FIRE IN THE UNITED STATES

Deaths, Injuries, Dollar Loss, and Incidents at the National, State, and Local Levels

U.S. Department of Commerce
U.S. Fire Administration
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December 1978

Highlights of the Report

Fire is one of our Nation's major problems. Each year it causes thousands of deaths, hundreds of thousands of injuries, and billions of dollars of property loss. It causes more loss of life and property than all natural disasters combined. In the home it is the second most frequent cause of accidental death. If a "catastrophe" is defined as an event that causes five or more deaths at one time, fire is the catastrophe that occurs most frequently in this country.

If we are to reduce fire losses as much as we can as a Nation, fire departments across the country, Federal and State governments, and others active in the fire protection field need to more clearly identify their fire problems and continually evaluate their priorities for action, priorities that compete for staff time and funds. They need to identify what works and what does not work, and to target programs more accurately. To do these tasks well, they need more detailed, more reliable information than has been available to date.

Objectives of This Report

This report is intended to provide part of the information that is needed for the above purposes. As a by-product, it illustrates ways that State and local governments might analyze their own fire problems. It is the first in what is planned to be an annual series.

The report describes the magnitude of the national fire problem in terms of numbers of fires, deaths, injuries, and dollars lost. It also describes specific characteristics of the fire problem, such as who are the victims and what are the causes of fires in various types of property. Although some suggestions for reducing the fire problem are included, the reader is encouraged to formulate his own.

Better Fire Data Needed

Before discussing findings, we must emphasize that the fire data currently available leave much to be desired in completeness, accuracy, and comparability—especially for rural sections of the United States. This report is uneven in detail on different aspects of the fire problem largely due to deficiencies in the available data when we began our analysis. The most detailed data on fire causes were available for a full year only for two States—California and Ohio. A few other States had detailed data, but not in a form that was easily comparable. The limited State data available this year were supplemented by data from seven cities (in other States) with compatible data systems.

In spite of the shortcomings, however, we think that the available data accurately characterize some major aspects of the U.S. fire problem. Sources drawn upon for this report included the following: National Fire Protection Association (NFPA); Center for Health Statistics of the U.S. Department of Health, Education and Welfare (HEW); insurance industry; National Fire Incident Reporting System (NFIRS) of the National Fire Prevention and Control Administration (NFPCA); National Household Fire Survey; and State Fire Marshals' reports.

Improved fire data is likely in the near future. More and more State and local governments are upgrading their fire data collection programs. Participation in the National Fire Incident Reporting System is growing. And more attention is being paid to fire data at all levels of government. But there is clearly still a long way to go.

Some of the key findings in this report are summarized below. Except where otherwise noted, all the findings are based on information about fires that were attended by the fire service. References in parentheses below indicate where each finding is given in the report.

National Estimates Show Severe U.S. Fire Problem

In the mid-70's the Nation's annual fire experience was approximately as follows:

FIRES	2,600,000	Reported to Fire Service
	30,000,000	Not Reported to Fire Service
	32,600,000	Total
DEATHS	7,500	
INJURIES	110,000	Reported to Fire Service
	200,000	Not Reported to Fire Service
	310,000	Total
DOLLAR LOSS ..	$ 4.2+	Billion Direct Property
	$ 9.4+	Billion Other Costs
	$13.6+	Billion Total
	See Part I Section II for data interpretation notes.	

When these U.S. statistics are compared with those from other industrialized countries, our fire incidents, casualties, and dollar loss *per capita* are found to be among the highest in the world. U.S. casualties and losses *per fire*, however, are slightly below average compared to other countries. These results support the increasing belief that in order to make a major dent in the national problem we need to emphasize better fire prevention. (Part 1, Table 8)

Estimates for the above U.S. statistics differ widely from source to source, sometimes by 50-100 percent. This variation is a result of different methods and assumptions used in collecting and analyzing the data. (Examples of the variation for each estimate are given in Part I, Table 2.)

Fire Deaths Are Highest in the Home

- Residential fires are the main killer and should receive high priority in prevention programs if we are to reduce fire deaths significantly. We think that the use of smoke detectors, coupled with escape plans, is one of the promising ways to reduce this toll.

- Roughly two-thirds of fire deaths occur in residences, mostly in ones and twos in the victims' own homes. However, the less than 4 percent of fire deaths that occur in multiples of five or more draw the most attention. As a result, the residential fire danger probably is underestimated by the public.

- Only a small fraction of deaths (for example, 7 percent in California and Ohio) are in commercial or institutional places such as nightclubs, schools, jails, offices, or nursing homes. We should not, of course, permit these statistics to let us get complacent about the threat of fire in public buildings lest we invite more frequent catastrophes such as the 1977 Southgate, Ky., nightclub fire. (Part I, Tables 13 and 18)

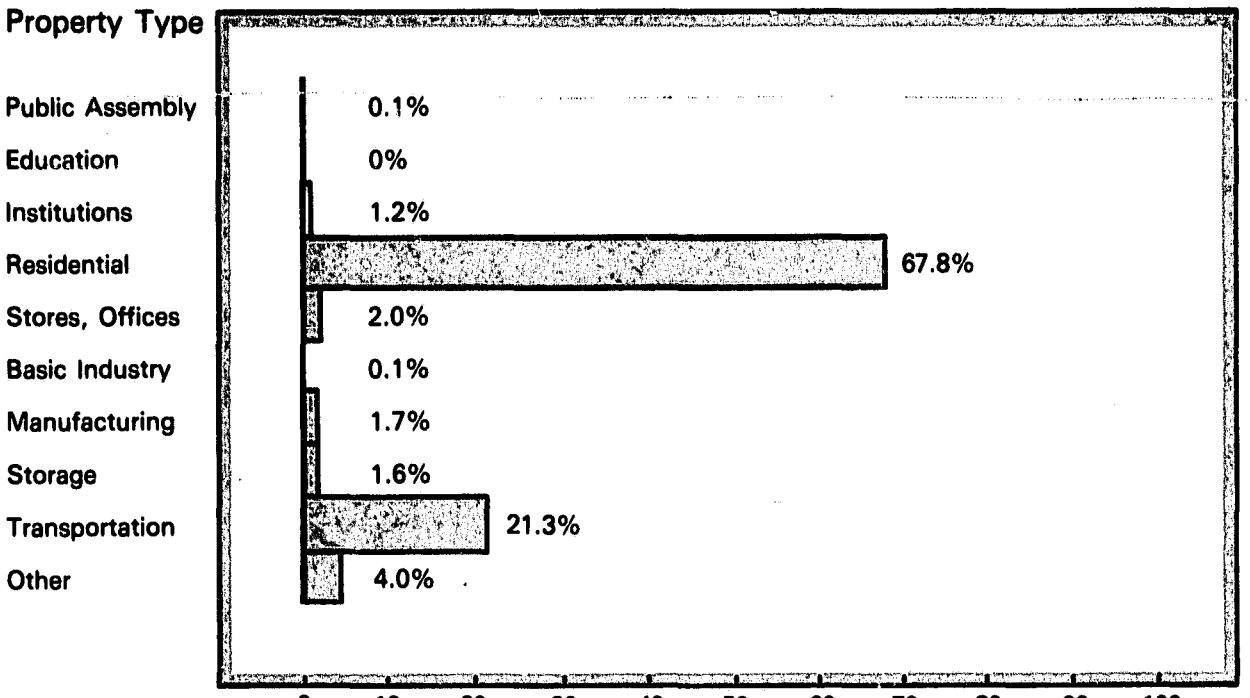
Who Dies

- Among civilians (that is, anyone not a firefighter), males (especially nonwhite males), the very old, and the very young are high risk groups that fire prevention should focus on. While the problem of high fire death rates among the elderly, children, and nonwhites has long been known, the predominance of males as victims has not. This problem deserves more attention in prevention programs than it has received.

