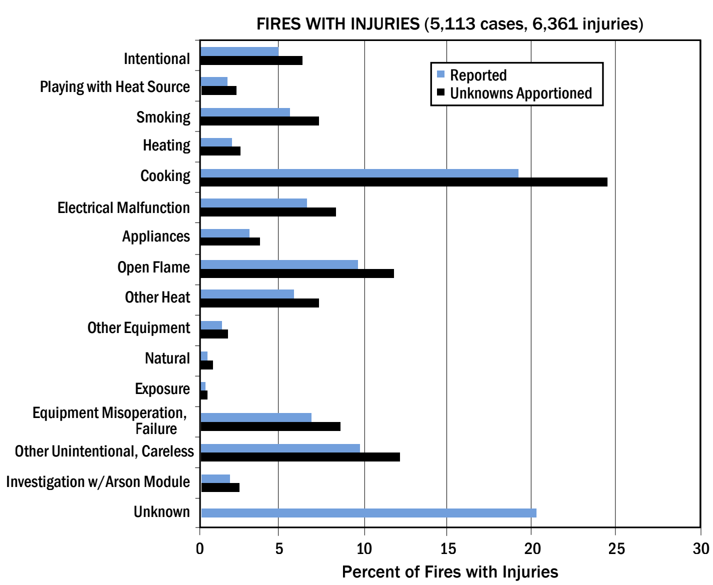
Figure 11. Fire Cause for Residential Building Fires and Fires with Losses (2005).



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	3.9	4.8
Playing with Heat Source	0.6	0.8
Smoking	1.9	2.3
Heating	10.6	13.2
Cooking	33.4	41.3
Electrical Malfunction	6.2	7.7
Appliances	1.8	2.3
Open Flame	5.0	6.1
Other Heat	3.9	4.8
Other Equipment	1.3	1.6
Natural	1.4	1.8
Exposure	1.6	2.0
Equipment Misoperation, Failure	3.5	4.3
Other Unintentional, Careless	5.1	6.3
Investigation w/Arson Module	0.6	0.8
Unknown	19.3	

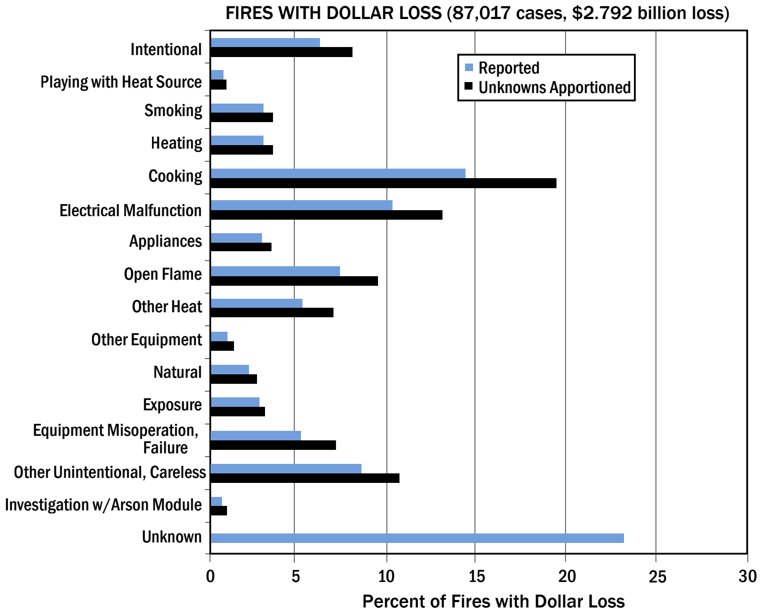


Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	6.8	11.6
Playing with Heat Source	0.9	1.6
Smoking	11.6	19.7
Heating	2.2	3.7
Cooking	2.6	4.4
Electrical Malfunction	6.1	10.4
Appliances	0.7	1.2
Open Flame	5.3	9.0
Other Heat	4.8	8.1
Other Equipment	1.6	2.6
Natural	0.4	0.7
Exposure	0.3	0.5
Equipment Misoperation, Failure	2.7	4.6
Other Unintentional, Careless	8.8	15.0
Investigation w/Arson Module	4.0	6.9
Unknown	41.1	



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	4.9	6.1
Playing with Heat Source	1.9	2.3
Smoking	5.8	7.3
Heating	2.0	2.5
Cooking	19.7	24.7
Electrical Malfunction	6.5	8.1
Appliances	3.1	3.8
Open Flame	9.5	11.9
Other Heat	5.8	7.2
Other Equipment	1.3	1.7
Natural	0.5	0.7
Exposure	0.4	0.5
Equipment Misoperation, Failure	6.9	8.6
Other Unintentional, Careless	9.7	12.2
Investigation w/Arson Module	1.9	2.3
Unknown	20.2	

Figure 11 (cont'd)



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	6.3	8.2
Playing with Heat Source	1.2	1.5
Smoking	3.2	4.1
Heating	3.2	4.1
Cooking	14.7	19.2
Electrical Malfunction	10.4	13.5
Appliances	3.2	4.2
Open Flame	7.5	9.8
Other Heat	5.6	7.3
Other Equipment	1.5	1.9
Natural	2.3	2.9
Exposure	3.0	3.9
Equipment Misoperation, Failure	5.7	7.4
Other Unintentional, Careless	8.1	10.5
Investigation w/Arson Module	1.1	1.5
Unknown	23.1	

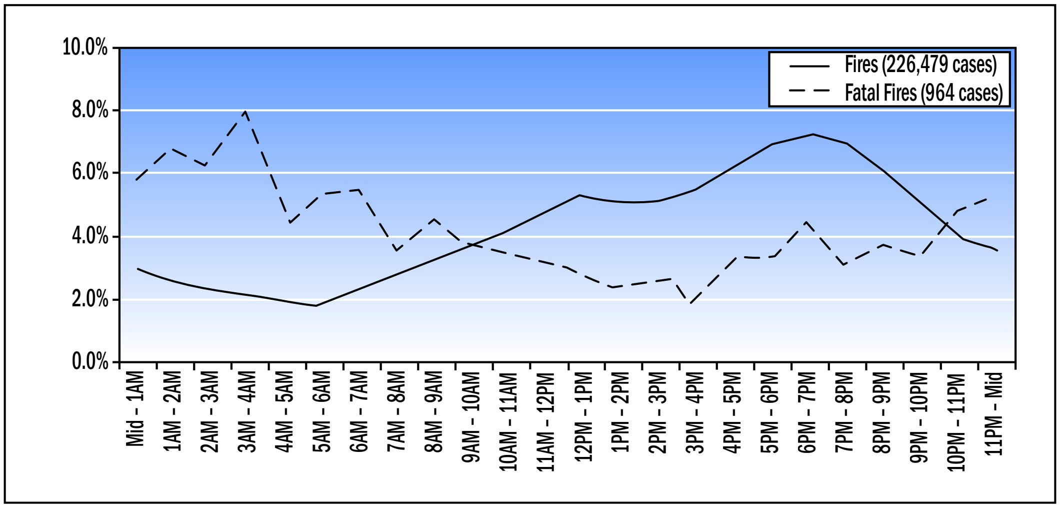
Sources: 2005 NFIRS 5.0.

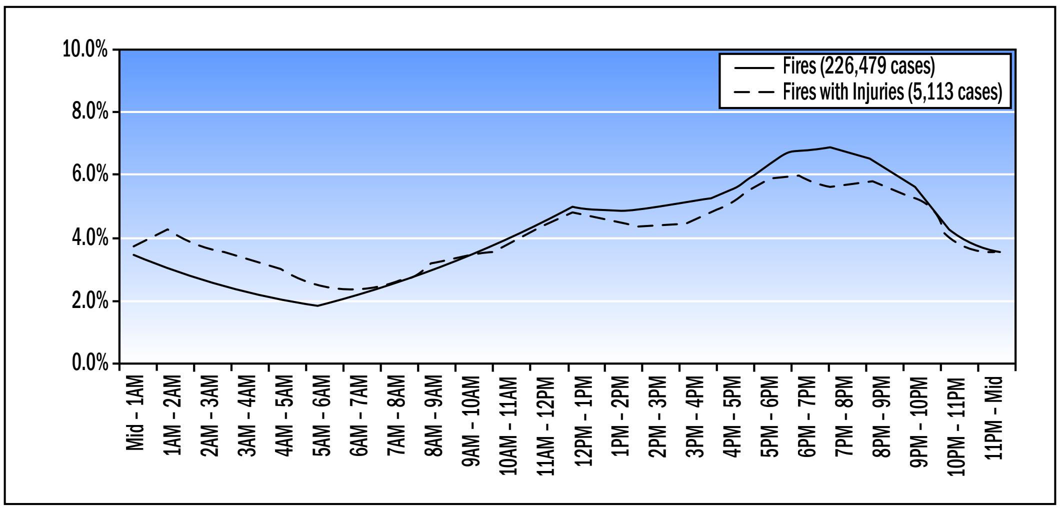
When Fires Occur

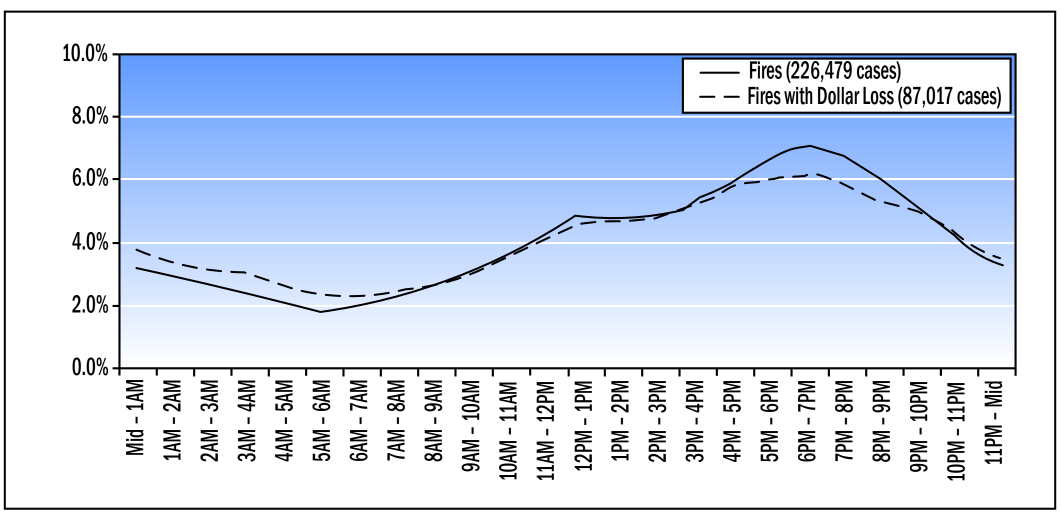
Time of Fire Alarm

As residential building fires dominate the overall residential structure fire problem, the time-of-day profiles are nearly identical, as shown in Figure 12. Residential building fire incidents peak from 5 p.m. to 8 p.m., during dinner preparation. Although fire incidents drop at night when people sleep and there is little activity, fatal fires are at their highest. Fatal fires peak late at night and in the early morning. Twenty-one percent of residential building fatal fires occur between 1 a.m. and 4 a.m., when most people are asleep. Fires resulting in injuries occur more uniformly throughout the day and, like residential structure fires in general, follow the incidence of fires, decreasing slightly during morning hours. Fires with property losses track closely with the number of fires except in the early morning hours, when the occurrence of fires with property loss is higher, and in the afternoon and evening, when it is lower.

Figure 12. Time of Fire Alarm of Residential Building Fires and Fires with Losses (2005).





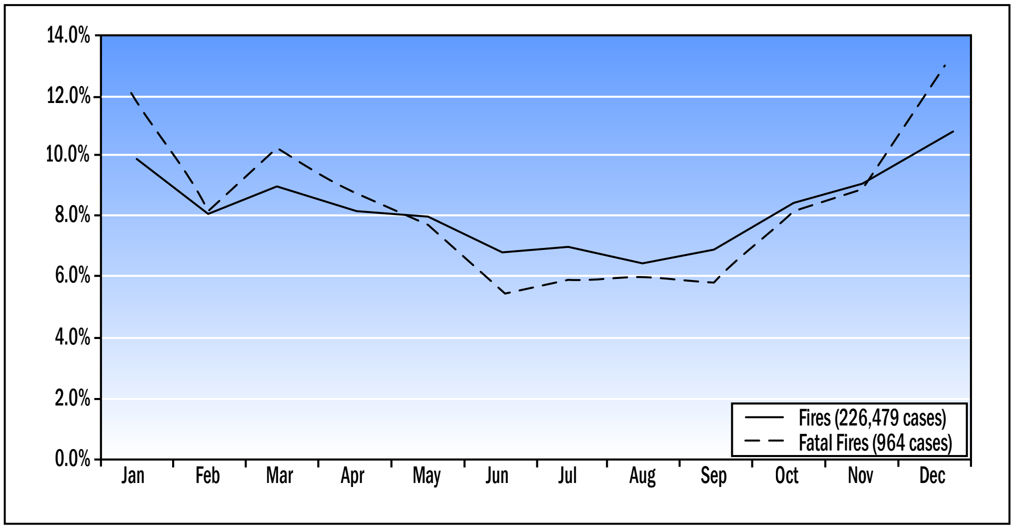


Source: 2005 NFIRS 5.0.

Month of Year

Residential building fires are lowest in late summer and highest in the winter months. Residential building fatal fires are most frequent during winter months, largely the result of miscellaneous unintentionally caused fires and smoking fires. Thirty-three percent of all fatal fires occur in the cold months from December through February (Figure 13).

Figure 13. Month of Year of Residential Building Fires and Fatal Fires (2005).

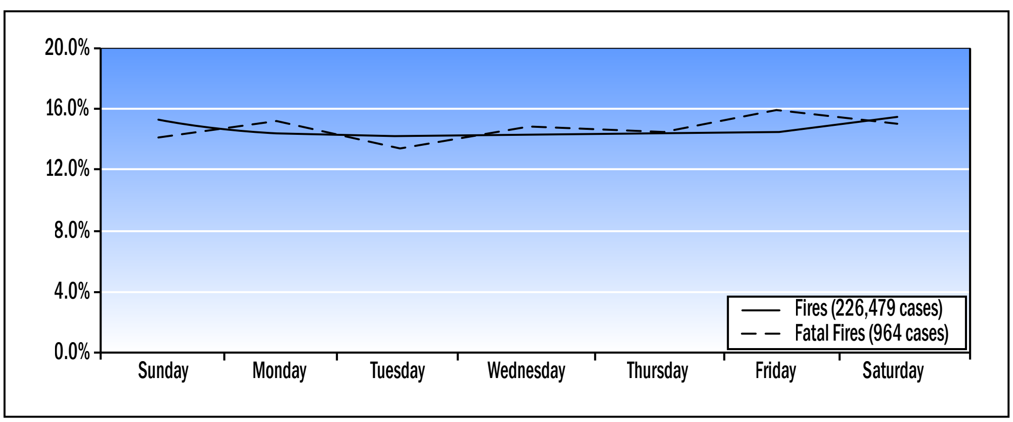


Source: 2005 NFIRS 5.0.

Day of Week

Residential building fires rise slightly on weekends (Figure 14). Fatal fires are more variable during the week, increasing marginally on Fridays.

Figure 14. Day of Week of Residential Building Fires and Fatal Fires (2005).



Source: 2005 NFIRS 5.0.

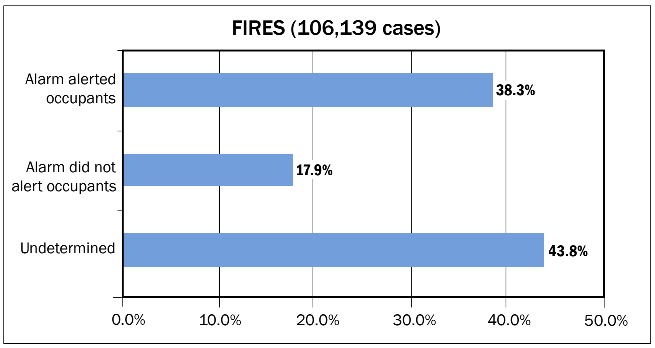
Smoke Alarm Performance

The term "smoke alarm" encompasses a variety of devices intended to warn occupants of the presence of fire. Smoke alarms are thought to play a significant role in the decrease in reported fires and fire deaths since their installation. Their use began to increase in the mid-1970s and has continued to increase since then. As of 2004, 96 percent of all homes reported having at least one smoke alarm.[20]

Smoke Alarm Effectiveness in Confined Fires

Smoke alarms were present and effective in alerting the household in 38 percent of confined residential building fires—low-loss fires typically confined to the container of origin. Occupants were not alerted by a smoke alarm in 18 percent of these confined fires. In a large portion of residential confined building fires, 44 percent, there is no information on the alert status and effectiveness of the smoke alarm (Figure 15).[21]

Figure 15. Smoke Alarm Alert Status in Confined Residential Building Fires (2005).



Source: 2005 NFIRS 5.0.

Notes: 1) The category "Alarm did not alert occupants" does not indicate the presence of a smoke alarm. It only indicates that the occupants were not alerted by an alarm, for whatever reason.

2) Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

[20] Harris Interactive *Fire Prevention Week Survey* conducted for the National Fire Protection Association, Public Affairs Division, Fall 2004 (http://www.nfpa.org/assets/images/Public%20Education/FPWSurvey.pdf). Previous smoke alarm usage statistics have been published by the Consumer Product Safety Commission. The Commission's 2004–2005 Residential Fire Survey had not been released officially as of the publication of this document.

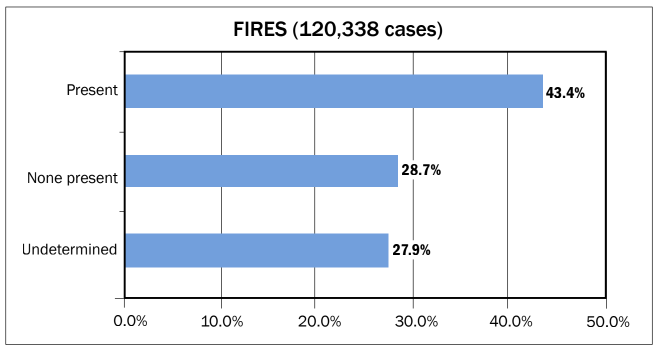
[21] While the number of "Undetermined" entries is high, this data item may be misleading. If the fire was very small and confined to the item of origin, the alarm may not have sounded. In this case, it is not clear how this data item would be filled in correctly. If the occupant was present at the time of the confined fire, there may have been no need for a smoke alarm to notify the occupants. Again, it is unclear what the coding would be, and how the NFIRS instructions are interpreted.

Smoke Alarm Effectiveness in Nonconfined Fires

To be effective, a working smoke alarm must alert the occupants. The first step is to determine if the alarm was present and whether it operated.

Smoke alarms were present in only 43 percent of nonconfined residential building fires (Figure 16). Nonconfined fires are those fires that spread beyond the original object of origin—what is typically envisioned as a "fire." The presence or absence of alarms was not reported to NFIRS in 28 percent of nonconfined residential building fires.

Figure 16. Presence of Smoke Alarms in Nonconfined Residential Building Fires (2005).



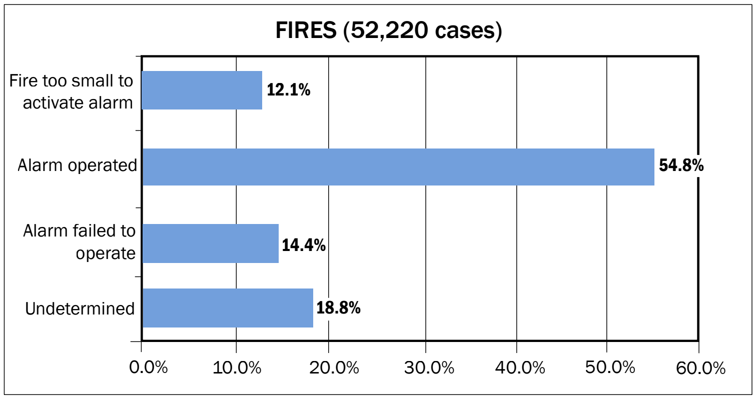
Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

When smoke alarms were present in nonconfined residential building fires, the alarms operated in 55 percent of the incidents. In the remaining 45 percent of incidents, smoke alarms failed to operate (14 percent), the fire was too small to activate the system (12 percent), or no information on smoke alarm operation was available (19 percent) (Figure 17).[22]

[22] Looking at the percentage of operational smoke alarms from another perspective, at a minimum, smoke alarms were known to be present and operated in 24 percent of all nonconfined residential building fires (present 43.4% x operated 54.8% = 23.8%).

Figure 17. Smoke Alarm Operation When Alarm was Present in Nonconfined Residential Building Fires (2005).



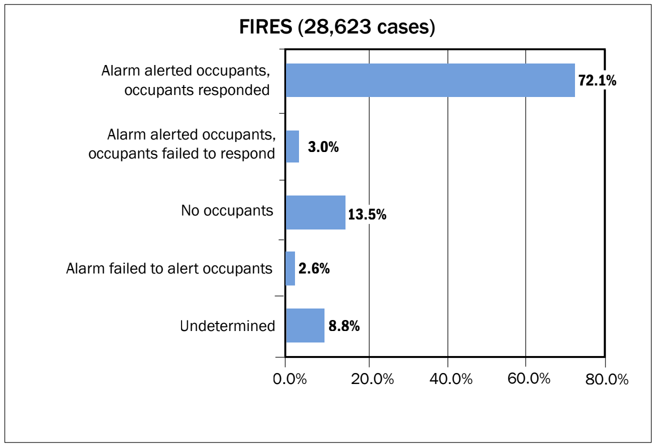
Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

Figure 18 shows that, in nearly three-quarters of the nonconfined residential building fires where alarms were present and operated, occupants were alerted to the fire by the smoke alarm: 72 percent of occupants were alerted and were able to respond to the warning, and an additional 3 percent were alerted but did not respond to the warning. Occupants were not alerted in 3 percent of nonconfined residential building fires, and no occupants were in the residence at the time of the fire in 14 percent of these incidents. Alarm alert effectiveness information was not available in 9 percent of nonconfined residential building fires.[23]

[23] At a minimum, smoke alarms were effective at alerting occupants in 18 percent of all nonconfined residential building fires (present 43.4% x operated 54.8% x alerted occupants 75.1% = 17.9%).

Figure 18. Smoke Alarm Effectiveness When Alarm was Operational in Nonconfined Residential Building Fires (2005).



Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

Widespread public awareness programs that focus on the proper maintenance of alarms are needed to ensure that they operate properly. A number of initiatives are focused directly on this problem. Messages are broadcast nationally when daylight savings time goes into effect, reminding the public to check and maintain their alarms. Some local fire departments in urban areas distribute free smoke alarms to households that are unprotected. All these initiatives have helped, but residences without smoke alarms and residences with nonworking alarms still have reported fires.

Current guidelines published by the CPSC recommend placing working smoke alarms on every level of the home, outside sleeping areas, and inside bedrooms. These guidelines also encourage residents to replace batteries annually and test smoke alarms monthly.[24]

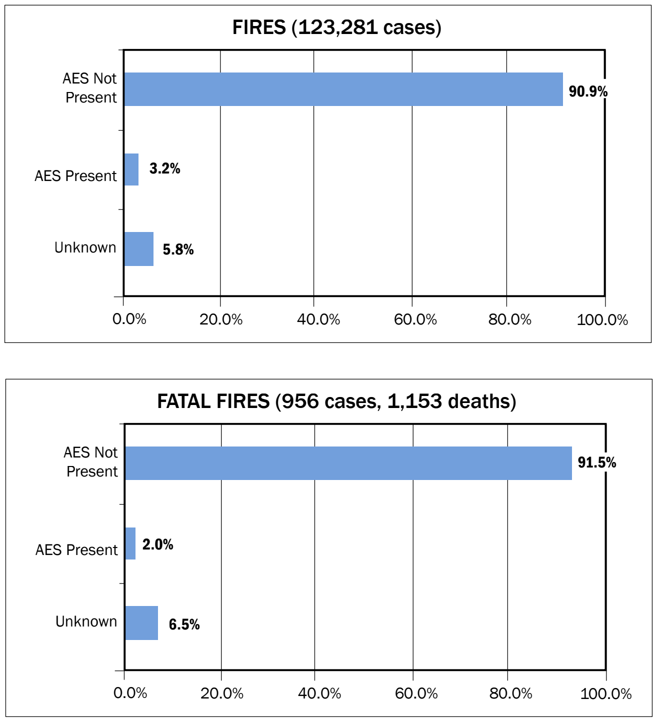
Presence of Automatic Extinguishing Systems

Other protection types fall in the category of automatic extinguishment systems (AESs). AESs encompass sprinkler, dry chemical, foam, halogen, and carbon dioxide systems. When found in residences, sprinkler systems are the most common type of AES. Residential sprinklers, however, are found today in only a small fraction of residences other than hotels, newer multifamily buildings, and newer high-value custom homes. It is no surprise that they are reported to be present in only 3 percent of residential buildings

[24] Consumer Product Safety Commission, "Smoke Alarms," March 2008, http://www.cpsc.gov/CPSCPUB/PUBS/smokealarms.pdf and "CPSC Daylight Saving Time Alert: Working Smoke Alarms Are Key to Surviving Home Fires," March 2008, http://www.cpsc.gov/cpscpub/prerel/prhtml08/08211.html

fires nationally and 2 percent of fatal residential building fires (Figure 19). Residential AESs represent a great potential in the future.[25] In residences, sprinklers are widely thought to be the most effective type of system, not only alerting residents of the presence of fire, but helping to extinguish it. As a note, if a fire is extinguished by a sprinkler or other AES, it may never be reported to the fire service, and the statistics below may underrepresent the presence of AES.

Figure 19. Presence of Automatic Extinguishing Systems in Residential Buildings (2005).



Source: 2005 NFIRS 5.0.

Note: Percentages reflect only those incidents with structure types 1 (enclosed building) or 2 (fixed portable or mobile structures).

[25] The presence of AESs includes only those fires with a structure fire module in NFIRS. While confined fires are allowed abbreviated reporting, some fire departments have filled out the fire and structure fire modules voluntarily for some confined fires, and AES information is collected for these incidents. Generally speaking, less than 3 percent of residential building fires are confined fires with a structure fire module.

One- and Two-Family Residential Buildings

One- and two-family residential buildings dominate the fire profile for residential buildings as well as for residential structures in general.[26, 27]

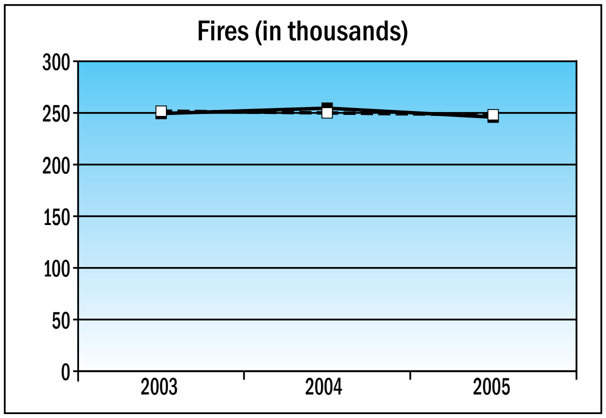
Trends

Trends for one- and two-family residential building fires, deaths, and injuries declined during the 3-year period (2003–2005), 1, 10, and 3 percent respectively. Property loss increased 5 percent (Figure 20). Because the numbers of deaths and injuries dropped more than fires, the statistics per fire improved, with fewer deaths and injuries per fire. Dollar losses, however, increased during this period, and the dollar loss statistics per fire worsened. Smoke alarms are thought to play a major role in the reduction in the number of reported fires and the resulting civilian casualties.

[26] See the discussion on the U.S. population and one- and two-family homes in the section on *Types of Residential Structures*.

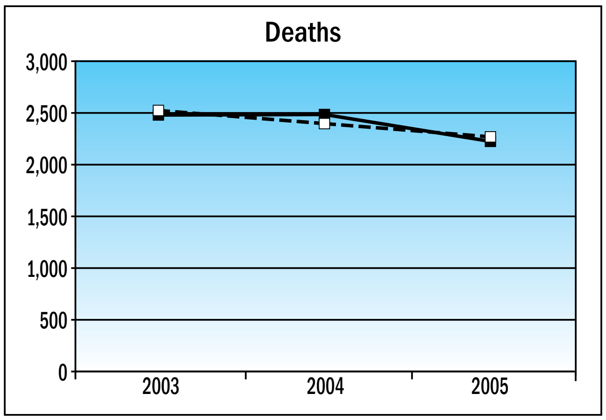
[27] Manufactured housing (mobile homes used as fixed residences) is included here.

Figure 20. Trends in One- and Two-Family Building Fires and Fire Losses (2003–2005).



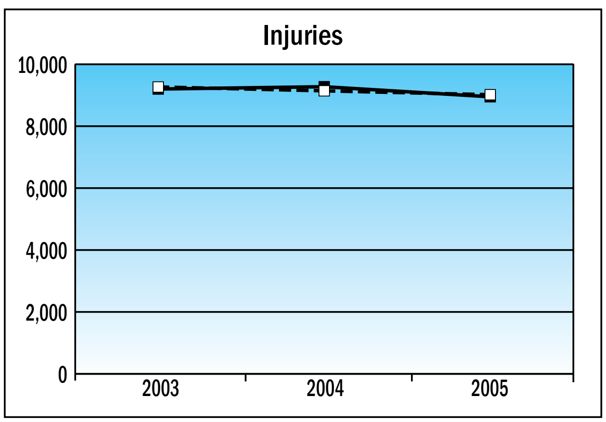
FIRES (IN THOUSANDS)

Year	Value
2003	249.4
2004	254.6
2005	245.9
3-Year Trend (%)	–1.4%



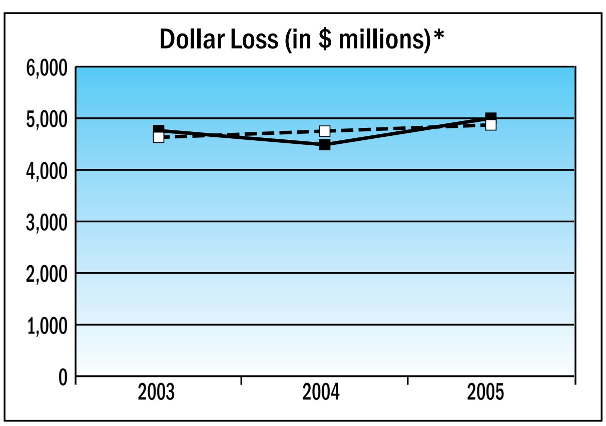
DEATHS

Year	Value
2003	2,480
2004	2,485
2005	2,225
3-Year Trend (%)	–10.1%



INJURIES

Year	Value
2003	9,200
2004	9,275
2005	8,950
3-Year Trend (%)	–2.7%



DOLLAR LOSS (IN $MILLIONS)*
*ADJUSTED TO 2005 DOLLARS

Year	Value
2003	$4,761
2004	$4,489
2005	$5,002
3-Year Trend (%)	5.2%

Sources: 2003–2005 NFIRS 5.0, NFPA, and Consumer Price Index.