- Nationwide, males outnumber females almost two to one as fire death victims. Nonwhite males have more than twice the fire death rate of white males and almost twice that of nonwhite females. And nonwhite females have almost three times the rate of white females. (Part I, Figure 2)

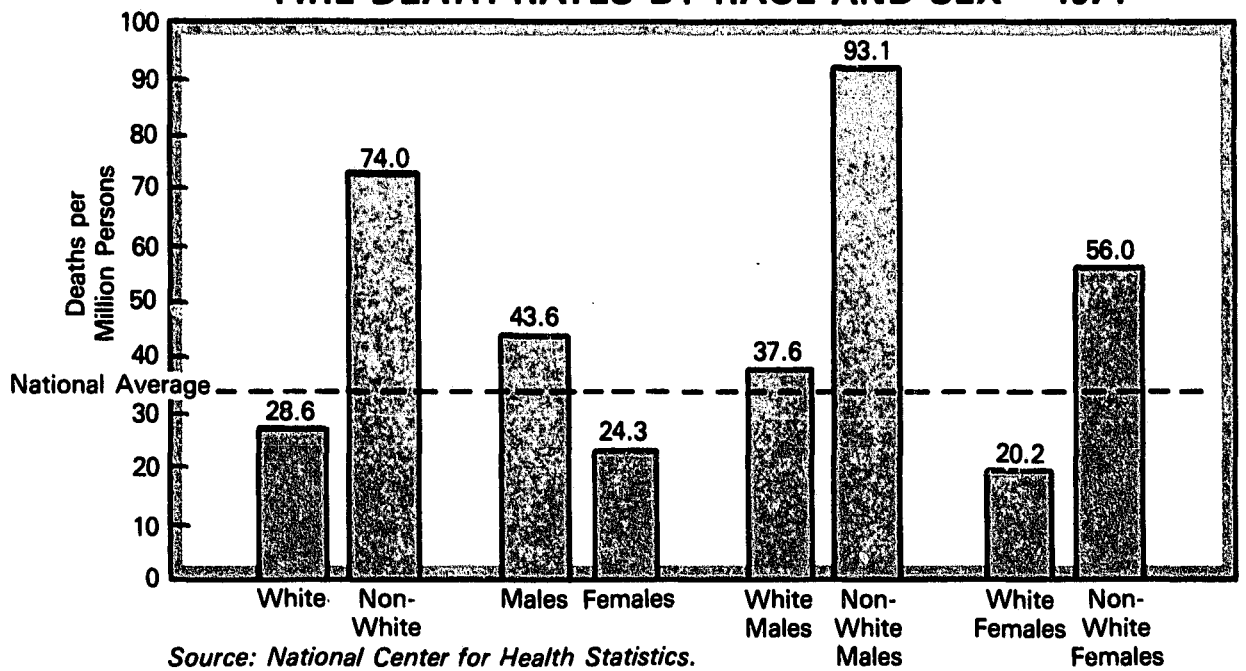
- Firefighters have the Nation's most hazardous profession in terms of death rates. Not surprisingly, they also have the highest fire death rate for any group in our society—it is over 25 times that of civilians. Firefighter on-duty deaths are most often (45 percent) caused by heart attacks and other cardiovascular problems, which suggests the potential importance of improving fire service physical fitness programs. (Part I, Table 5 and Section IV)

WHERE FIRE DEATHS OCCUR



Source: California (CFIRS 1975), Ohio (NFIRS 1976).

FIRE DEATH RATES BY RACE AND SEX – 1974

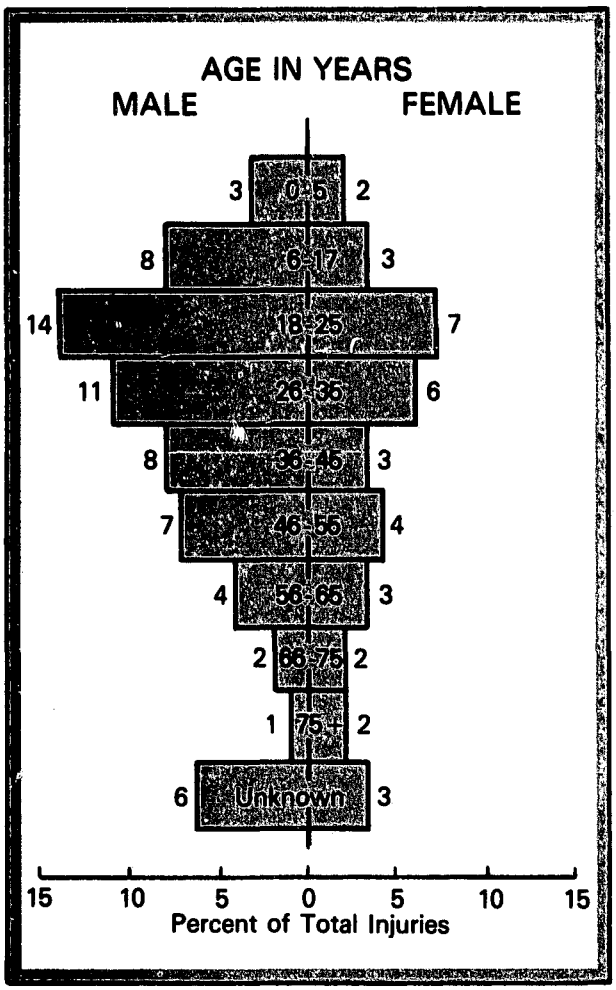


Source: National Center for Health Statistics.

Who Gets Hurt

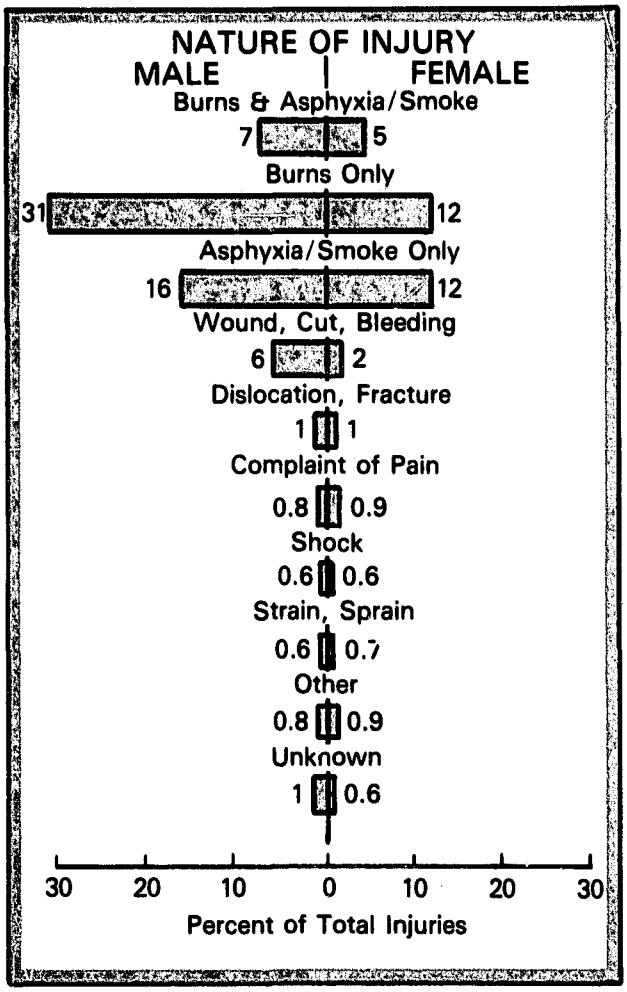
- Unlike deaths, the risk of fire injury is highest for those in the 18-35 age group, and not the very young and very old. This may be due to a greater number of exposures to danger for people in their most active years, but an increased ability to escape with minor injuries when exposed. (Part I, Table 28)
- For civilians in Ohio, the only State for which we have injury data by sex, about the same two-for-one male-female ratio is true for injuries as for deaths. Male injury victims outnumber female victims not only overall, but also for every age group under 65. (Part I, Figures 2, 12; Part II, Table 27)
- Civilian fire injuries are largely due to burns or "smoke" inhalation or both (83 percent in Ohio). As was noted for civilian deaths, smoke detectors offer good potential for reducing these injuries. Further research is needed on the relative frequency with which the various components of "smoke" caused either death or injury as a guide to both prevention and medical care. (Part I, Table 12; Part II, Table 32)
- Firefighter injuries also require more attention in research and prevention than they have

CIVILIAN NON-FATAL INJURIES BY AGE AND SEX



Source: Ohio (NFIRS 1976).