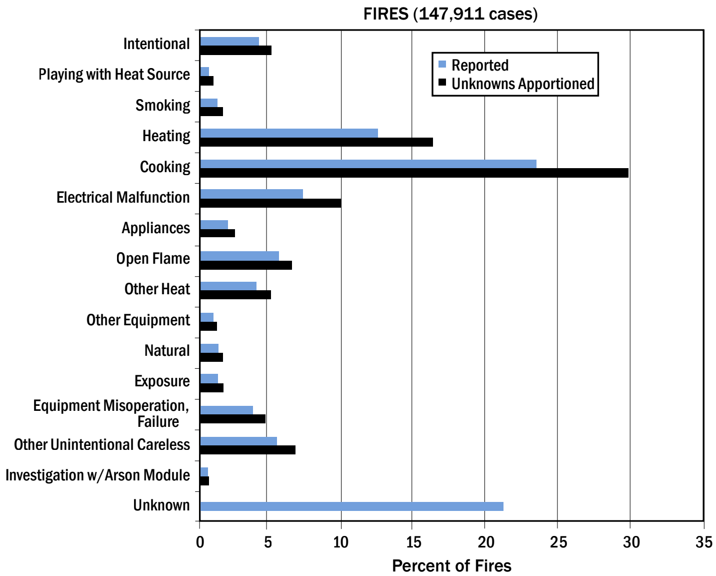
Causes

Thirty percent of all fires in one- and two-family buildings are caused by cooking incidents (Figure 21). The most common cooking fires result from misuse of materials or products, abandoned or discarded materials, and the heat source too close to combustibles when food (most often grease or cooking oils) catches fire. Heating (17 percent) and electrical malfunction (10 percent) are the second and third leading causes of fires.

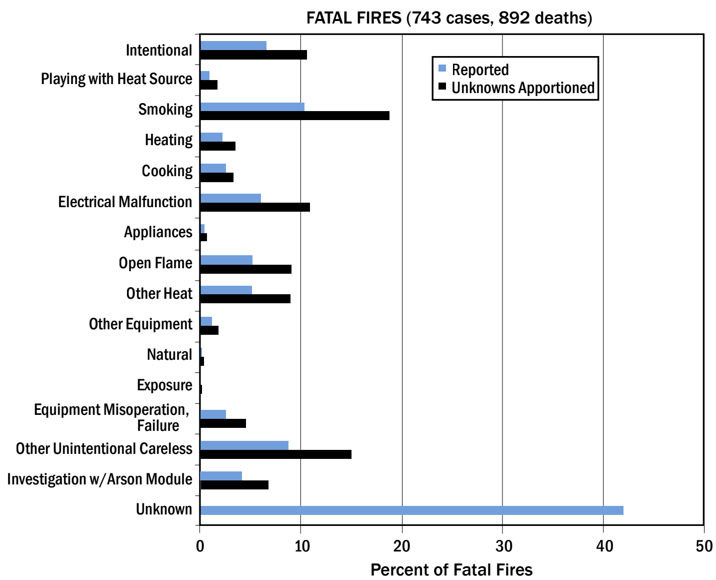
The first and second leading causes of fatal fires in 2005 are smoking (18 percent) and other unintentional, careless action (16 percent). Two-thirds of the fatal smoking fires come from cigarettes dropped on upholstered furniture, bedding, mattresses, or pillows. Studies and anecdotal evidence suggest that alcohol consumption may have a role in these fires.[28] Electrical malfunction and intentional causes tied at third with 11 percent. These four causes account for 57 percent of the fatal fires and 59 percent of fatalities in 2005.

[28] Several of the published studies on the effect of alcohol abuse in U.S. fires are listed in *Other Resources on the Fire Problem* at http://www.usfa.dhs.gov/statistics/reports/fius.shtm

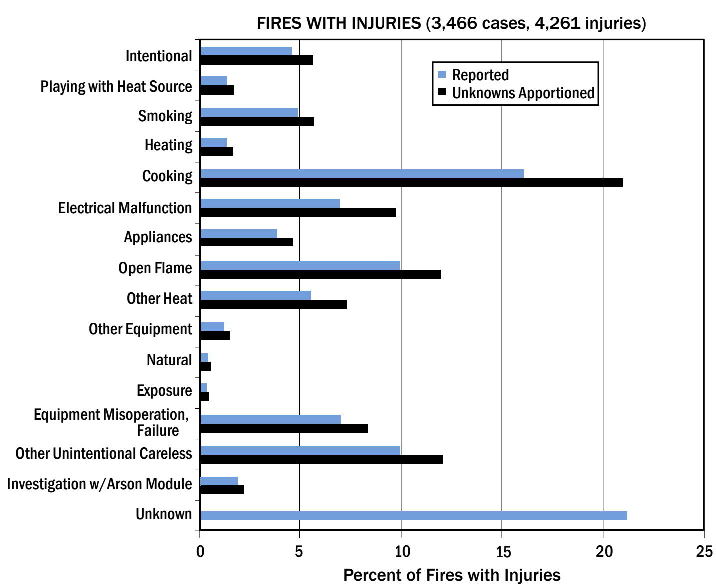
Figure 21. Fire Cause for One- and Two-Family Building Fires and Fires with Losses (2005).



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	4.3	5.6
Playing with Heat Source	0.7	0.9
Smoking	1.7	2.2
Heating	12.9	16.5
Cooking	23.4	29.9
Electrical Malfunction	7.8	10.0
Appliances	2.1	2.7
Open Flame	5.7	7.2
Other Heat	4.3	5.5
Other Equipment	1.1	1.4
Natural	1.9	2.4
Exposure	1.9	2.4
Equipment Misoperation, Failure	3.8	4.9
Other Unintentional, Careless	5.8	7.5
Investigation w/Arson Module	0.7	0.9
Unknown	21.7	

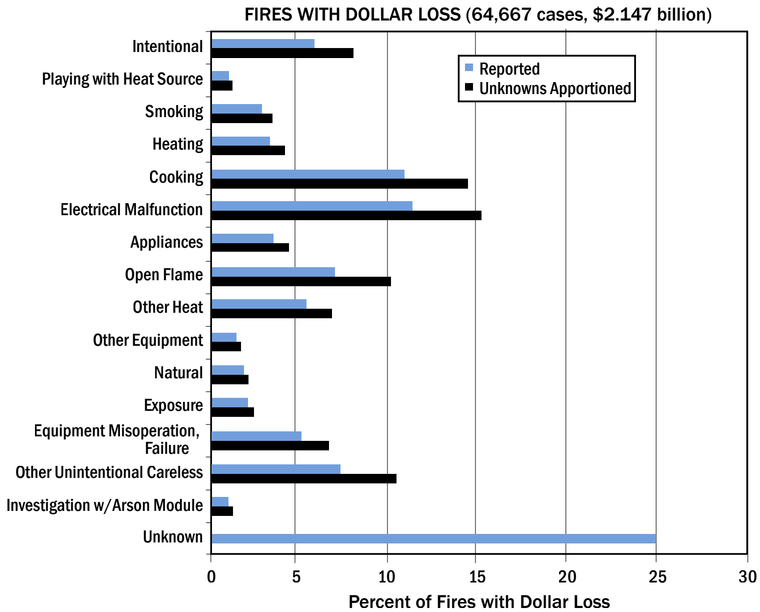


Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	6.5	11.4
Playing with Heat Source	0.8	1.4
Smoking	10.1	17.9
Heating	2.6	4.5
Cooking	2.3	4.0
Electrical Malfunction	6.5	11.4
Appliances	0.7	1.2
Open Flame	4.4	7.9
Other Heat	4.6	8.1
Other Equipment	1.6	2.9
Natural	0.4	0.7
Exposure	0.1	0.2
Equipment Misoperation, Failure	2.6	4.5
Other Unintentional, Careless	9.3	16.4
Investigation w/Arson Module	4.2	7.4
Unknown	43.5	



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	4.6	5.8
Playing with Heat Source	1.8	2.2
Smoking	4.8	6.2
Heating	1.9	2.4
Cooking	16.5	21.0
Electrical Malfunction	7.6	9.7
Appliances	3.5	4.4
Open Flame	10.1	12.8
Other Heat	6.1	7.8
Other Equipment	1.8	2.2
Natural	0.6	0.7
Exposure	0.4	0.6
Equipment Misoperation, Failure	7.0	8.8
Other Unintentional, Careless	10.1	12.9
Investigation w/Arson Module	1.8	2.3
Unknown	21.4	

Figure 21 (cont'd)



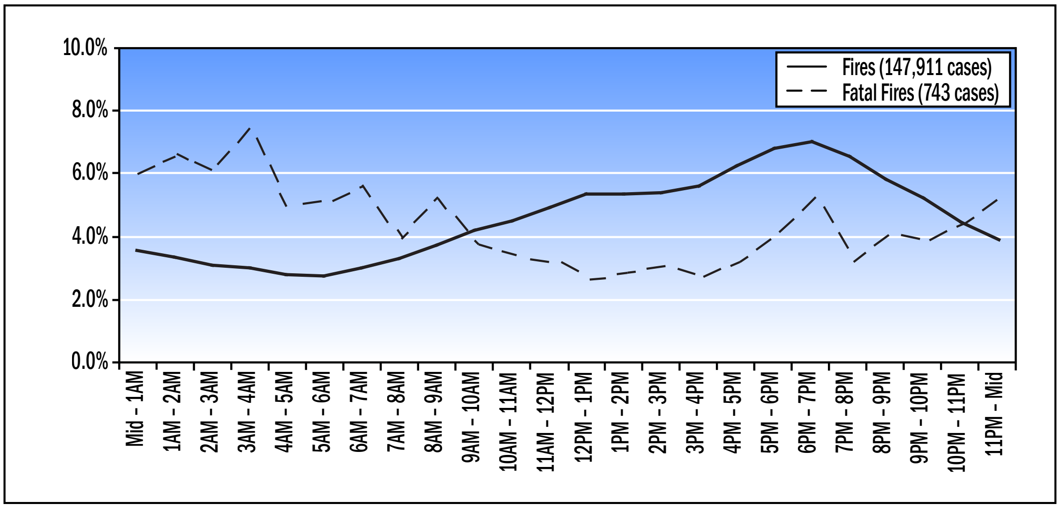
Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	6.3	8.3
Playing with Heat Source	1.2	1.6
Smoking	2.6	3.5
Heating	3.5	4.6
Cooking	11.0	14.6
Electrical Malfunction	11.6	15.4
Appliances	3.3	4.4
Open Flame	7.6	10.2
Other Heat	5.7	7.6
Other Equipment	1.6	2.2
Natural	2.6	3.5
Exposure	3.2	4.3
Equipment Misoperation, Failure	5.5	7.4
Other Unintentional, Careless	8.2	11.0
Investigation w/Arson Module	1.1	1.5
Unknown	24.9	

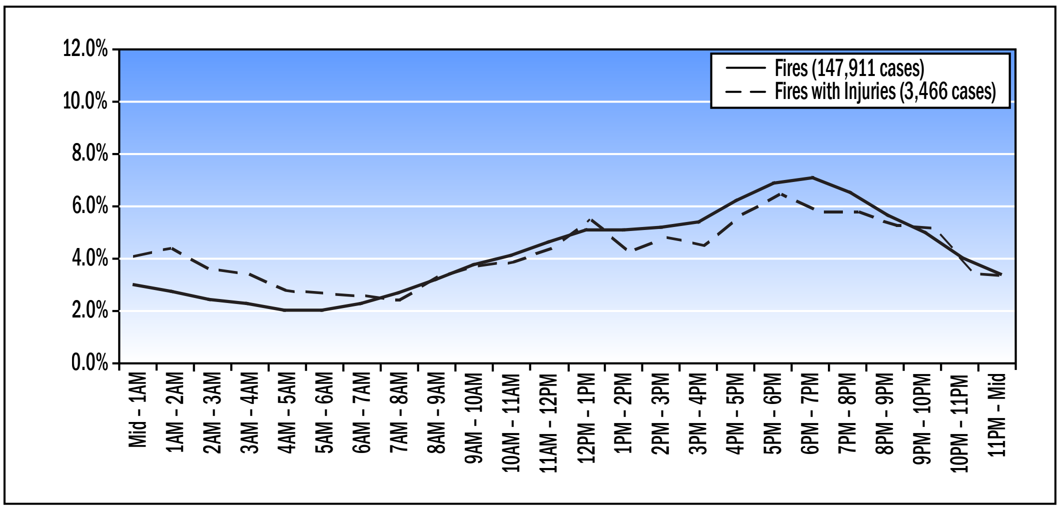
Source: 2005 NFIRS 5.0.

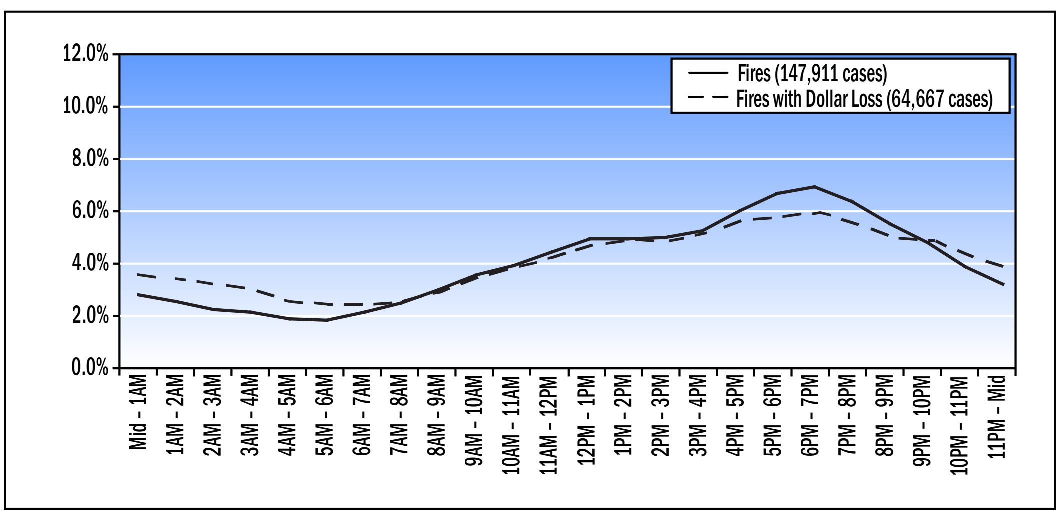
When Fires Occur

Time of Fire Alarm. Figure 22 mirrors Figure 12 (all residential buildings). Fires in one- and two-family residences are highest between 4 p.m. and 8 p.m., when cooking fires sharply increase. Fires with injuries follow the overall fire incidence, and peak during the dinner hour, largely as a result of cooking fires. Fatal fires, on the other hand, are highest in the early morning hours, from 1 a.m. to 4 a.m., with a peak between 3 a.m. to 4 a.m. These early morning hours are when most people are in deep sleep and are not easily awakened in time to escape. Causes of fatal fires during this period are intentional, smoking-related, and miscellaneous unintentional causes. Smoke and flames have a greater opportunity to grow larger while people are asleep and unable to respond quickly to warning signs. Fires with dollar loss reported are relatively consistent with the incidence of fires.

Figure 22. Time of Fire Alarm for One- and Two-Family Building Fires and Fires with Losses (2005).



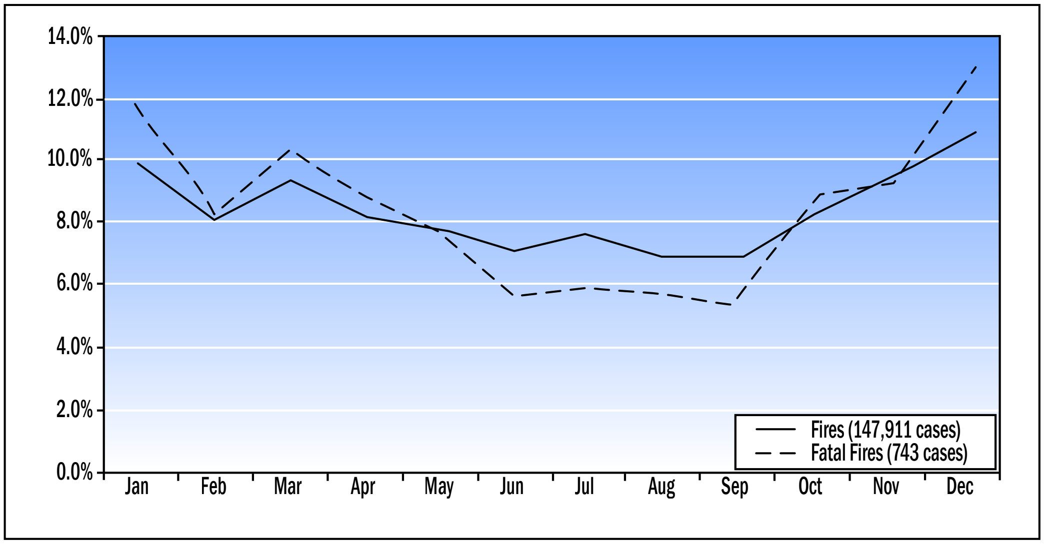




Source: 2005 NFIRS 5.0.

Month Of Year. Fires and fatal fires in one- and two-family homes peak in midwinter, when heating fires are added to the other types of year-round fires (Figure 23). Fatal fires are at their lowest in the summer months.

Figure 23. Month of Year of One- and Two-Family Building Fires and Fires with Losses (2005).



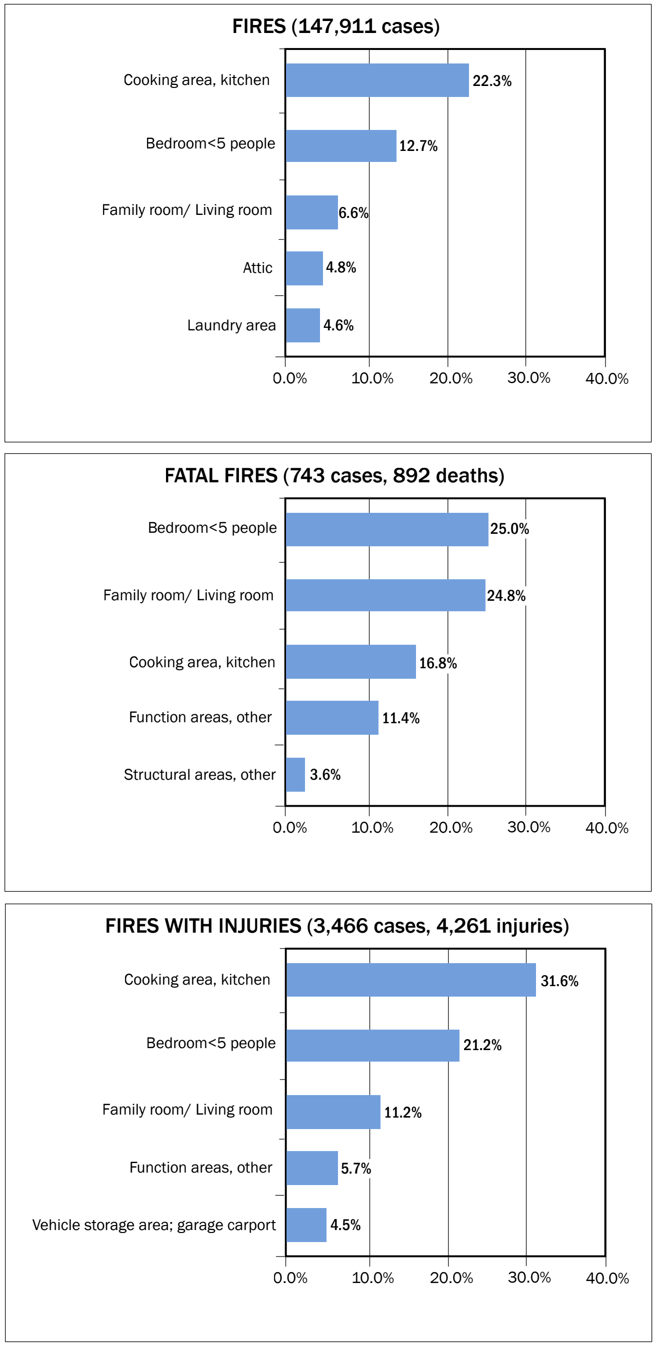
Source: 2005 NFIRS 5.0.

Area of Fire Origin

To help visualize the fire problem more personally, it is useful to describe it in terms of where different types of fires occur in the home, and what types of fires occur in each room. Figure 24 shows the leading rooms where fires, fatal fires, and fires resulting in injuries originated in one- and two-family homes in 2005. The rankings of the top three rooms for all three measures have remained relatively constant over the years. Kitchens, bedrooms, and lounge areas (e.g., living rooms, family rooms) are the rooms where most fires originate—42 percent of fires—and result in 67 percent of fatal fires, and 64 percent of fires with injuries.

Twenty-two percent of fires in one- and two-family homes occur in the kitchen, with 43 percent of these fires caused by cooking. Fifty percent of fatal fires in one- and two-family homes occur in lounge areas and bedrooms, with nearly one-quarter (23 percent) of these fires due to smoking, and 32 percent of fires with injuries occur in the kitchen, again with most as the result of cooking (41 percent).

Figure 24. Leading Locations of Fire Origin in One- and Two-Family Building Fires, Fatal Fires, and Fires with Injuries (2005).



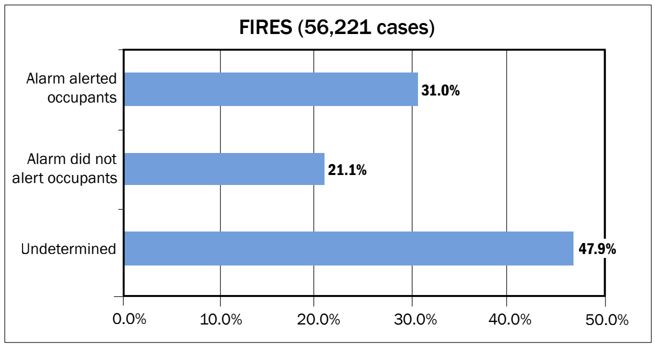
Source: 2005 NFIRS 5.0.

Note: Percentages reflect distribution of those incidents where area of fire origin was unknown.

Smoke Alarm Performance

Smoke Alarm Effectiveness in Confined Fires. Smoke alarms were present and effective in alerting the household occupants in 31 percent of small, low-loss confined one- and two-family building fires. Occupants were not alerted by a smoke alarm in 21 percent of these confined fires. In a large portion of confined one- and two-family building fires (48 percent) there is no information on the alert status and effectiveness of the smoke alarm (Figure 25).

Figure 25. Smoke Alarm Alert Status in Confined One- and Two-Family Building Fires (2005).



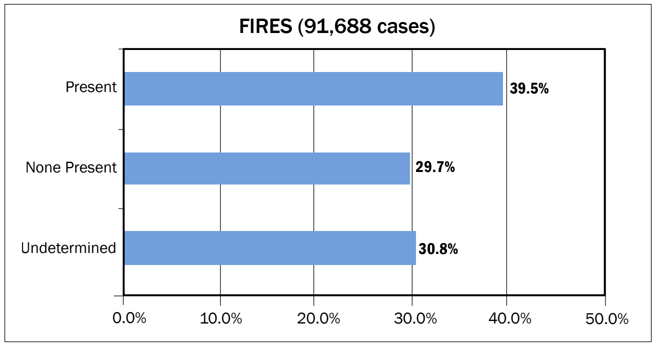
Source: 2005 NFIRS 5.0.

Notes: 1) The category "Alarm did not alert occupants" does not indicate the presence of a smoke alarm. It only indicates that the occupants were not alerted by an alarm, for whatever reason.

2) Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

Smoke Alarm Effectiveness in Nonconfined Fires. Alarms must be present and must operate to determine effectiveness. As shown in Figure 26, smoke alarms were present in less than half of larger, nonconfined one- and two-family building fires (40 percent). The presence or absence of alarms was not reported to NFIRS in 31 percent of nonconfined one- and two-family building fires.

Figure 26. Presence of Smoke Alarms in Nonconfined One- and Two-Family Building Fires (2005).

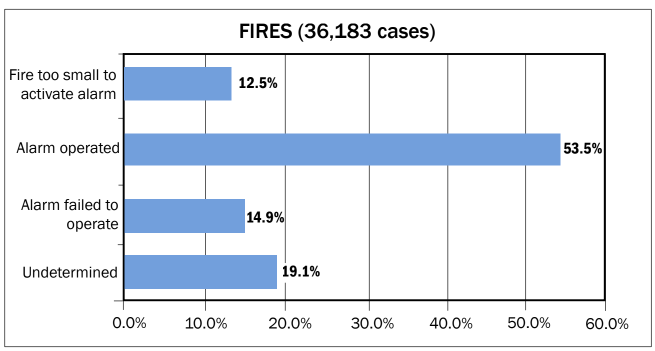


Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

When smoke alarms were present in nonconfined one- and two-family building fires, the alarms operated in 54 percent of the incidents. In the remaining 46 percent of incidents, smoke alarms failed to operate (15 percent), the fire was too small to activate the system (13 percent), or no information on smoke alarm operation was available (19 percent) (Figure 27).[29]

Figure 27. Smoke Alarm Operation When Alarm was Present in Nonconfined One- and Two-Family Building Fires (2005).



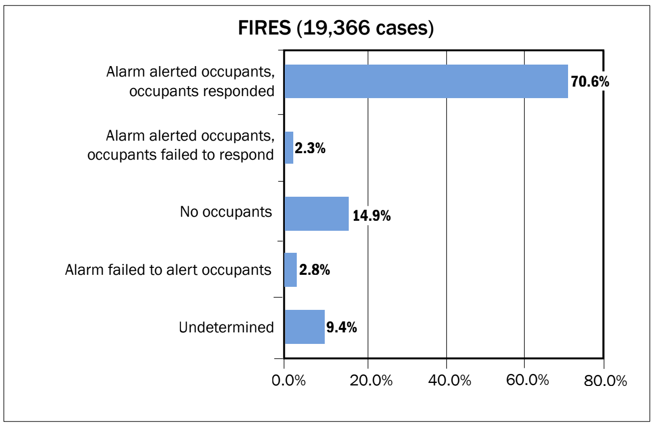
Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

[29] Looking at the percentage of operational smoke alarms from another perspective, at a minimum, smoke alarms were known to be present and operated in 21 percent of all nonconfined one-and two-family building fires (present 39.5% x operated 53.5% = 21.1%).

The effectiveness of working smoke alarms in nonconfined one- and two-family building fires is shown in Figure 28. In nearly three-quarters of the nonconfined one- and two-family building fires where alarms were present and operated, occupants were alerted to the fire by the smoke alarm: 71 percent of occupants were alerted and were able to respond to the warning, and an additional 2 percent were alerted but did not respond to the warning. Occupants were not alerted in 3 percent of nonconfined one- and two-family building fires, and no occupants were in the residence at the time of the fire in 15 percent of these incidents. Alarm alert effectiveness information was not available in 9 percent of nonconfined one- and two-family building fires.[30]

Figure 28. Smoke Alarm Effectiveness When Alarm was Operational in Nonconfined One- and Two-Family Building Fires (2005).



Source: 2005 NFIRS 5.0.

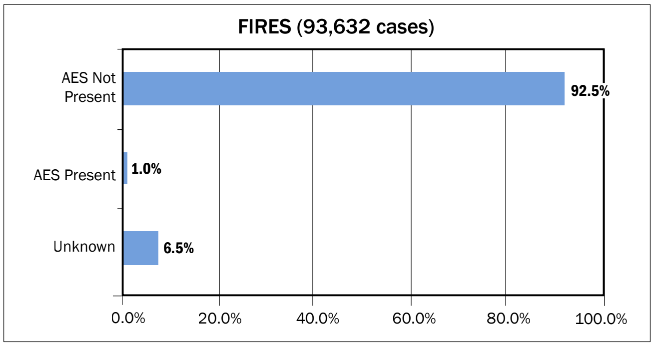
Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

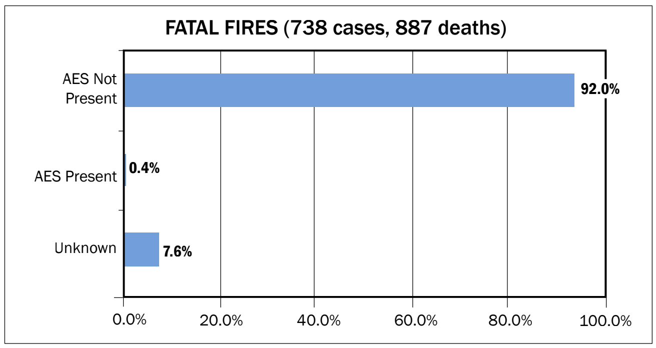
Presence of Automatic Extinguishing Systems

AESs were present in only 1 percent of fires, and much less than 1 percent of fatal fires in one- and two-family homes in 2005 (Figure 29). Although this is a small amount from which to draw conclusions, the proportion of reported fires in homes with AESs, such as sprinklers, is largely unchanged since the advent of NFIRS 5.0. Further investigation into these results is needed.

[30] At a minimum, smoke alarms were effective at alerting occupants in 15 percent of all nonconfined one-and two-family building fires (present 39.5% x operated 53.5% x alerted occupants 72.9% = 15.4%).

Figure 29. Presence of Automatic Extinguishing Systems in One- and Two-Family Buildings (2005).





Source: 2005 NFIRS 5.0.

Note: Percentages reflect only those incidents with structure types 1 (enclosed building) or 2 (fixed portable or mobile structures).

Multifamily Buildings

Formerly addressed as "apartments", multifamily buildings tend to be regulated by stricter building codes than one- and two-family residences. The category now includes condominiums, town houses, row-houses, and tenements, as well as the traditional apartment (lowrise or highrise apartment). In addition, many multifamily residences are rental properties, frequently falling under more stringent fire prevention statutes. Often these properties have a reasonably homogeneous socioeconomic mix of residents. They may be suburban town house communities, rent-subsidized low-income housing projects, high-income families in luxury highrises, or centers of living for the elderly. In large cities, all of these groups are represented in these buildings.

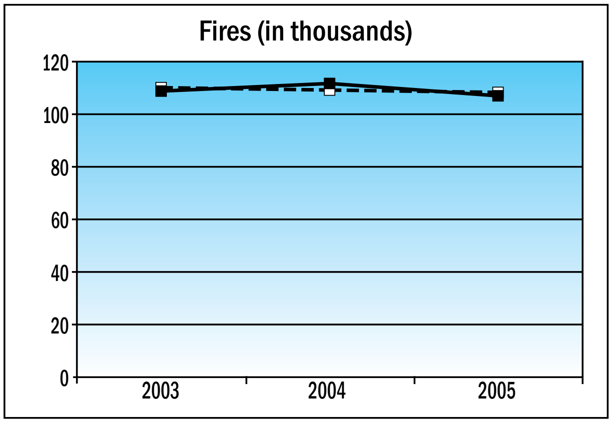
Because multifamily buildings tend to have large clusters of similar people, prevention programs can be tailored specially to the cause profiles of multifamily buildings in different areas of the community.