CIVILIAN NON-FATAL INJURIES BY NATURE OF INJURY



Source: Ohio (NFIRS 1976).

received if we are to reduce the Nation's fire injuries significantly. Firefighters incur over half of the injuries sustained at fires they attend. This nationwide estimate is supported by the detailed analysis of data from Ohio (56 percent) and in seven cities elsewhere (54 percent). (Part I, Table 5; Part II, Table 32)

- Firefighters need an across-the-board improvement in their protective clothing. They need to make greater use of breathing apparatus. They need to achieve and maintain a higher level of physical fitness. And they need better fire safety training. "Smoke" (often carbon monoxide) inhalation seems to be the most common type of firefighter injury. In Ohio, for example, smoke inhalation accounted for 25 percent of incident-related injuries to firefighters, followed by strains and sprains (17 percent), cuts or wounds (17 percent), and burns (11 percent). (Smoke and burns combined were another 4 percent.) Firefighter injuries other than smoke inhalation were distributed roughly evenly over the body. (Part I, Table 5; Part II, Tables 29, 31, 32)

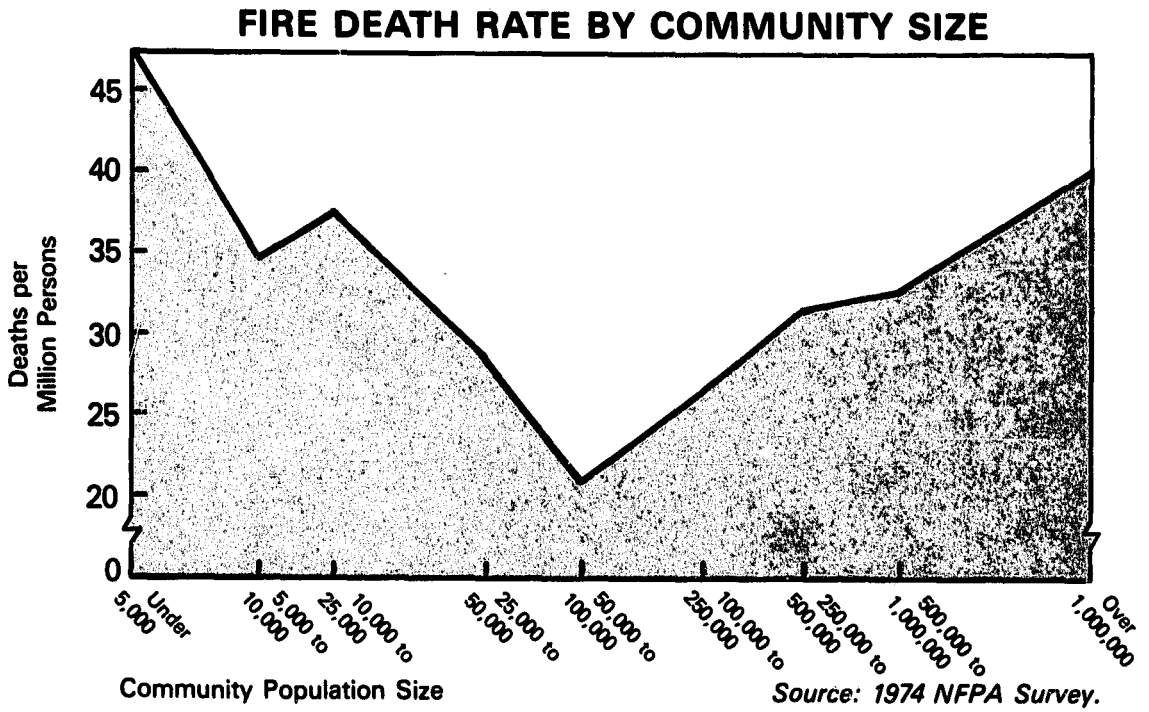
It should be noted that the injury data—both for civilians and firefighters—are of much more questionable accuracy than fire death data. The major uncertainty probably is the degree of under-reporting (though in some cases, over-reporting) of minor injuries.

The Problem Varies by Location

- Overall, the fire death problem seems more severe both in large cities and in rural communities than in mid-sized communities. Fire death rates plotted versus population size have a U-shaped pattern, with a low in medium-sized cities (50-100,000 population) and highs in cities of over a million population at one extreme and in small towns and areas of under 5,000 population at the other, according to NFPA 1974 survey data. Supplemental data gathered from cities over one million population indicate that the big city fire death rate may be even higher than shown in the figure, perhaps exceeding 50 deaths per million on the average. (Part I, Figure 4)

Patterns for fire incidents, injuries, and dollar loss are more complex and less reliable than for deaths, and are not easily summarized. (See Part I, Figures 4 and 14 for the patterns.)

- Statewide fire death rates are highest in Alaska and Maine and the belt of Southern States from Oklahoma, Arkansas, and Louisiana through Tennessee, Mississippi, Alabama, Georgia, and the Carolinas (over 42 deaths per million in



each State). The fire death problem in these States is serious during the period considered. However, in any given year, a State just by laws of chance may have a high fire death rate.

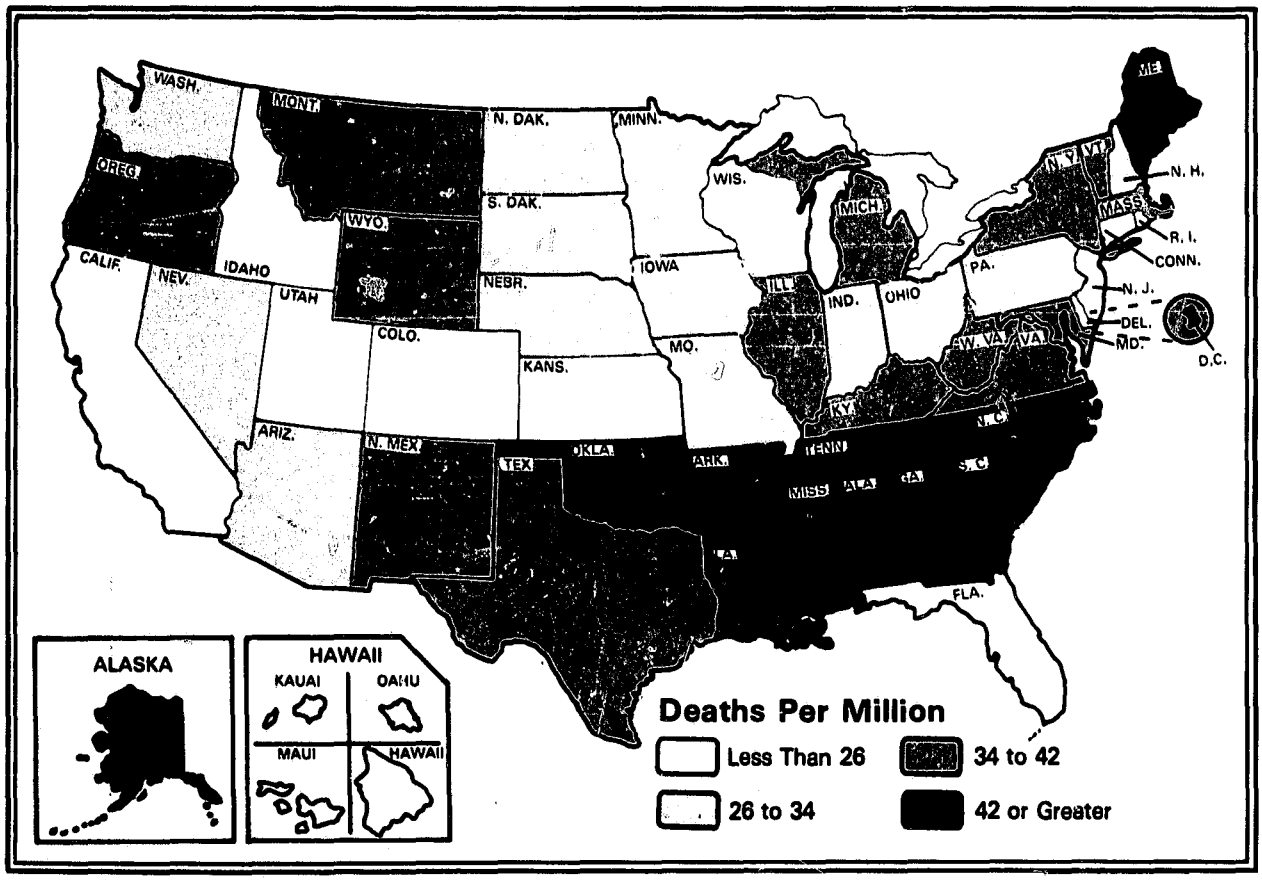
- State and local governments should analyze their own fire problems and not rely on analyses from others. National trends and regional similarities exist, but there are also striking differences from place to place. To cite one example for residential fires, some of the six Ohio cities with over 200,000 population had smoking-related fires far outnumbering cooking-related fires, some had the reverse, and some had both about the same. In some of these cities arson outnumbered both cooking and smoking as a cause of residential fires; in others arson was lower than both. While some of the variation might be due to differences in reporting procedures, some of it is probably real. Each community should try to identify its own priorities and to learn why it differs from others. (Part II, Table 48)

Deaths Trend Downward, Dollar Loss Upward

- The annual U.S. fire death rate has declined slightly during the last 20 years, though it is still among the highest in the world. We did not find adequate data for assessing trends in injuries. (Part I, Figure 10)

- Direct dollar loss from fire, adjusted for inflation, has about doubled over the last 20 years. Per capita dollar loss, also adjusted for inflation,

STATE FIRE DEATH RATES — DEATHS PER MILLION POPULATION (AVERAGE 1974-75)



Source: State Fire Marshals and National Center for Health Statistics.

has increased by about 40 percent over this same period. But, overall, losses have remained a fairly constant percentage of the Gross National Product. (Part I, Figures 7, 8, and 9)

Eight Cause Categories Predominate

For the two States examined in detail–Ohio and California—and seven additional cities with comparable data systems, the leading causes of fire are described below. These data may or may not be representative of the entire United States; they collectively represent about 15 percent of the U.S. population, but are not a random sample. In general, the cause pattern was quite similar in the two States and the seven cities.