Trends

Figure 30 shows the 3-year trends in multifamily building fires, deaths, injuries, and losses. The number of multifamily building fires dropped 2 percent. The same was not true of the death trend in multifamily buildings, which was up 35 percent. The trend for multifamily building injuries increased 4 percent. Adjusted dollar losses were up 21 percent in multifamily buildings. Property losses in multifamily residences continued the overall national upward trend.[31]

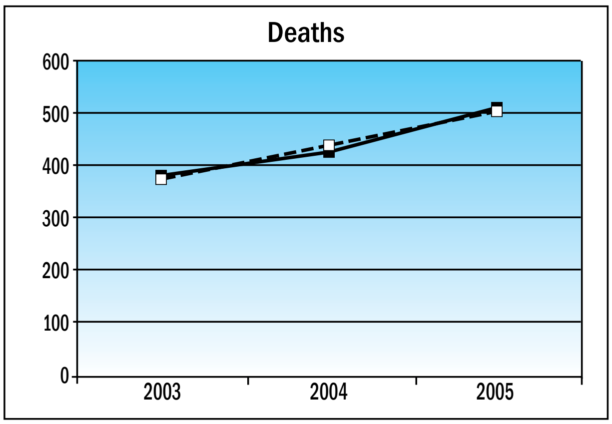
[31] *Fire in the United States 1995-2004, Fourteenth Edition,* United States Fire Administration, August 2007.

Figure 30. Trends in Multifamily Building Fires and Fire Losses (2003–2005).



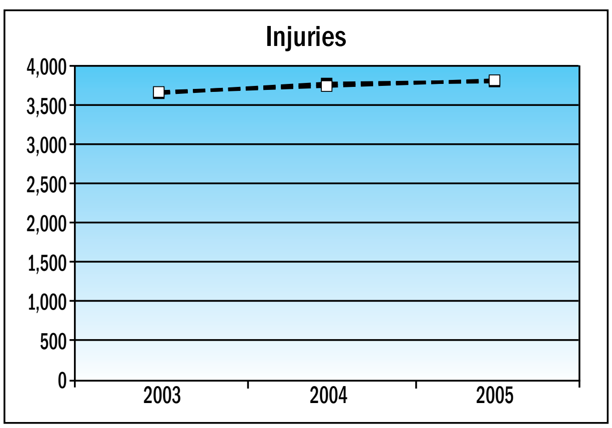
FIRES (IN THOUSANDS)

Year	Value
2003	108.8
2004	111.7
2005	107.0
3-Year Trend (%)	**–1.6%**



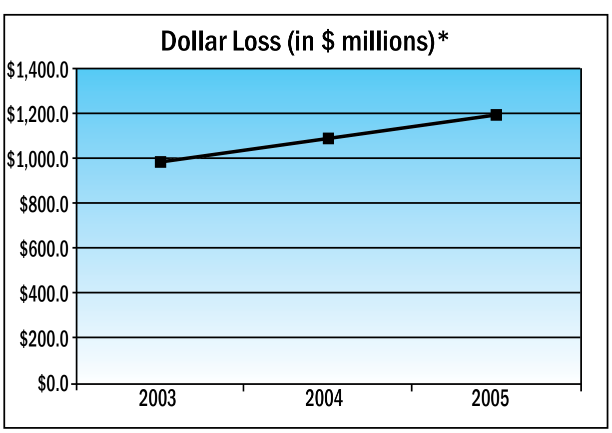
DEATHS

Year	Value
2003	380
2004	425
2005	510
3-Year Trend (%)	**34.8%**



INJURIES

Year	Value
2003	3,650
2004	3,775
2005	3,800
3-Year Trend (%)	**4.1%**



DOLLAR LOSS (IN $MILLIONS)*
***ADJUSTED TO 2005 DOLLARS**

Year	Value
2003	$983
2004	$1,088
2005	$1,193
3-Year Trend (%)	**21.4%**

Sources: 2003–2005 NFIRS 5.0, NFPA, and Consumer Price Index.

The steep increase in multifamily building deaths is perplexing. Because of stricter building codes, the required presence of smoke alarms, and the increase in the number of sprinkler systems, deaths in multifamily buildings typically do not exhibit marked increases. It simply may be that the 3-year trend is what is known as a "local high" and that subsequent years' data may moderate the trend. On the other hand, it may be that there are socioeconomic and demographic forces at work. A more detailed study of socioeconomic and demographic changes over time might reveal some of the factors involved in fire incidence.

Causes

The fire problem in multifamily buildings generally is similar to that of one- and two-family structures, with the exception of one major category: cooking fires. Because multifamily buildings often have central heating systems that are maintained regularly, there are fewer heating fires from misuse and poor maintenance in multifamily buildings than in one- and two-family dwellings.[32] In addition, the general lack of fireplaces, chimneys, and fireplace-related equipment reduces the heating fire problem in multifamily buildings, especially apartments,[33] and, because of construction materials, codes, and professional maintenance, electrical problems cause a smaller percentage of fires in multifamily buildings. These factors change the proportions of the causes for multifamily buildings, with heating and electrical becoming less noteworthy and cooking—the leading cause of residential building fires—to move up in importance.

In terms of numbers of reported fires in 2005, cooking in multifamily buildings leads by a factor of at least 8 over the second leading cause (Figure 31). Cooking accounts for more than 60 percent of all multifamily building fires; heating is a distant second at 7 percent, and open flame is third at 4 percent.

The leading cause of fatal fires in multifamily buildings is smoking, accounting for 26 percent of fatal fires. The second and third leading causes of fatal fires are intentional at 12 percent, and open flame at 11 percent. These three leading causes account for just under half of all fatal fires in multifamily buildings.

For fires with injuries, cooking leads at 34 percent; other unintentional, careless, is second at 11 percent, and open flame is third at 10 percent.

Cooking is the leading cause for fires with dollar loss, followed by open-flame fires and miscellaneous unintentionally set fires.

Cooking fires in multifamily buildings represent a substantial challenge, as they have resulted in more than half of all multifamily fires, 34 percent of fires with injuries, 33 percent of fires with dollar loss, and 7 percent of fatal fires. The percentage of fatal fires is low because cooking fires tend to occur during the day or evening hours during meal times when most people are awake and responsive. Deaths are less likely under these circumstances.

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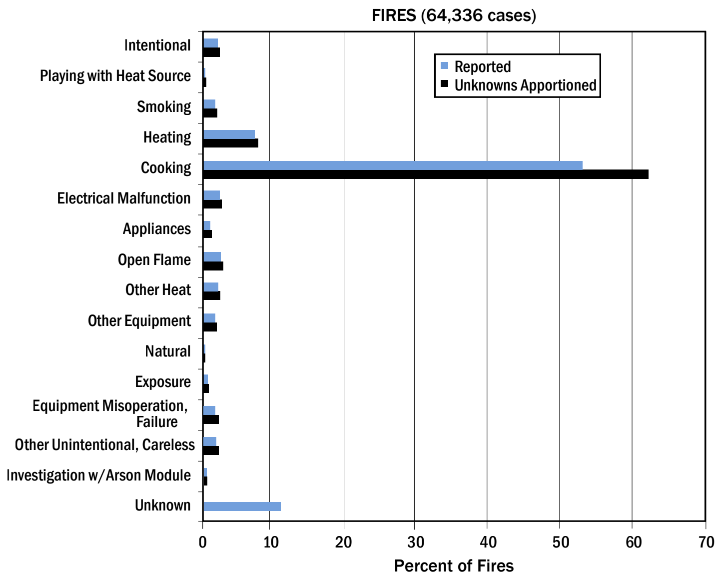
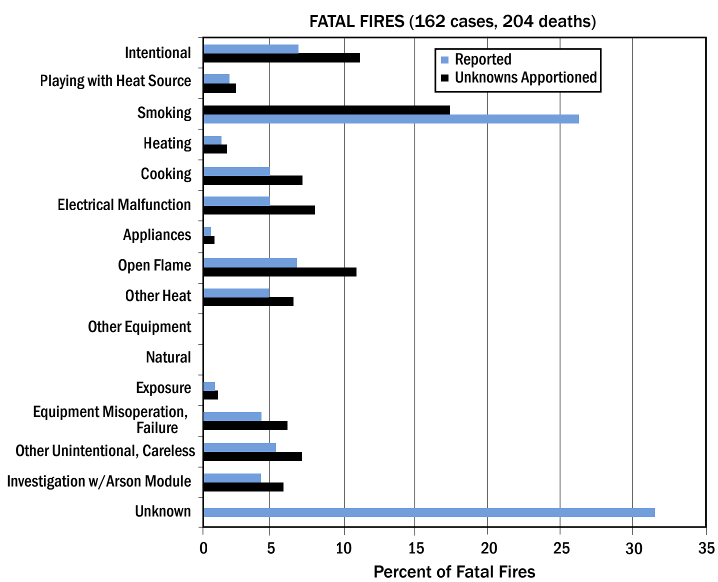
[32] Multifamily buildings include town houses, rowhouses, and other units (e.g., highrise condominiums) that do not necessarily have central heating units that fall under joint maintenance agreements. Nonetheless, central heating units play a much smaller role in multifamily buildings than in one- and two-family buildings.

[33] Fireplace-related equipment is involved in 56 percent of one- and two-family heating fires, but only 39 percent of multifamily heating fires.

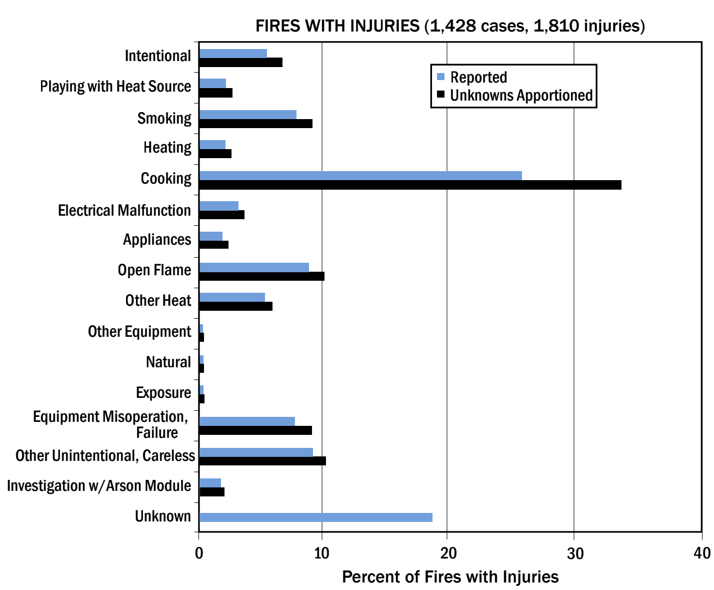
Figure 31. Fire Cause for Multifamily Building Fires and Fires with Losses (2005).



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	2.7	3.1
Playing with Heat Source	0.5	0.6
Smoking	2.1	2.4
Heating	6.1	7.1
Cooking	54.2	62.8
Electrical Malfunction	2.9	3.3
Appliances	1.3	1.5
Open Flame	3.7	4.2
Other Heat	2.8	3.3
Other Equipment	1.9	2.2
Natural	0.4	0.5
Exposure	1.1	1.2
Equipment Misoperation, Failure	2.8	3.3
Other Unintentional, Careless	3.5	4.0
Investigation w/Arson Module	0.4	0.5
Unknown	13.8	

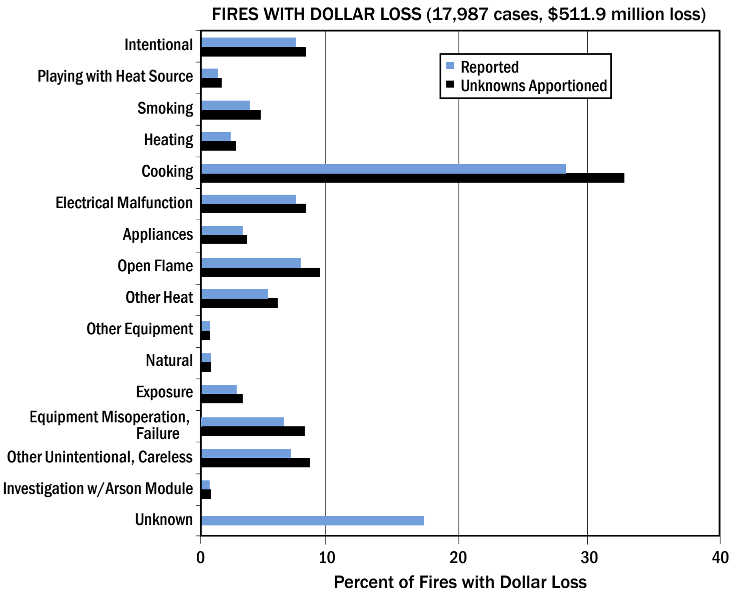


Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	8.0	11.8
Playing with Heat Source	1.9	2.7
Smoking	17.9	26.4
Heating	1.2	1.8
Cooking	4.9	7.3
Electrical Malfunction	5.6	8.2
Appliances	0.6	0.9
Open Flame	7.4	10.9
Other Heat	4.9	7.3
Other Equipment	0.0	0.0
Natural	0.0	0.0
Exposure	1.2	1.8
Equipment Misoperation, Failure	4.3	6.4
Other Unintentional, Careless	5.6	8.2
Investigation w/Arson Module	4.3	6.4
Unknown	32.1	



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	5.3	6.5
Playing with Heat Source	2.0	2.5
Smoking	7.2	8.8
Heating	1.8	2.2
Cooking	27.8	33.8
Electrical Malfunction	3.5	4.3
Appliances	2.0	2.4
Open Flame	8.5	10.3
Other Heat	4.9	6.0
Other Equipment	0.4	0.4
Natural	0.4	0.5
Exposure	0.5	0.6
Equipment Misoperation, Failure	7.1	8.7
Other Unintentional, Careless	9.0	10.9
Investigation w/Arson Module	1.8	2.1
Unknown	17.9	

Figure 31 (cont'd)



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	6.2	7.4
Playing with Heat Source	1.2	1.4
Smoking	4.8	5.7
Heating	2.1	2.5
Cooking	27.8	33.4
Electrical Malfunction	6.4	7.7
Appliances	2.8	3.4
Open Flame	7.5	9.0
Other Heat	5.4	6.4
Other Equipment	0.9	1.1
Natural	0.9	1.1
Exposure	2.3	2.8
Equipment Misoperation, Failure	6.5	7.8
Other Unintentional, Careless	7.3	8.8
Investigation w/Arson Module	1.1	1.3
Unknown	16.9	

Source: 2005 NFIRS 5.0.