In the two States combined, **residential fires** are only 22 percent of all fires attended by the fire service; but they account for 68 percent of deaths, 57 percent of injuries, and 43 percent of dollar loss. (Part I, Table 13)

- The eight major "known" cause categories of residential fires in the two States combined are, in order of frequency: cooking (18 percent), smoking (13), heating (13), incendiary or suspicious (11), electrical distribution (7), appliances (7), children playing (5), and carelessness with open flames or sparks (5). These general "cause" categories are shorthand for groups of more complex causes. The percentages shown in parentheses are of all fires attended by the fire service, not just "known cause" fires. The actual percentages thus may be somewhat higher, depending on the true causes of the 10 percent of fires listed as "unknown." (Part I, Figure 13)

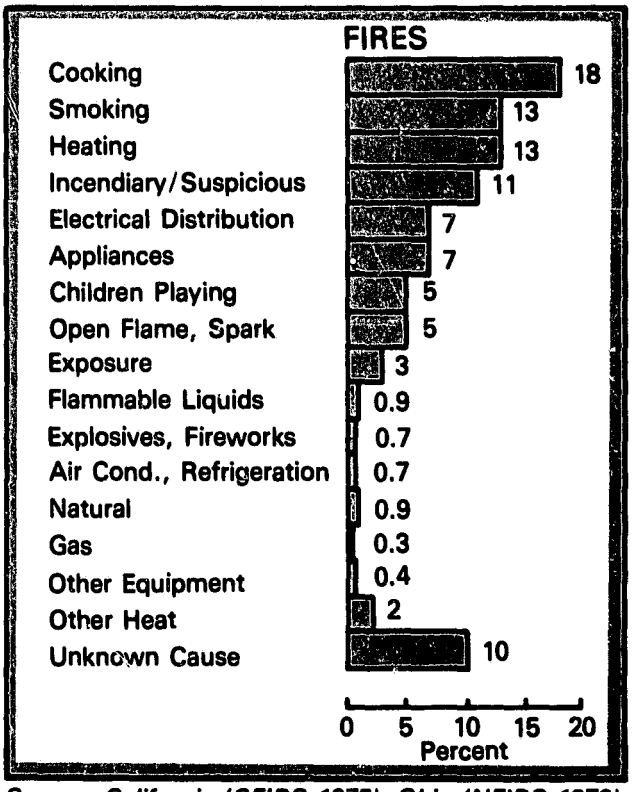
- Among cooking fires, cooking left unattended (for example, while talking with neighbors or watching TV) was the most common problem. For smoking-related fires, dropped, thrown, or abandoned cigarettes were the most common problems. For heating-related fires, there appear to be sharp regional differences in the nature of the problem: Failures of central heating systems and construction of deficiencies in fireplaces lead a wide variety of mechanical and operational problems in Ohio; "combustibles stored too close" to fixed room heating equipment and water heaters, and, surprisingly, "misuse" of fireplaces are among the leading heating-related problems in California. (Part II, Tables 38, 35, and 40)

- The most frequently reported cause of residential *deaths* (29 percent) and *injuries* (18 percent) in the two States is smoking, mostly cigarettes igniting bedding, mattresses, or upholstered furniture.

The second most frequent cause of residential fire deaths and injuries in the two States, surprisingly, is cooking fires (9 percent of deaths, 13 percent of injuries). Although most people probably think of cooking fires as minor, they occur frequently; and the small fraction of them that are not minor cause a large number of casualties.

Heating-related fires (8 percent of deaths, 12 percent of injuries) and incendiary/suspicious fires (6 percent of deaths, 12 percent of injuries) are close behind cooking as third and fourth causes of casualties.

CAUSES OF RESIDENTIAL FIRES

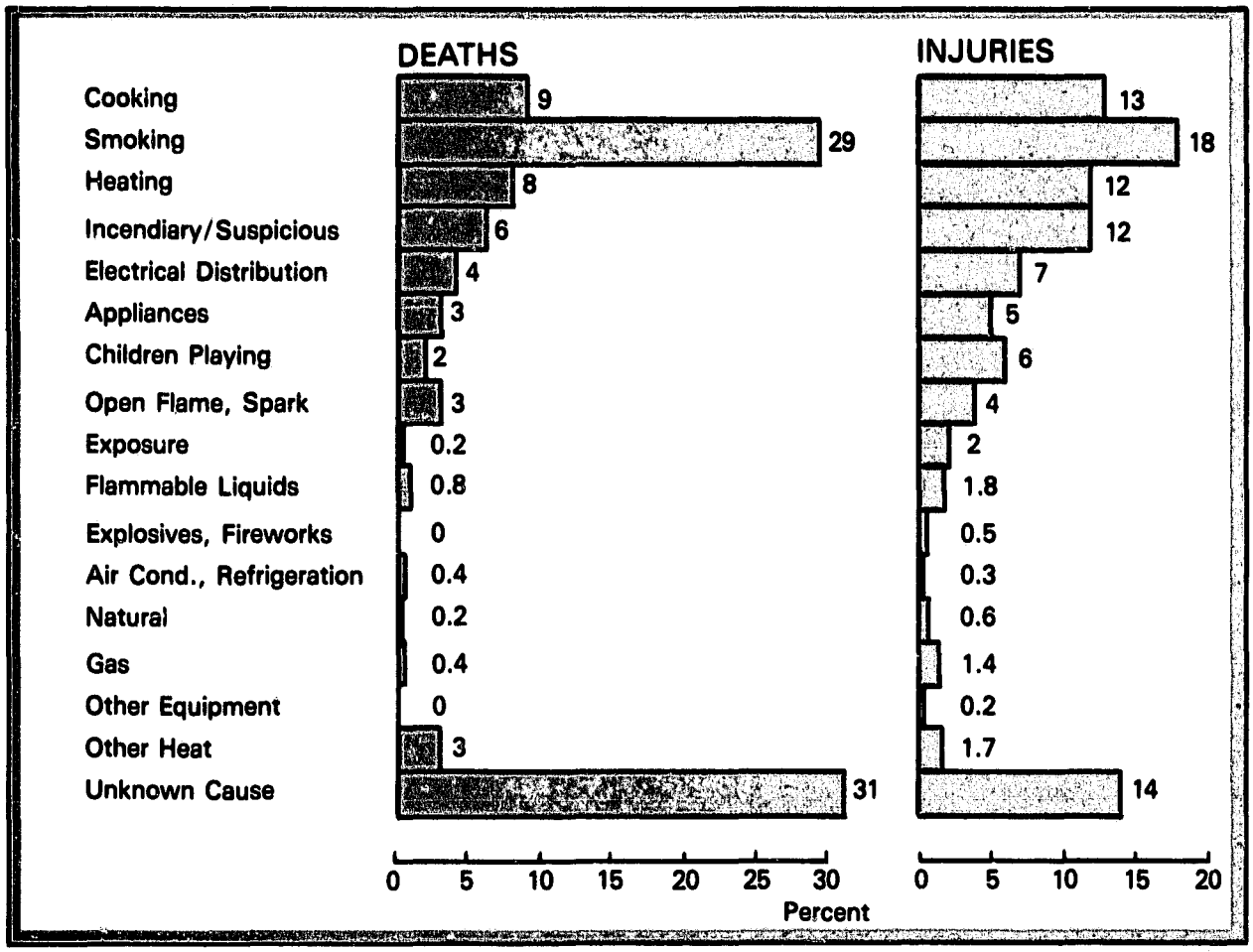


Source: California (CFIRS 1975), Ohio (NFIRS 1976).

Again, percentages here are of total fire deaths, not just those with a known cause. Actual percentages may be considerably higher depending on the true nature of the "unknown cause" deaths—an enormous 31 percent in these two States. (Part I, Figures 13; Part II, Table 33)

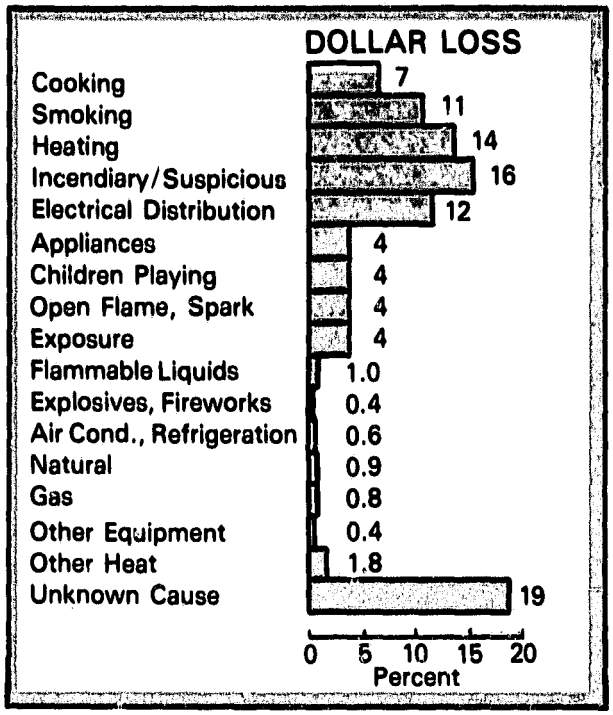
- The known cause accounting for the most *dollar loss* is incendiary/suspicious fires (16 percent). Next highest is heating-related fires (14 percent). (Part I, Figure 13)
- Better fire investigation and reporting practices are needed to reduce the number of fires with cause listed as "unknown." There always will be some fires for which the cause will be unknown, but the fraction today seems excessive. "Unknown" is the leading cause category in the two States for deaths (31 percent) and dollar loss (19 percent), second for injuries (14 percent), and fifth for the number of fires (10 percent). Although the known causes discussed above clearly are important ones, their rank ordering could change significantly depending on what the "unknown" causes actually are. (Part I, Figure 13)

CAUSES OF RESIDENTIAL FIRE CASUALTIES



Source: California (CFIRS 1975), Ohio (NFIRS 1976).

CAUSES OF RESIDENTIAL FIRE DOLLAR LOSS



Source: California (CFIRS 1975), Ohio (NFIRS 1976).

Non-residential building fires in the two States account for only 10 percent of all fires, 7 percent of deaths, 26 percent of injuries, but for 43 percent of dollar losses—tied with residential dollar loss (Part I, Table 13). Non-residential buildings cover an enormous range of structures and uses and probably should not be viewed as a single category. Principal causes vary considerably for different types of non-residential buildings, and prevention efforts should be tailored to the leading causes in each.

- Overall, incendiary and suspicious fires are the number one problem for non-residential buildings. They account for 20 percent to 25 percent of non-residential building fires, deaths, injuries, and dollar loss. "Unknown" is the second most frequent cause reported (13 percent). The next most frequent cause categories are electrical distribution fires (11 percent), carelessness involving open flames or sparks (8 percent), and smoking related fires (8 percent). As with residential, the unknowns could change the rank orderings. (Part I, Table 18)

- For each category of non-residential occupancies, in the two States, the leading causes are shown below. More than one cause is listed when one alone did not dominate:

Public Assembly	Cooking (mainly restaurants) Incendiary/Suspicious
Education	Smoking Incendiary/Suspicious in public day schools
Institutions	Smoking Incendiary/Suspicious
Stores, Offices	Incendiary/Suspicious Electrical Distribution
Basic Industry	Electrical Distribution (mostly from fires in the energy distribution industry)
Manufacturing	Many assorted causes
Storage	Incendiary/Suspicious
Vacant, Construction	Incendiary/Suspicious

(Part I, Table 18; Part II, Section XI)

Unreported Fires Should Not Be Disregarded

Fires not reported to the fire service cannot be assumed to be trivial. About 9 out of 10 fires in households are not reported to fire departments, according to the 1974 National Household Fire Survey of 33,000 households. Most of these unreported fires involve cooking and are very small. However, the survey showed that almost half of the fires causing injuries severe enough to result in time lost from work were not reported to the fire service. And over half of the fires with more than a $200 loss were not reported. Another survey in a year or two is needed to see if these results will still apply. (Part I, Section IV)

Findings Should Be Used to Reduce Losses

Knowledge of the most common causes of fires can be used in setting prevention priorities. The priority to be assigned to any particular cause is not necessarily its frequency rank, however.

Sometimes a greater reduction in fire loss can be achieved per dollar or man-year spent on preventing a lower ranking cause than a higher one, because of the difficulty in making progress on the higher one. And sometimes a group of citizens may have a disproportionately high casualty rate due to a cause that is not one of the most frequent ones community-wide. Priority setting must consider these productivity and equity issues as well as frequency of occurrence.

To reduce fire losses further, fire protection leaders, prevention officers, researchers, code makers, and others concerned with the Nation's fire problem can now make use of the improved information they called for. Making sure that fire prevention efforts are targeted accurately in each community is perhaps the most important "next step." When this is done, it will show the thousands of firefighters who are bearing the brunt of data collection that their efforts are paying off.

Acknowledgments

Several thousand local fire departments and tens of thousands of firefighters collected the raw data that were used in this report. Their efforts are greatly appreciated.

Special thanks for providing data go to the State governments of California and Ohio; to the local governments of Denver, Colo.; Jacksonville Fla.; Kansas City, Mo.; Madison, Wis.; Syracuse and New York, N.Y.; Tucson, Ariz.; Wichita, Kans.; Detroit, Mich.; Philadelphia, Pa.; Los Angeles City, Calif.; to the National Fire Protection Association (NFPA), Boston, Mass.; and to the Insurance Information Institute, New York, N.Y. We also would like to acknowledge NFPA's assistance in undertaking new analyses of their 1974 survey data for us.

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Introduction

"Data Can Save Lives" . . . unfortunately, the opposite is also true—data can kill. Critical decisions affecting fire and life safety are being made every day. These decisions are being based on what are believed to be "the facts" . . . and those "facts" are the result of conclusions drawn from the data YOU ARE—or are not—REPORTING . . . ACCURATELY. Think about it.

PHILIP C. FAVRO
California State Fire Marshal[1]

Fire is one of our major and often under-recognized national problems. U.S. fire losses and casualties are high, both in absolute numbers and relative to other nations. Developing effective ways to reduce the problem requires better understanding of its dimensions and characteristics. In an age when fire protection agencies cannot obtain resources adequate to do everything well, we must have the best possible information to target available resources as efficiently as possible. As the quote above implies, not having adequate data can result in avoidable deaths and injuries due to mistargeted programs.

Background

This report has been written in partial fulfillment of the requirements set forth in Section 9 of the National Fire Prevention and Control Act, Public Law 93-498. According to Section 9, the National Fire Data Center was established specifically to provide an accurate, nationwide analysis of the fire problem, identify major problem areas, assist in setting priorities, determine possible solutions to problems, and monitor the effectiveness of programs to reduce fire losses. This report is the National Fire Data Center's initial effort to address the above requirements. It is the first of an annual series of reports by the Data Center designed to provide a comprehensive, continuing description of the fire problem in the United States.

To assure that key data about each fire are collected in a similar way from place to place and to help assure that the data get used for fire protection at local, State, and national levels, the Fire Administration established the National Fire Incident Reporting System (NFIRS).

NFIRS uses standard terminology and reporting forms developed by the Committee on Fire Reporting of the National Fire Protection Association.[2] One reporting form is filled out for each fire incident and another for each casualty. These reports provide information on frequency, causes, spread, and extinguishment of fires; number, nature, and causes of casualties; amount of direct property losses; and other relevant factors. Data on incidents other than fires also may be collected at the discretion of State and local fire authorities.

NFIRS depends on the voluntary cooperation of State and local governments. Local communities collect the data and send them to their State. The State processes the data and sends feedback reports to the local communities. State and local governments can use the data to guide fire prevention efforts and to answer a variety

[1] Favro, Philip C., "Introduction: Some Observations and Conclusions," in *Summary and Analysis—California Fire Incident Reporting System 1976* (Sacramento, CA: California State Fire Marshal, 1977), p. 3.

[2] The committee includes representatives from the fire service, industry, and Government agencies.

of questions about their fire problem and fire protection programs. Every three months the State sends a data tape to the National Fire Data Center in Washington, D.C. The Center analyzes the data from all participating States along with data from other sources to produce annual reports as well as various special studies.

By the end of 1977, 19 States were involved in various stages of developing the system; five—Ohio, California, Maryland, New York, and Missouri—were reporting data on a regular basis to the National Fire Data Center. Data from two of these States—Ohio and California—have been reported for over a year and are used as examples of detailed analyses of the fire problem in this report. The national estimates of total fires, casualties, and losses, however, were not based on NFIRS data this year because of the limited geographic coverage of the data. Instead, we used HEW Center for Health Statistics data (on deaths), State fire marshal reports, a new analysis of the 1974 NFPA Annual Survey, and other existing sources. As more States provide data over a full year, we will base the national estimates on that data source. Eventually, we hope all States and territories will participate in NFIRS.

Although new and still quite limited in scope, the NFIRS system has already been very useful. Information from the over 500,000 incidents now on file is shared with other Federal agencies to assist in a wide variety of fire-related issues such as consumer product safety, mobile home standards, and rural fire protection. The data have been used to answer numerous requests from industry, the fire service, and others about the Nation's fire experience. They have also been used by the National Fire Administration's program offices in assigning priorities and shaping plans. As data are uniformly reported by additional States over a longer period of time, NFIRS will become even more valuable.