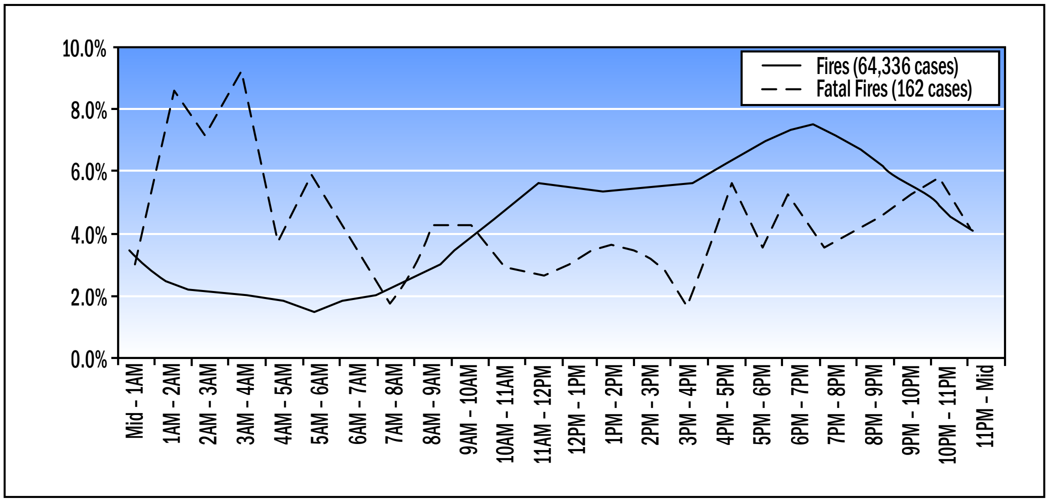
When Fires Occur

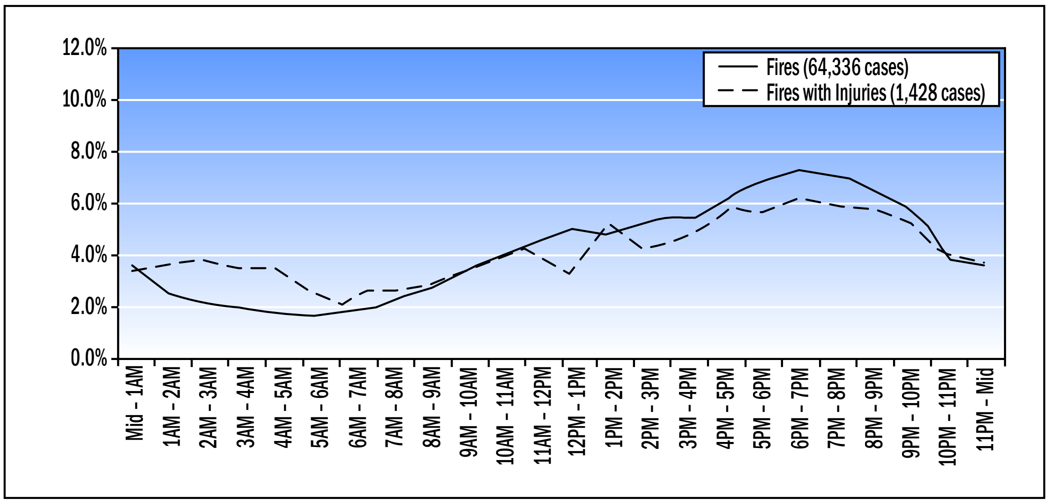
Time of Fire Alarm. Figure 32 shows the alarm times for fires and fires with losses in multifamily buildings. The profiles are not as smooth as those for one- and two-family buildings due to the smaller numbers of incidents involved.

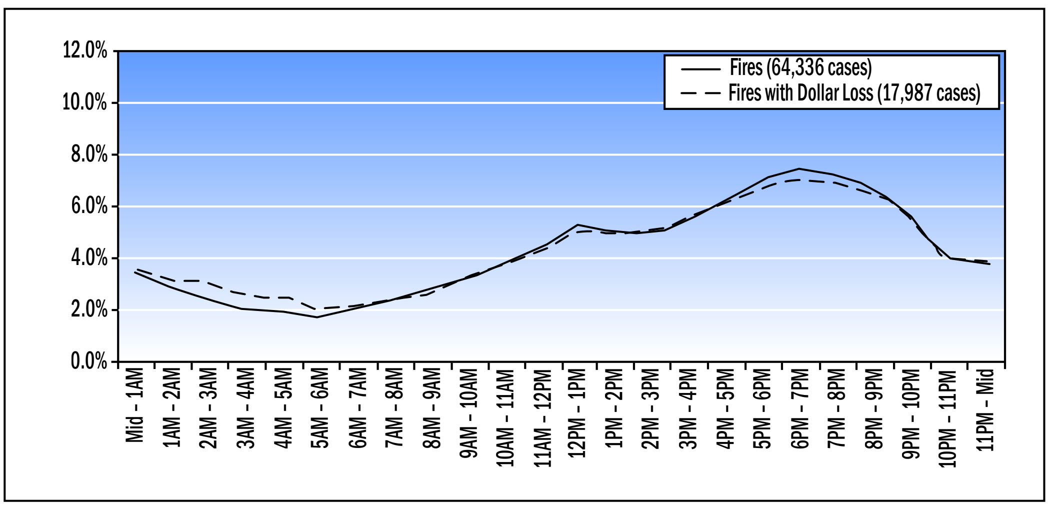
As in one- and two-family buildings, multifamily building fires peak during the evening cooking hours—here from 5 p.m. to 8 p.m.—and are at their lowest point from 4 a.m. to 7 a.m. The early morning hours from 1 a.m. to 4 a.m. are the most dangerous in terms of fatal fires, especially those fires associated with latent smoldering materials from smoking. Thirty-six percent of fatal fires at this time are the result of smoking.

Fires with injuries are spread somewhat evenly throughout the day, generally rising from 8 a.m. throughout the day and falling at night. Fires with dollar loss track closely with fire incidence.

Figure 32. Time of Fire Alarm for Multifamily Building Fires and Fires with Losses (2005).



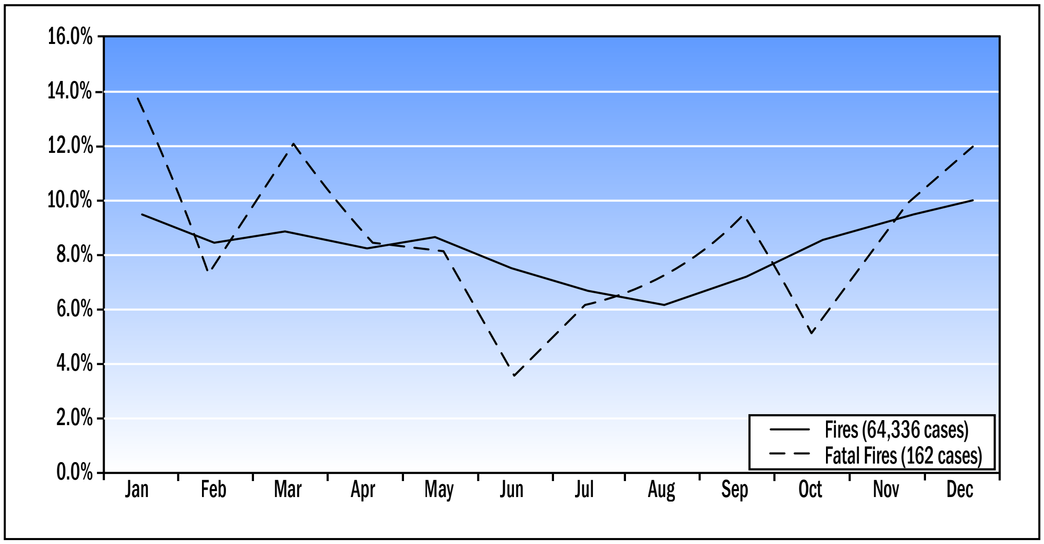




Source: 2005 NFIRS 5.0.

Month Of Year. Fires and fatal fires in multifamily buildings (Figure 33) track closely with those in one- and two-family buildings. Both are somewhat more common in colder months than in warmer months when heating fires increase. Another seasonal factor probably plays a role in winter fires and deaths: simply the greater propensity to stay indoors.

Figure 33. Month of Year of Multifamily Building Fires and Fatal Fires (2005).

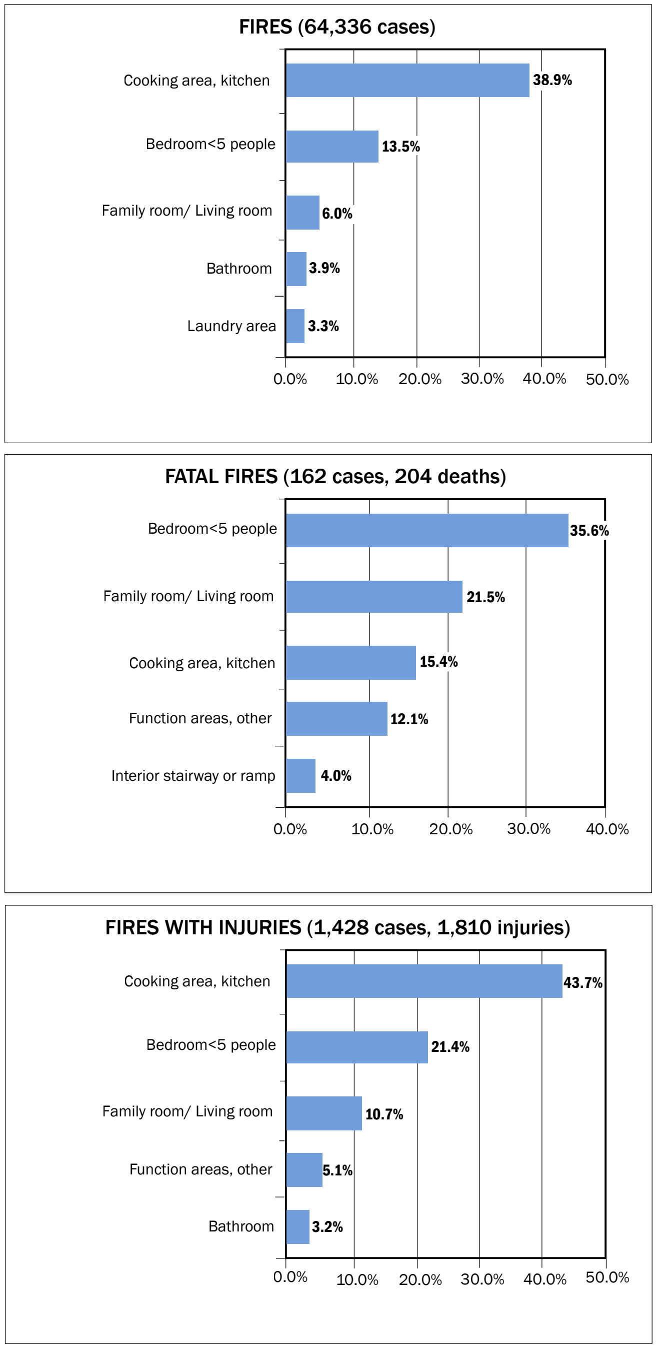


Source: 2005 NFIRS 5.0.

Area of Fire Origin

The leading locations where multifamily building fires started in 2005 are shown in Figure 34. The kitchen, with cooking as the cause, is the most common place for fires to start. The kitchen also is the leading area of fire origin for those fires with injuries. The bedroom is the most common place for a fatal fire to originate, largely due to smoking fires and open flame fires from candles and lighters. The top three leading locations of all three measures are the same as in one- and two-family dwellings.

Figure 34. Leading Locations of Fire Origin in Multifamily Building Fires and Fires with Casualties (2005).



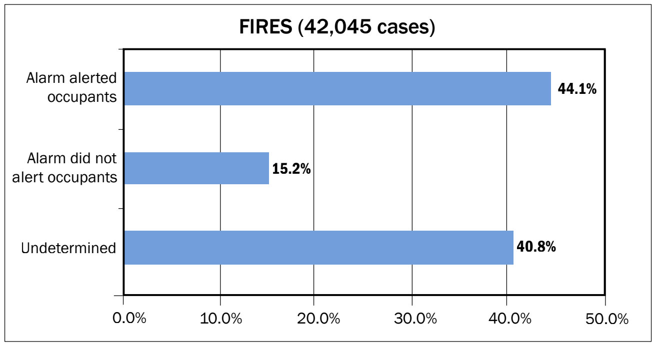
Source: 2005 NFIRS 5.0.

Note: Percentages reflect distribution of those incidents where area of fire origin is unknown.

Smoke Alarm Performance

Smoke Alarm Effectiveness in Confined Fires. Smoke alarms were present and alerted occupants in 44 percent of confined multifamily fires. Occupants were not alerted by a smoke alarm in only 15 percent of these small, low-loss fires. The portion of confined multifamily building fires where there is no information on the alert status and effectiveness of the smoke alarm is 41 percent (Figure 35).

Figure 35. Smoke Alarm Alert Status in Confined Multifamily Building Fires (2005).



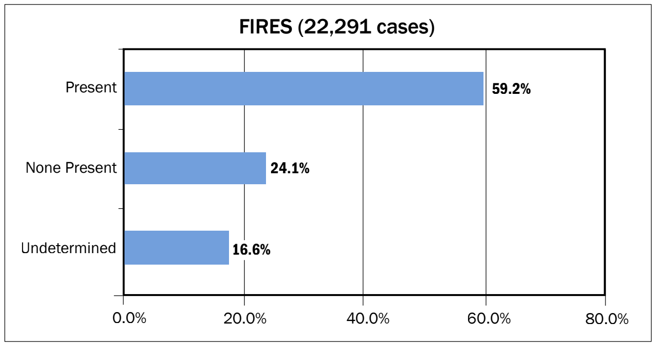
Source: 2005 NFIRS 5.0.

Notes: 1) The category "Alarm did not alert occupants" does not indicate the presence of a smoke alarm. It only indicates that the occupants were not alerted by an alarm, for whatever reason.

2) Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

Smoke Alarm Effectiveness in Nonconfined Fires. Alarms must be present and must operate to determine effectiveness—and they appear more likely to be present in larger, nonconfined multifamily building fires than in larger, nonconfined one- and two-family residence fires. As shown in Figure 36, smoke alarms were present in more than half of nonconfined multifamily building fires (59 percent). The presence of smoke alarms was undetermined in only 17 percent of nonconfined multifamily building fires.

Figure 36. Presence of Smoke Alarms in Nonconfined Multifamily Building Fires (2005).

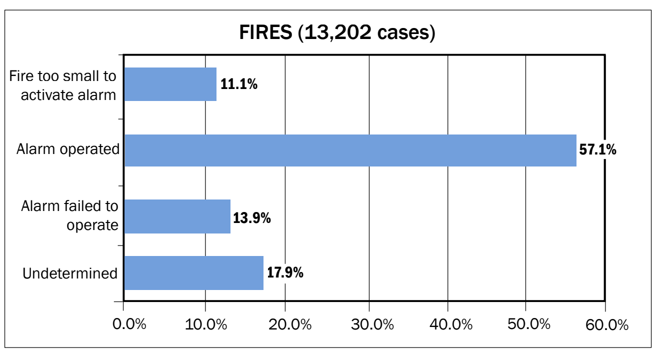


Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

When smoke alarms were present in nonconfined multifamily building fires, the alarms operated in 57 percent of multifamily incidents. Smoke alarms failed to operate in 14 percent of fires, the fire was too small to activate the system in another 11 percent of fires, and no information on smoke alarm operation was available in 18 percent of fires (Figure 37).[34]

Figure 37. Smoke Alarm Operation When Alarm was Present in Nonconfined Multifamily Building Fires (2005).



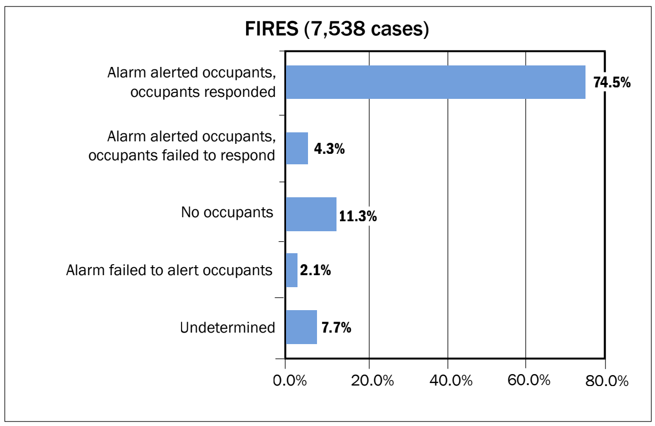
Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

[34] Looking at the percentage of operational smoke alarms from another perspective, at a minimum smoke alarms were known to be present and operated in 34 percent of all nonconfined multifamily building fires (present 59.2% x operated 57.1% = 33.8%).