Purpose and Uses

This series of annual reports has multiple objectives. The first is to provide a description of the magnitude and trends of the overall U.S. fire problem, and how it compares to other national problems and to the experience of other nations. This information indicates how well we are doing as a Nation in fire protection and provides a perspective for allocating resources to the fire problem. It is probably true that the fire problem is underestimated by the public. It is also probably true that many people misunderstand the nature of the problem due to the attention given to spectacular or catastrophic fires.

The second objective of this series of reports is to detail the characteristics of the fire problem in terms of losses, causes, victims, times and places of occurrence, and other particulars. This information is essential in assigning priority ratings to fire protection programs. It also is needed to target programs to specific problems and to the population groups most in need of help. And, over time, it will allow evaluation of the success of the programs undertaken.

A third objective is to establish baseline data, national norms, and data from a variety of communities that States and localities can use to see how well they are doing relative to others. Comparisons are difficult to make accurately and often can be misinterpreted. They are important nonetheless. We will work toward providing data and methodology for communities to make meaningful and useful comparisons.

Data from individual communities invariably will show some communities being high and some low on a given type of measure. This variation leads to a fourth objective, related to the preceding one: to identify places with outstanding results in some aspect of fire protection to see if they resulted from programs that can be used by other communities; and to identify places which may need special assistance.

The fifth objective is to illustrate ways in which fire data can be analyzed by State and local governments, so they can learn more about their own problems. Developing useful analyses takes time and statistical expertise often not available in State and local fire services. By providing examples of national, State, and local data analyses meaningful to policy and operations, we hope to encourage more accurate and useful analyses in many communities.

A sixth objective is to provide information in support of various fire protection research activities, such as studies of the relationship of fires to community characteristics or studies of the expected benefits from improved fire resistance in certain materials.

A seventh and final objective is to provide an indication of the reliability of data used for the above purposes, by contrasting estimates from

various data sources and by providing estimates of confidence, precision, and accuracy where possible.

Obviously, meeting all of these objectives is a tall order. This first national estimates report does not meet each of the above objectives to the same degree, and meets none as completely as we would wish. Nonetheless, those are the ends toward which we are committed.

Scope

In principle, the scope of this series of reports includes all aspects of fire in the United States. We do present considerable data on the overall problem. However, in practice the limitations of available resources led us to emphasize the part of the fire problem faced by local governments, especially the part concerning fires in buildings. This focus includes the greatest human and property losses and the part of the problem most likely to be influenced by changes in public policy.

Availability of data also influenced the scope of this report. As a result, various aspects of the fire problem described here have different levels of statistical detail. For example, California and Ohio fire characteristics are described in more detail than those of other States because, as noted above, they were the only two States for which we had comparable data for a full year, and not because they were thought most representative. For some characteristics, only Ohio data were available. Although no claims are made about California and Ohio as typical States, they happen to be two good choices because together they contain about 15 percent of the U.S. population and a wide range of climates, community sizes, city ages, industry types, life styles, and other factors. As more States and more communities in each State join the National Fire Incident Reporting System, coverage will be greater and more even.

"Clean" data are not available for any single recent year for all purposes. We therefore present data from different years, mostly 1974, 1975, or 1976, in various tables and figures. The scope of each table and figure is described in the text.

The overall scope of the report is summarized below:

- Department Type: Paid and volunteer departments.
- Community Size: All.
- Geographic Scope: The United States in general. Ohio and California in most detail.
- Property Types: All—residential and nonresidential structures, vehicles, outside fires.
- Fire Data: Incidents, deaths, injuries, direct dollar loss, "causes," selected other data.
- Period: 1974-1975 for national estimates; 1975-1976 for details of two States.
- Reported/Unreported: Mostly fires attended by the fire service; some data from a special study of unreported household fires.

Excluded from the report are data for:

- Industrial fires not reported to the public fire service (probably the bulk of fires in big industry).
- Federal government and military fires not reported to the public fire service.
- Fires involving U.S. (transportation) carriers or property outside the United States.

The scope of the analyses varies, as well as the scope of the available data. Because our purpose here is to present an overview of the fire problem, the analyses do not use every data element available, nor do they summarize data at the most detailed levels of the data base.[3]

Although the report shows a number of ways to analyze data that State and local governments might consider, it just scratches the surface of what can be done.

Validity and Proper Use of Data

Data validity is not a new problem for fire protection, nor for other government services. It is a problem that is being discussed more openly than ever before, however, in the hope of achieving improvements. For example, the Federal approach to measuring unemployment is under review. The FBI Uniform Crime Reports have been found to under-report major crimes to a degree that requires separate victimization studies to supplement them. The validity of national statistics on illegal drug dealing and usage is unknown.

The existence of these validity problems does not mean the data cannot be used. It does mean they must be used intelligently.

[3] For example, data are summarized in this report by State for property types at one and two digit NFPA 901 codes, but not the third digit level. The National Fire Data Center can provide specialized computer reports from its data base at any level of detail in the NFPA 901 codes, upon request. Charges are at cost for this service.

A major objective of the National Fire Data Center is to improve and periodically evaluate the validity of fire data available at all levels of government. Toward this end, the information in this report is presented wherever possible with comments on its validity and precision.

One problem facing the readers of this first report is the confidence they can place in the results presented. Some results disagree with previously well-publicized "facts" about fires. Some findings are so elementary that they may be suspect for being "newly discovered." And some of the information here is based on a new data collection system using a complex coding scheme that has not been fully broken-in in each participating fire department.

Whether the validity of the data is adequate depends on the question being asked. In general, most of the major findings appear to have at least face validity, and a number of reasonableness checks are given in the text. These, plus the results of a recent independent study of the validity of the data in one State,[4] suggest that the data presented in this initial report probably suffice to identify many major problem areas. The precision of the rank ordering of fire problems is not known, however.

One must be especially careful in using new data when making comparisons among communities. Meaningful comparisons are difficult to make even when data are reliable and complete because of differences in the characteristics of the fire problem faced by various communities. It is especially hazardous here because of differences in the completeness of reporting of fire data to the State and national levels. Given the complex validity situation, we are particularly concerned about having the data on individual communities and States quoted without the necessary caveats. That would be grossly unfair and could discourage the fire service from making further advances in data collection.

[4] Eisenberg, Daniel, and Getis, Robert, Principal Investigators, *Initial NFIRS Data Validation Study* (Philadelphia, PA: Auerbach Associates for the National Fire Prevention and Control Administration, March 1977), Contract No. 6-34583.

Organization of This Report

To meet the needs of readers with different roles and interests, this report has been divided into three parts. Part I presents the overall national estimates and discusses both recent and long-term trends. Highlights from more detailed studies are also included.

Part II presents detailed statistical tabulations of significant characteristics of fires in Ohio, California, and seven cities in other States. Part II is directed primarily toward providing an understanding of the causes of fires and fire losses, insights for targeting fire safety programs, and data useful for fire protection policy decisions at the local and State levels. The analysis illustrated in this part is also intended to provide ideas to State and local governments wishing to analyze their own fire experience.

The Appendices discuss methods used to develop the national estimates and the quality of the data sources available; they also give more details on State and national estimates.

Readers' Comments Requested

We hope this report will provide a stimulus for State and local governments to upgrade the quality of their data, to make better use of the data, and to participate in the national data collection effort. There will be modifications and improvements in the methods of analysis employed for next year's estimates. We welcome comments on how to improve the usefulness and accuracy of this report.

PART I
National Fire Estimates and Selected Statistics

Section I

Introduction to Part I

The three main sections of Part I which follow will give the reader an overall picture of the fire problem in the United States. The purposes and contents of each section are:

Section II: National Fire Problem. To indicate the magnitude of the fire problem in the United States and to provide a baseline from which future progress in fire safety can be measured, this section compiles overall estimates of the Nation's fire losses. The national estimates presented are a composite of data from various sources.

Section III: Trends and Comparisons. To show whether the problem is getting better or worse, this section presents trends in the Nation's fire death rate, number of fires, and amount of direct property loss. To show how our country is doing relative to others, a comparison is made with other Western industrialized countries. Finally, comparisons of fire to other causes of death, such as accidents, serve to place fire in perspective relative to other national problems.

Section IV: Selected Characteristics of Fires. To provide more precise information needed to target fire prevention, a detailed analysis is given for two States: Ohio and California. Findings summarized in this section include: the types and causes of fires, the differences in fire rates between communities, the importance of fire protection devices, and fire casualty characteristics. Principal results from the National Household Fire Survey are also summarized. More detailed analyses of the Ohio and California data are presented in Part II of this report.

Section II

The National Fire Problem

NATIONAL FIRE LOSSES

The National Fire Prevention and Control Administration's estimates of overall fire losses in the United States for 1975 are summarized in Table 1, below. The estimates represent a composite from several data sources which are described in more detail in the following pages. The year 1975 has been used rather than 1976 because the data for 1975 were more complete. For the purpose of making appropriate "baseline" estimates—the main concern here—the differences from year to year are not significant.[5]

[5] As the National Fire Incident Reporting System becomes fully operational and the estimating methodology routinized, we can expect a shorter interval between the publication of the national estimates and the year for which they are made.

There were approximately 2,600,000 fires in 1975 that were reported to the fire service, and about 30,000,000 more that were not reported. Approximately 7,500 deaths resulted from these fires. In addition, about 110,000 injuries were reported to the first service; another 200,000 injuries were not reported, although they may have been reported in part to hospitals. The estimated total dollar loss—excluding such indirect losses due to fire as temporary housing, lost wages, extra food expenses, and medical treatment, etc.,[6] —exceeded $13.6 billion.

[6] Estimates of these indirect costs for residential occupancies will soon be published in Munson, Michael J., and Ohls, James C., *Indirect Losses Arising from Residential Fires* (Princeton, NJ: Princeton University, forthcoming), Fire Administration Grant No. NFPCA-77007.

Table 1. NFPCA's "BEST" NATIONAL ESTIMATES OF U.S. FIRE LOSSES (1975)

	Fire Losses		Approximate Rates
FIRES	2,600,000	Reported to Fire Service	1,200 per 100,000 persons
	30,000,000	Not Reported to Fire Service[1]	14,000 per 100,000 persons
	32,600,000	Total	
DEATHS	7,500		35 per million persons
INJURIES	110,000	Reported to Fire Service	520 per million persons
	200,000	Not Reported to Fire Service[2]	940 per million persons
	310,000	Total	
DOLLAR LOSS	$ 4.2 Billion	Direct Property Loss	$ 19.70 per person 59.10 per household[4]
	9.4 +? Billion	Other Costs[3]	44.00 per person 132.20 per household[4]
	$13.6 +? Billion	Total Cost	$ 63.70 per person Total $191.30 per household Total

[1] *National Household Fire Survey* indicates that only about 8 percent of all fires are reported to the fire service.

[2] *America Burning: Report of the National Commission on Fire Prevention and Control,* Richard E. Bland, Chairman (Washington, DC: Goverment Printing Office, 1973), p. 1. Also *National Household Fire Survey.* Some injuries not reported to the fire service may be reported to hospitals.

[3] "Indirect" losses, such as medical costs, displacement costs, and building construction costs attributable to fire protection are excluded this year. See Appendix II for a breakdown of the "other" costs which are included.

[4] There was an average of 2.9 persons per household in 1975. Source: U.S. Bureau of the Census, *Statistical Abstract of the United States, 1976 (97th Edition)* (Washington, DC: U.S. Department of Commerce, 1977), p. 38.

NOTES: The data are not from any single year due to differences among data sources. This will be improved in the future. Rates are based upon a 1975 Census population estimate of 213 million persons.

Of this total, about $4.2 billion consisted of direct property loss and at least $9.4 billion was attributed to other costs such as public fire departments, insurance overhead, and sprinkler systems. See Appendix II for a breakdown of the "other" costs which are included.

BASIS OF NATIONAL ESTIMATES

There are several sources that provide national summary fire data. The National Fire Protection Association (NFPA) makes estimates of incidents, deaths and injuries, and dollar losses. These are published annually in the *Fire Journal* and have been based on a mail survey of some 2,000 fire departments in the United States, information obtained from various agencies of the Federal Government, State Fire Marshals, and some local fire departments not reporting in the survey. These estimates will be termed the "NFPA composite" in this report, as opposed to the composite National Estimates developed by the Fire Administration. The 1974 NFPA survey data have been, in addition, analyzed in detail in a different way by NFPCA, assisted by NFPA.[7] (See Appendix III.)

The National Center for Health Statistics (NCHS) of the U.S. Department of Health, Education and Welfare collects information from death certificates. The NCHS-published fire death figure is a count of deaths recorded as being caused by a fire, whether from a burn or another type of injury. Certain categories of fire deaths are intentionally omitted to avoid double counting or inaccuracies in other areas. For example, deaths by fire resulting from a motor vehicle accident are listed only under transportation accidents and not under fires. A detailed discussion of the NCHS data and of estimates of transportation fire deaths are contained in a separate National Fire Administration technical report.[8]

Data originating from local fire departments are summarized, in most States, in annual State Fire Marshal reports. Unfortunately, the summary data from many States are incomplete, and it is questionable whether the data can be directly added for making national estimates (with the possible exception of the data on fire deaths). However, these figures are useful for making comparisons and for estimating trends. The details of the Fire Marshal report data are given in Appendix IV.

The Insurance Information Institute publishes an annual estimate of direct property loss, based on information supplied by the Insurance Services Organization (ISO). ISO gets information from its members, which include about half of the insurance industry, principally stock companies. The Insurance Institute estimates include allowances for unreported and uninsured losses, but certain classes of property not usually covered by fire insurance are omitted; for example, government property, timber, and standing crops.

The National Safety Council (NSC) also publishes estimates of fires, fire deaths, fire injuries, and direct and indirect fire losses in their annual publication *Accident Facts* along with other accident information. Their death estimates are obtained from NCHS data and their estimates of numbers of fires and direct fire losses are obtained from the NFPA. They make their own estimates of injuries and indirect losses. The NSC data were used in several charts and tables in this report, although they were not used directly in making the national estimates shown in Table 1.

Besides NSC, a number of other public and private agencies collect injury data: the National Health Interview Survey[9] (interviews conducted by the National Center for Health Statistics), the Commission on Professional and Hospital Activities (data from hospital discharge records), the National Burn Information Exchange (data from burn treatment facilities), the National Electronic Injury Surveillance System (hospital emergency room data collected by the Consumer Product Safety Commission), and the National Ambulatory Medical Care Survey (data from physicians' visits, conducted by HEW). These injury data sources and others were investigated by the University of Michigan.[10] While all of these sources contain some useful information, the overall conclusion of the Michigan report is that each contains at

[7] Derry, Louis, Principal Investigator, *Analysis of NFPA Data for National Fire Loss Estimates* (Boston, MA: National Fire Protection Association, 1977), Fire Administration Contract No. 7-34753.

[8] Fristrom, Geraldine, *Fire Deaths in the United States: Review of Data Sources and Range of Estimates* (Washington, DC: National Fire Prevention and Control Administration, September 1977). Some major points of this report are discussed in Appendix V.

[9] Not to be confused with the 1974 National Household Fire Survey, sponsored by National Bureau of Standards and Consumer Product Safety Commission.

[10] Flora, Jarius D., et al, *Fire Data Methodology, Vol. I: National Estimates of Fire Injuries* (Ann Arbor, MI: Highway Safety Research Institute, The University of Michigan, 1978), Fire Administration Grant No. 76028.

least one major deficiency that limits its usefulness for making national estimates.

Basis of Fire Incident Estimate

Table 2 summarizes the individual national estimates from the various sources used in forming the Fire Administration composite estimate. The large differences among the estimates reflect the disparate methods and assumptions used in collecting and analyzing the data. The final NFPCA composite estimates are presented in terms of both a range of values and a single "best estimate." The reasons for the differences between the estimates and the considerations that led to the final values are discussed below.

Several factors account for the large differences between the 1974 NFPCA/NFPA survey estimate and the NFPA composite estimate of the number of fires attended by the fire service.[11] First, processing of the 1974 NFPA survey data included extensive editing to eliminate or correct those responses that had obvious errors or inconsistencies in terms of the new application of the data.[12] Second, the NFPCA/NFPA analysis stratified the survey data according to community population, so that each population grouping was given its appropriate weight in the total. The main result of doing this was to increase the weight given to medium size and small communities over that in the earlier NFPA analysis. Finally, the NFPA composite estimate included certain fires that were not reported to fire departments, but which insurance records showed to have involved substantial losses.

To provide a further check, data from several States whose reporting was considered relatively complete were examined. From these data, we estimated a range of 1,150 to 1,300 reported fires per 100,000 persons, selecting 1,200 as the "best estimate" on the basis of NFPCA staff judgment. We do not consider this approach satisfactory; better estimates will have to await improved data collection in the future.