The effectiveness of working smoke alarms in nonconfined multifamily building fires is shown in Figure 38. In 79 percent of the nonconfined multifamily building fires where alarms were present and operated, occupants were alerted to the fire by the smoke alarm: 75 percent of occupants were alerted and were able to respond to the warning, and an additional 4 percent were alerted but did not respond to the warning. Occupants were not alerted in 2 percent of nonconfined multifamily building fires, and no occupants were in the residence at the time of the fire in 11 percent of these incidents. Alarm alert effectiveness information was not available in 8 percent of nonconfined residential building fires.[35]

Figure 38. Smoke Alarm Effectiveness When Alarm was Operational in Nonconfined Multifamily Building Fires (2005).



Source: 2005 NFIRS 5.0.

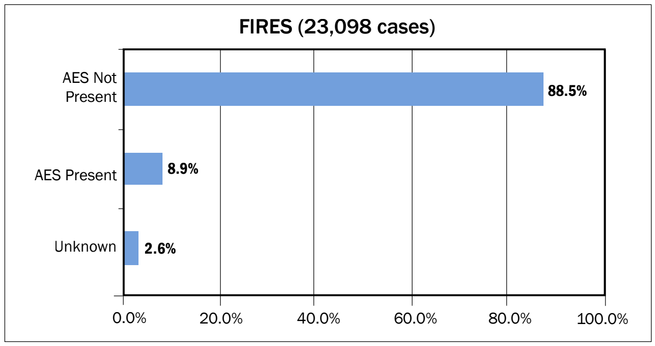
Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

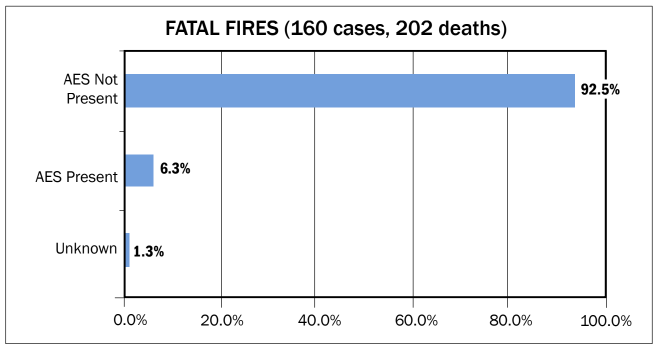
Presence of Automatic Extinguishing Systems

Figure 39 shows the presence of AESs in multifamily buildings in 2005. As is to be expected, a much higher percentage of multifamily buildings that experienced fires were equipped with sprinklers than in one- and two-family homes. As town houses, rowhouses, and the like are considered by many codes as single-family dwellings, AESs are not required. NFIRS includes these occupancies in the multifamily category, and this inclusion may affect the statistics for the presence of AES in multifamily buildings.

[35] At a minimum, smoke alarms were effective at alerting occupants in 27 percent of all nonconfined multifamily building fires (present 59.2% x operated 57.1% x alerted occupants 78.9% = 26.7%).

Figure 39. Presence of Automatic Extinguishing Systems in Multifamily Buildings (2005).





Source: 2005 NFIRS 5.0.

Note: Percentages reflect only those incidents with structure types 1 (enclosed building or 2 (fixed portable or mobile structures).

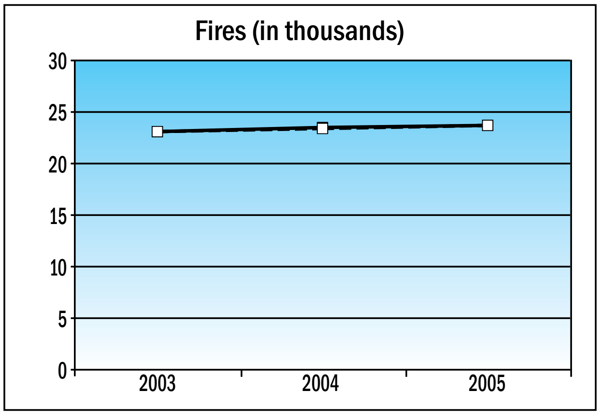
Other Residential Buildings

Other residential properties include rooming houses, dormitories, fraternities and sororities, home hotels, halfway houses, hotels and motels, assisted living facilities, and miscellaneous and unclassified properties reported as residences. The other residential properties category does not include homes for the elderly, prisons, orphanages, or other institutions, as these building types are considered nonresidential institutions.

Trends

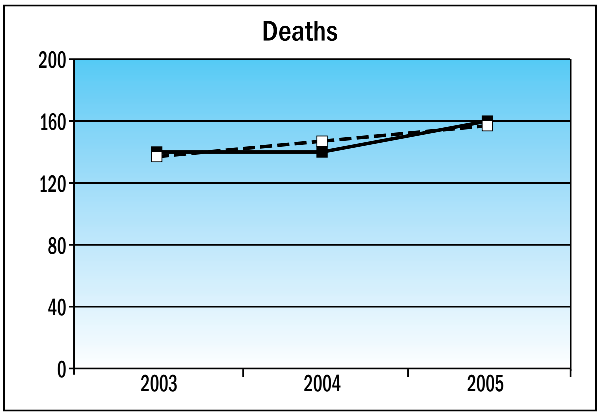
Figure 40 shows increasing trends in the numbers of other residential fires, deaths, injuries, and property loss (3, 15, 4, and 5 percent, respectively). Civilian fire deaths ranged from 140 to 160 a year, and injuries ranged from 575 to 600. Adjusted dollar loss ranged from a low of $259 million in 2004 to a high of $310 million the following year, 2005.

Figure 40. Trends in Other Residential Building Fires and Fire Losses (2003–2005).



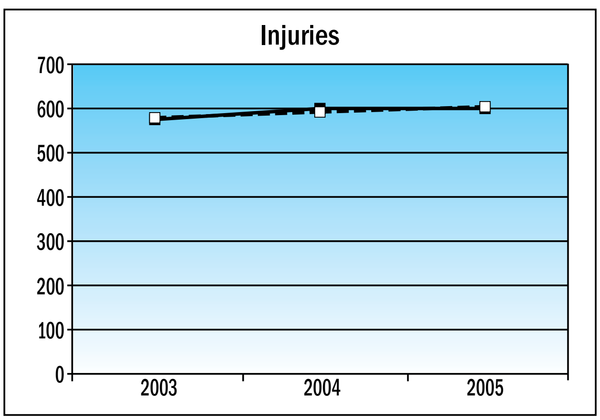
FIRES (THOUSANDS)

Year	Value
2003	23.1
2004	23.5
2005	23.7
3-Year Trend (%)	**2.6%**



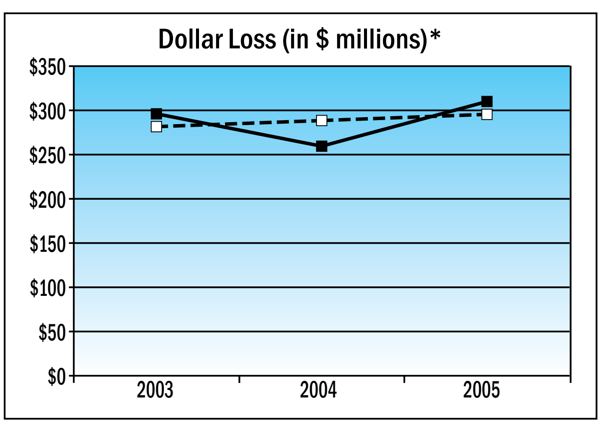
DEATHS

Year	Value
2003	140
2004	140
2005	160
3-Year Trend (%)	**14.6%**



INJURIES

Year	Value
2003	575
2004	600
2005	600
3-Year Trend (%)	**4.3%**



DOLLAR LOSS ($M)*
*ADJUSTED TO 2005 DOLLARS

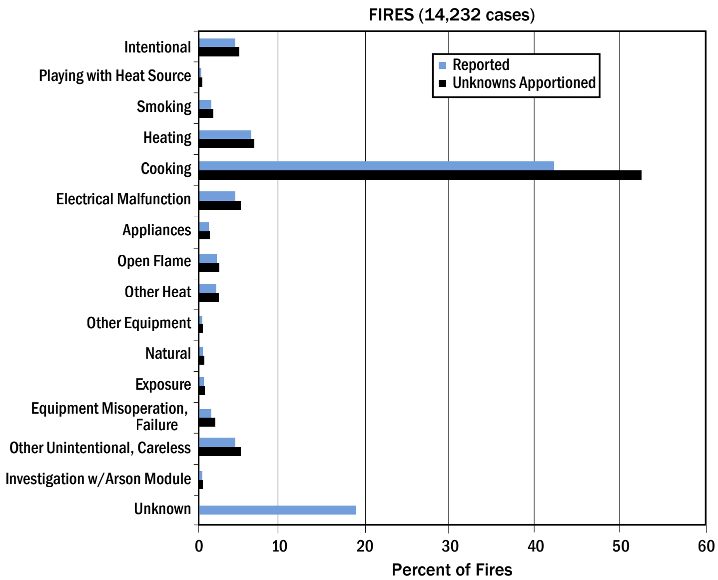
Year	Value
2003	$296.1
2004	$259.5
2005	$310.0
3-Year Trend (%)	**4.9%**

Sources: 2003-2005 NFIRS 5.0, NFPA, and Consumer Price Index.

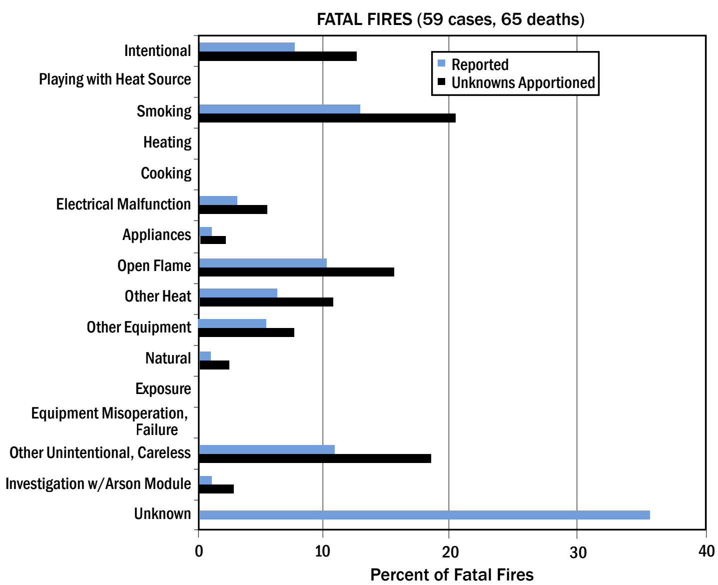
Causes

In 2005, cooking was the leading cause of fires, fires with injuries, and fires with dollar loss in other residential properties (Figure 41). Smoking was the leading cause of fatal fires and the second leading cause of fires with injuries. The cause of fatal fires was not reported in more than one-third of the cases. Because of the small numbers of reported fatal fires and fires with injuries, the cause distributions shown may not reflect the true cause distribution. In addition, conclusions drawn from these distributions may not be reliable. A multiyear aggregation of these fatal fires and fires with injuries, to increase the sample size, would be recommended in this case.

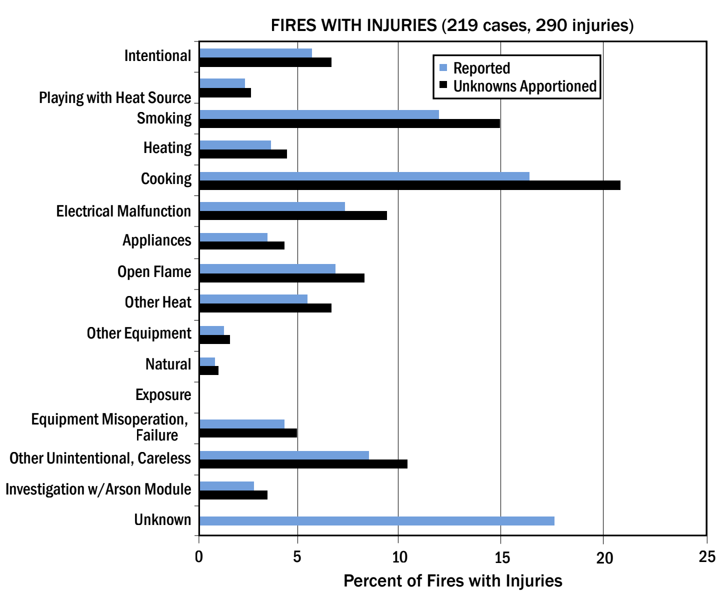
Figure 41. Fire Cause for Other Residential Building Fires and Fires with Losses (2005).



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	4.3	5.3
Playing with Heat Source	0.3	0.4
Smoking	2.2	2.8
Heating	7.0	8.7
Cooking	42.4	52.2
Electrical Malfunction	4.7	5.8
Appliances	1.7	2.1
Open Flame	3.5	4.3
Other Heat	3.4	4.2
Other Equipment	1.2	1.4
Natural	1.2	1.5
Exposure	1.3	1.6
Equipment Misoperation, Failure	2.6	3.2
Other Unintentional, Careless	4.7	5.8
Investigation w/Arson Module	0.7	0.8
Unknown	18.8	

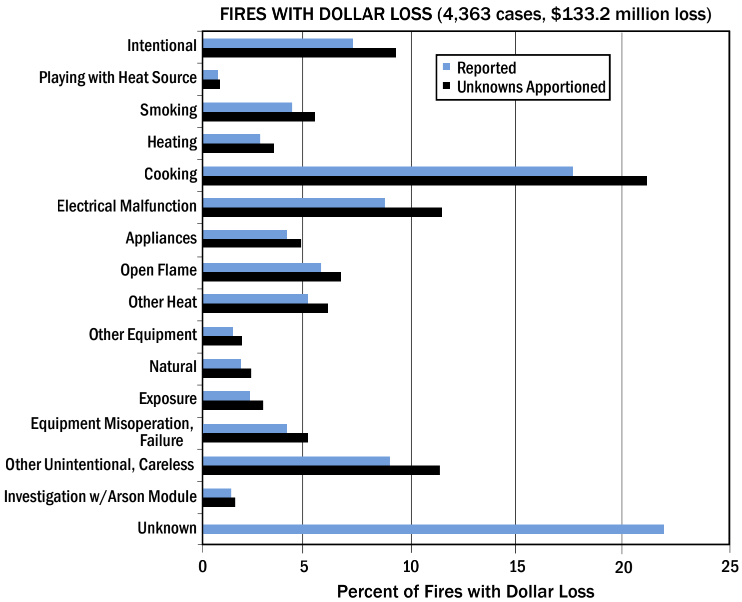


Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	8.5	13.2
Playing with Heat Source	0.0	0.0
Smoking	13.6	21.1
Heating	0.0	0.0
Cooking	0.0	0.0
Electrical Malfunction	3.4	5.3
Appliances	1.7	2.6
Open Flame	10.2	15.8
Other Heat	6.8	10.5
Other Equipment	5.1	7.9
Natural	1.7	2.6
Exposure	0.0	0.0
Equipment Misoperation, Failure	0.0	0.0
Other Unintentional, Careless	11.9	18.4
Investigation w/Arson Module	1.7	2.6
Unknown	35.6	



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	5.9	7.2
Playing with Heat Source	2.3	2.8
Smoking	12.3	15.0
Heating	3.7	4.4
Cooking	16.9	20.6
Electrical Malfunction	7.8	9.4
Appliances	3.2	3.9
Open Flame	6.8	8.3
Other Heat	5.5	6.7
Other Equipment	1.4	1.7
Natural	0.9	1.1
Exposure	0.0	0.0
Equipment Misoperation, Failure	4.1	5.0
Other Unintentional, Careless	8.7	10.6
Investigation w/Arson Module	2.7	3.3
Unknown	17.8	

Figure 41 (cont'd)



Cause	Reported (Percent)	Unknowns Apportioned (Percent)
Intentional	7.2	9.2
Playing with Heat Source	0.6	0.8
Smoking	4.6	5.9
Heating	3.0	3.8
Cooking	17.1	22.0
Electrical Malfunction	9.2	11.8
Appliances	3.9	5.0
Open Flame	6.0	7.7
Other Heat	5.3	6.8
Other Equipment	1.6	2.1
Natural	2.0	2.6
Exposure	2.9	3.7
Equipment Misoperation, Failure	4.4	5.6
Other Unintentional, Careless	8.7	11.2
Investigation w/Arson Module	1.4	1.7
Unknown	22.4	

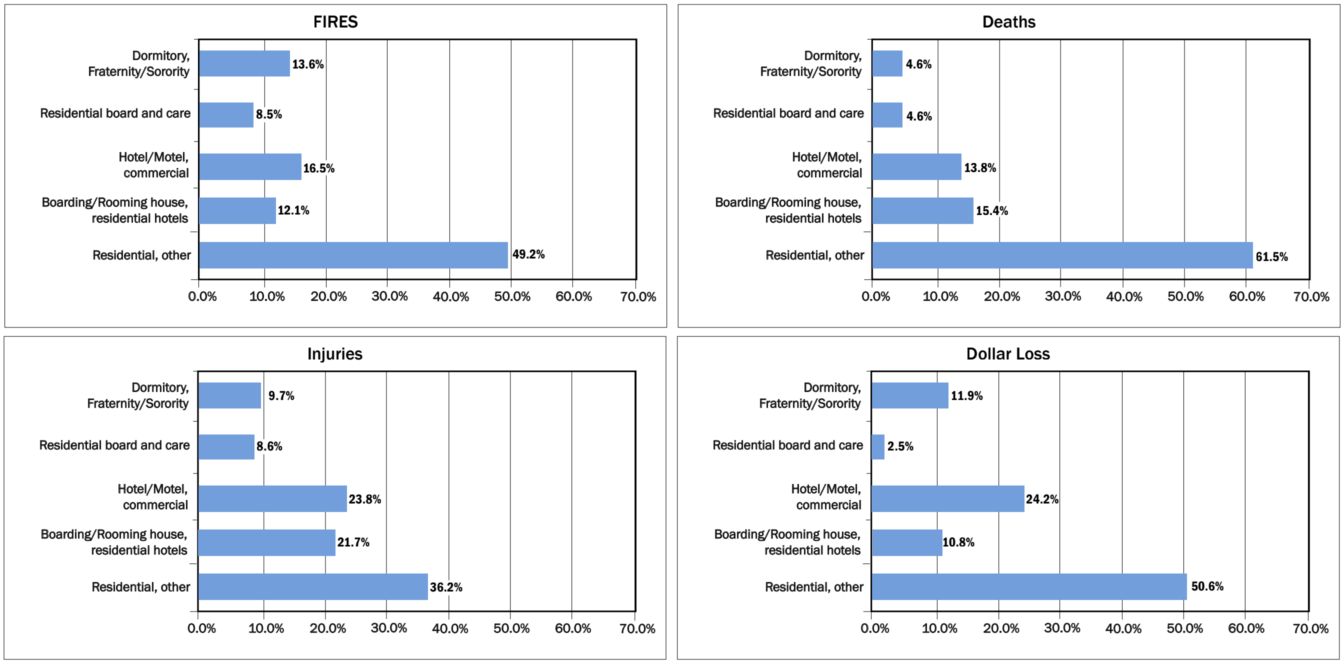
Source: 2005 NFIRS 5.0.

Types of Other Residential Buildings

Figure 42 shows that, in 2005, hotels and motels accounted for more fires, injuries, and dollar loss than other residential properties in this category, and was second to boarding/rooming houses for most deaths.[36]

[36] The "other" category tends to be a catchall category for any residential property that does not fit neatly into the main residential categories.

Figure 42. Types of Other Residential Building Fires and Fire Losses by Property Type (2005).



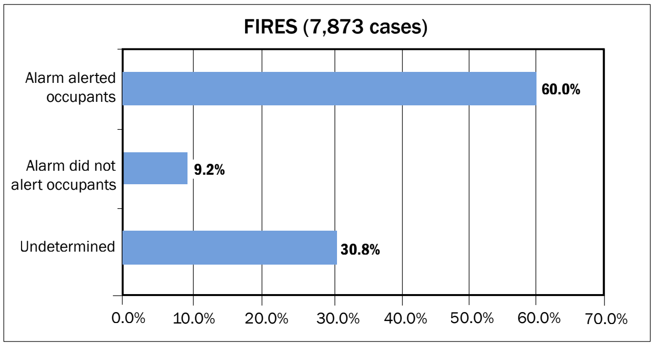
Source: 2005 NFIRS 5.0.

Smoke Alarm Performance

Smoke Alarm Effectiveness in Confined Fires. Smoke alarms were present and alerted occupants in 60 percent of confined other residential building fires; occupants were not alerted by a smoke alarm in only 9 percent of confined other residential building fires. The alert status was undetermined in 31 percent of confined other residential building fires (Figure 43). While this category is a catch-all, those included tend to be buildings such as dormitories that, like some of the multifamily properties, have strict fire codes.

There appears to be a pattern of an increasing proportion of alarms present and alerting occupants in these small, low-loss fires across the three major property types: from 31 percent in one- and two-family buildings to 44 percent in multifamily buildings to 60 percent in other residential buildings.

Figure 43. Smoke Alarm Alert Status in Confined Other Residential Building Fires (2005).



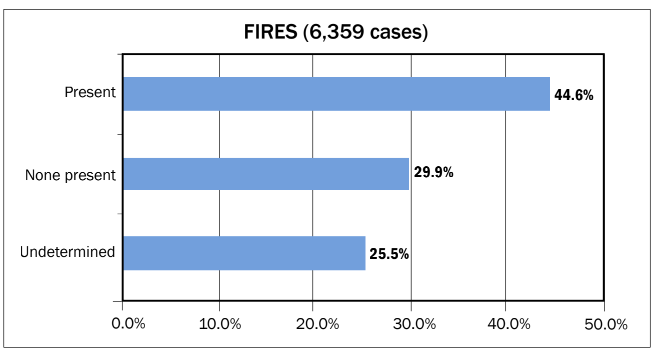
Source: 2005 NFIRS 5.0.

Notes: 1) The category "Alarm did not alert occupants" does not indicate the presence of a smoke alarm. It only indicates that the occupants were not alerted by an alarm, for whatever reason.

2) Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

Smoke Alarm Effectiveness in Nonconfined Fires. Smoke alarms must be present and must operate to determine effectiveness. Smoke alarms were present in 45 percent of nonconfined other residential building fires (Figure 44), and alarms were not present in 30 percent of these fires. The presence or absence of alarms was undetermined in 25 percent of nonconfined other residential building fires.

Figure 44. Presence of Smoke Alarms in Nonconfined Other Residential Building Fires (2005).

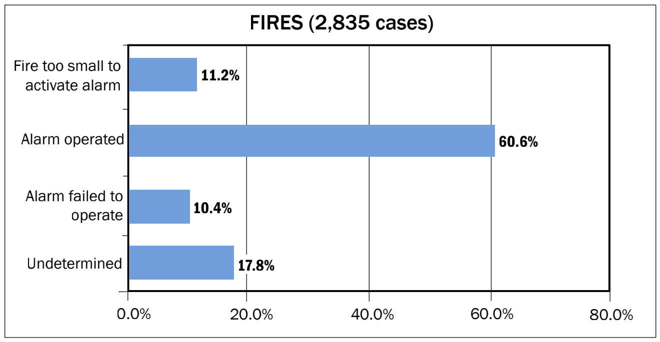


Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

When smoke alarms were present in nonconfined other residential building fires, alarms operated in 61 percent of incidents. Smoke alarms failed to operate in 10 percent of fires, the fire was too small to activate the system in another 11 percent of fires, and no information on smoke alarm operation was available in 18 percent of fires (Figure 45).[37]

Figure 45. Smoke Alarm Operation When Alarm was Present in Nonconfined Other Residential Building Fires (2005).



Source: 2005 NFIRS 5.0.

Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

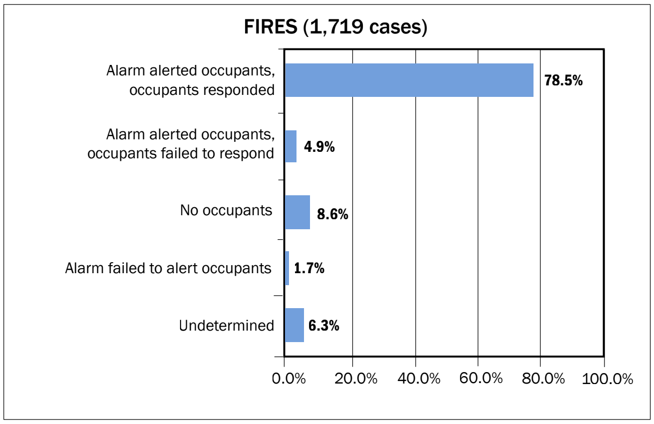
The effectiveness of working smoke alarms in nonconfined other residential building fires is shown in Figure 46. In 83 percent of the nonconfined other residential building fires where alarms were present and operated, occupants were alerted to the fire by the smoke alarm: 79 percent of occupants were alerted and were able to respond to the warning, and an additional 5 percent were alerted but did not respond to the warning.[38] Occupants were not alerted in 2 percent of nonconfined other residential building fires, and no occupants were in the residence at the time of the fire in 9 percent of these incidents. Alarm alert effectiveness information was not available in only 6 percent of nonconfined other residential building fires.[39]

[37] Looking at the percentage of operational smoke alarms from another perspective, at a minimum, smoke alarms were known to be present and operated in 27 percent of all nonconfined other residential building fires (present 44.6% x operated 60.6% = 27.0%).

[38] Percentages do not add due to rounding.

[39] At a minimum, smoke alarms were effective at alerting occupants in 23 percent of all nonconfined other residential building fires (present 44.6% x operated 60.6% x alerted occupants 83.4% = 22.6%).

Figure 46. Smoke Alarm Effectiveness When Alarm was Operational in Nonconfined Other Residential Building Fires (2005).



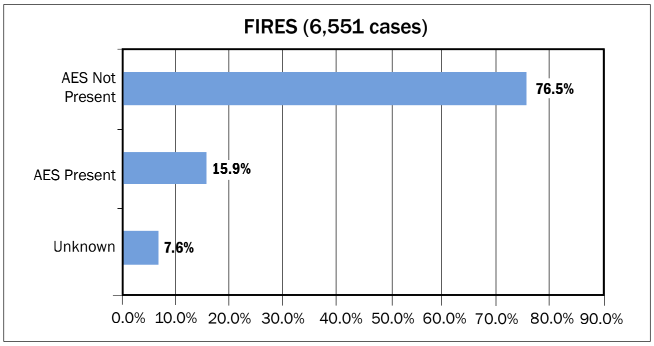
Source: 2005 NFIRS 5.0.

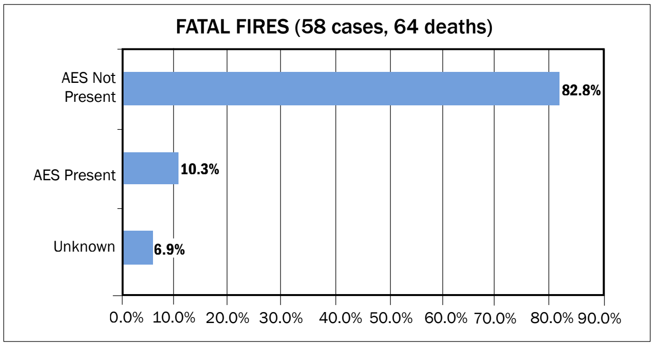
Note: Raw NFIRS 5.0 counts for smoke alarm data are contained in the Appendix.

Presence of Automatic Extinguishing Systems

Figure 47 shows the presence of AESs in other residential buildings in 2005. Sixteen percent of other residential building fire incidents have AESs present.

Figure 47. Presence of Automatic Extinguishing Systems in Other Residential Buildings (2005).





Source: 2005 NFIRS 5.0.

Note: Percentages reflect only those incidents with structure types 1 (enclosed building) or 2 (fixed portable or mobile structures).

APPENDIX

Smoke Alarm Data

RESIDENTIAL BUILDINGS

Nonconfined Fires

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count
Present	Fire too small to activate smoke alarm		6,295
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	20,649
		Smoke alarm alerted occupants, occupants failed to respond	854
		No occupants	3,874
		Smoke alarm failed to alert occupants	733
		Undetermined	2,512
		Null or blank	1
	Smoke alarm failed to operate		7,504
	Undetermined		9,798
None present			34,517
Undetermined			33,572
Null or blank			29
Total incidents			120,338

Source: 2005 NFIRS 5.0.

Confined Fires

Smoke Alarm Effectiveness	Count
Smoke alarm alerted occupants	40,668
Smoke alarm did not alert occupants	18,983
Unknown	46,487
Null or blank	1
Total incidents	106,139

Source: 2005 NFIRS 5.0.

ONE- AND TWO-FAMILY BUILDINGS

Nonconfined Fires

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count
Present	Fire too small to activate smoke alarm		4,510
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	13,680
		Smoke alarm alerted occupants, occupants failed to respond	445
		No occupants	2,876
		Smoke alarm failed to alert occupants	542
		Undetermined	1,822
		Null or blank	1
	Smoke alarm failed to operate		5,379
	Undetermined		6,928
None present			27,234
Undetermined			28,249
Null or blank			22
Total incidents			91,688

Source: 2005 NFIRS 5.0.

Confined Fires

Smoke Alarm Effectiveness	Count
Smoke alarm alerted occupants	17,424
Smoke alarm did not alert occupants	11,874
Unknown	26,922
Null or blank	1
Total incidents	56,221

Source: 2005 NFIRS 5.0.

MULTIFAMILY BUILDINGS

Nonconfined Fires

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count
Present	Fire too small to activate smoke alarm		1,468
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	5,619
		Smoke alarm alerted occupants, occupants failed to respond	325
		No occupants	851
		Smoke alarm failed to alert occupants	162
		Undetermined	581
	Smoke alarm failed to operate		1,831
	Undetermined		2,365
None present			5,380
Undetermined			3,706
Null or blank			3
Total incidents			22,291

Source: 2005 NFIRS 5.0.

Confined Fires

Smoke Alarm Effectiveness	Count
Smoke alarm alerted occupants	18,522
Smoke alarm did not alert occupants	6,382
Unknown	17,141
Total incidents	42,045

Source: 2005 NFIRS 5.0.

OTHER RESIDENTIAL BUILDINGS

Nonconfined Fires

Presence of Smoke Alarms	Smoke Alarm Operational Status	Smoke Alarm Effectiveness	Count
Present	Fire too small to activate smoke alarm		317
	Smoke alarm operated	Smoke alarm alerted occupants, occupants responded	1,350
		Smoke alarm alerted occupants, occupants failed to respond	84
		No occupants	147
		Smoke alarm failed to alert occupants	29
		Undetermined	109
	Smoke alarm failed to operate		294
	Undetermined		505
None present			1,903
Undetermined			1,617
Null or blank			4
Total incidents			6,359

Source: 2005 NFIRS 5.0.

Confined Fires

Smoke Alarm Effectiveness	Count
Smoke alarm alerted occupants	4,722
Smoke alarm did not alert occupants	727
Unknown	2,424
Total incidents	7,873

Source: 2005 NFIRS 5.0.