Basis of Death Estimate

The NCHS count of fire deaths is perhaps the most accurate of any of the fire loss numbers. However, as noted previously, this count must be corrected for transportation fire deaths, primarily from motor vehicle accidents. The NFPA's widely quoted *Fire Journal* pre-1977 figures included an estimate of motor vehicle fire deaths based upon some earlier studies, whereas the current NFPCA estimate of about 550 to 800 deaths from fire in motor vehicles is based on more recent studies, as well as State data. Combining the NCHS estimates with the NFPCA automobile death estimates leads to an estimated range of 34.6 to 35.7 fire deaths per million persons, with a "best estimate" of 35.1 deaths per million. Observe that the estimate, based on the 1974 NFPA survey, of 36.7 deaths per million is practically identical to the adjusted 1974 NCHS estimate of 36.5 per million.

Basis of Injury Estimate

The large differences in the injury estimates in Table 2 are not easy to reconcile. A major difficulty encountered in the collection of injury data is in deciding which minor injuries are to be reported and which are too insignificant to report. There is apparently little uniformity in this regard. The low estimate for the 1974 survey data partly reflects the fact that the injury rates for rural and small town areas were estimated to be less than one-half the city rates (although this is based on inadequate data). When the sample data for the 1974 survey was extrapolated to the United States, the estimate for total injuries turned out to be only slightly larger than the number estimated by NFPA and the International Association of Fire Fighters (IAFF) for firefighter injuries alone. (See Table 5, page 19.) On the other hand, NFPA's composite estimate of total injuries is about twice the number of firefighter injuries, which is a relationship observed in data from many State and local jurisdictions. A reasonable estimate of the injury rate appears to be between 400 to 600 injuries per million persons, with 500 as the "best estimate."

Basis of Dollar Loss Estimate

Again, the differences between the various estimates are substantial and not easily reconcilable. A few large losses can have a big effect. In fact, 0.2 percent of all fires accounted for 14 percent of total losses.[13] For many large-loss fires (mostly non-residential), the amounts es-

[11] "Fires attended by the fire service" is approximately equal to fires reported to the fire service.

[12] It was necessary to evaluate the data quality in light of a new application for the data.

[13] "Fires and Fire Losses Classified, 1975," *Fire Journal*, November 1976, pp. 17-19.

Table 2. COMPARISON OF NATIONAL ESTIMATES FROM VARIOUS SOURCES

Source	Year[1]	Fires		Deaths		Injuries		Dollar Loss		Remarks
		Number	Rate/ 100,000	Number	Rate/ Million	Number	Rate/ Million	Dollars (Millions)	Dollars/ Person	
NFPCA NATIONAL ESTIMATES	1975	2,556,000	1,200	7,500	35.1	106,500	500	$4,150	$19.50	
		Range of Estimates								
	1975	2,450,000 to 2,770,000	1,150 to 1,300	7,400 to 7,600	34.6 to 35.7	85,200 to 127,800	400 to 600	$3,800 to $4,500	$18.00 to $20.00	
1974 NFPA Survey (NFPCA/NFPA analysis)[2]	1974	2,400,000	1,140	7,740	36.7	74,000	350	$2,969	$14.07	Stratification analysis, rural estimates weak.
NFPA Composite *(Fire Journal)*	1974	2,982,000	1,410	11,600	55.0	123,000	582	$3,818	$18.10	Includes allowance for some unreported fires and losses.
	1975	3,105,000	1,460	11,800	55.4	131,000	615	$4,170	$19.60	
State Fire Marshals (Annual Reports)	1974[3]	1,670,000	790	6,250	29.5	53,640	253	$2,968	$14.00	Incomplete reporting by most States.
	1975[3]	1,712,000	800	6,830	31.9	61,850	290	$3,039	$14.20	
National Center for Health Statistics	1974			7,720	36.5					Death certificate count increased by NFPCA for transportation fire deaths.
	1975			7,490	35.1					
Insurance Information Institute[4]	1974						Unadjusted	$3,190	$15.12	Unadjusted figure includes building fires not reported to fire departments.
							Adjusted	$3,929	$18.62	
	1975						Unadjusted	$3,560	$16.71	
							Adjusted	$4,494	$21.10	

[1] U.S. population—1974: 211 million; 1975: 213 million.

[2] Analysis by NFPCA of edited tabulations provided by NFPA.

[3] For the 1974 row, one-third of the data are for 1975; similarly, for the 1975 row, one-third of the data are for 1976.

[4] An adjustment was made by adding in the figures for the dollar losses from several categories of fires not included in the Insurance Information Institute loss figures. These include, for 1974, forests—$169 million, transportation—$354 million, crops—$36 million, and Federal property—$180 million; for 1975, forests—$180 million, transportation—$495 million, crops—$38 million, brush, etc.—$21 million, and Federal property—$200 million. The Federal property loss estimates are from the Federal Fire Council; the other loss estimates are from NFPA.

NOTES: The NFPCA National Estimates are given as a "best" estimate and a range. They are *not* simple averages of range compilations of the other sources. See text for methodology.

Estimates of fires, injuries, and dollar loss are almost entirely for fires attended by the fire service. Some sources made adjustments for some unreported fires, as discussed in the text.

Table 3. COMPARISON OF DIFFERENT ESTIMATES OF YEAR-TO-YEAR CHANGES (1974 to 1975)

Source	Year	Fires (Reported) Number	Fires (Reported) Percent	Deaths Number	Deaths Percent	Injuries (Reported) Number	Injuries (Reported) Percent	Dollar Loss Dollars (Millions)	Dollar Loss Percent
NFPA Composite (*Fire Journal*)	1974-1975	+123,000	+4%	+200	+1%	+8,000	+ 6%	+$352	+ 8%
State Fire Marshals (Annual Reports)	1974-1975[1]	+ 40,000	+2%	+573	+8%	+8,210	+14%	+$ 79	+ 2%
National Center for Health Statistics	1974-1975			−235	−3%				
Insurance Information Institute	1974-1975						Unadjusted Adjusted	+$370 +$565[2]	+12% +14%
NATIONAL ESTIMATE OF CHANGE	1974-1975	+ 77,000	+3%	−234	−3%	+8,000	+7.5%	+$330	+ 8%

[1] For the 1974 data, one-third of the reports are from 1975; similarly, for the 1975 data, one-third are from 1976.

[2] An adjustment was made by adding in the figures for the dollar losses from several categories of fires not included in the Insurance Information Institute loss figures. These include, for 1974, forests—$169 million, transportation—$354 million, crops—$36 million, and Federal property—$180 million; for 1975, forests—$180 million, transportation—$495 million, crops—$38 million, brush, etc.—$21 million, and Federal property—$200 million. The Federal property loss estimates are from the Federal Fire Council; the other loss estimates are from NFPA.

timated by fire departments may be much less than the final amounts settled through adjustment or litigation. Note also that the Insurance Information Institute (III) estimate includes losses from fires not reported to fire departments and excludes substantial losses associated with Federal property, forests, and transportation. These categories of loss also tend to be under-reported by fire departments. Federal and non-building property losses have been included in the NFPA's composite estimate and the adjusted Insurance Information Institute values. The 1974 III unadjusted rate differs only slightly from the 1974 NFPA survey and from the State estimate. (States with unreasonably low published fire rates or dollar loss rates were not used in the calculation.) A reasonable estimated range for 1975 *total* direct property loss (including unreported, non-building, and Federal) is $18 to $21 per person. Our judgment is that the "best estimate" is about $19.50 per person.

It is apparent that the precision of the above national estimates of deaths, injuries, and dollar losses is low. We need more consistency and accuracy in State and local data collection methods to improve this situation.

ESTIMATED YEAR-TO-YEAR CHANGE IN FIRE LOSS

Year-to-year changes indicate whether the fire problem is getting better or worse. Because of the uncertainty in previous estimates of the Nation's fire losses, a relatively small change from one year to the next is difficult to detect with any degree of confidence. However, by comparing the differences between 1974 and 1975 for the same data sources, one may be able to obtain a better estimate of recent change than by comparing estimates from different sources.

Estimates of year-to-year changes from various sources are summarized in Table 3. The NFPCA composite estimates (bottom line) are that there was a small reduction in deaths (down 3 percent), a small increase in fire incidents (up 3 percent), and moderate increases in injuries (up 7.5 percent) and property loss (up 8 percent).[14] Much of the property loss increase may be attributed to inflation. It is also possible that the increases in fire and injury rates reflect improved reporting by communities rather than true changes.

NFPA did not consider its 1975 survey data sufficiently reliable to warrant the detailed analysis that was performed for the 1974 data, and thus year-to-year changes in it are omitted.

The year-to-year estimates given above were made in the following manner. For fire incidents, the percentage increase was taken to be the average between the change in the NFPA composite and the change in the State Fire Marshal report figure. For deaths, the NCHS estimate, thought the most reliable, was used. For injuries, the increase of about 8,000 shown by both the NFPA composite and the State Fire Marshal data was used as the national estimate of change and converted to a percentage. For dollar loss, the intermediate NFPA estimate was judged the most reliable; this was also consistent with using their value as the recommended National Estimate in Table 2.

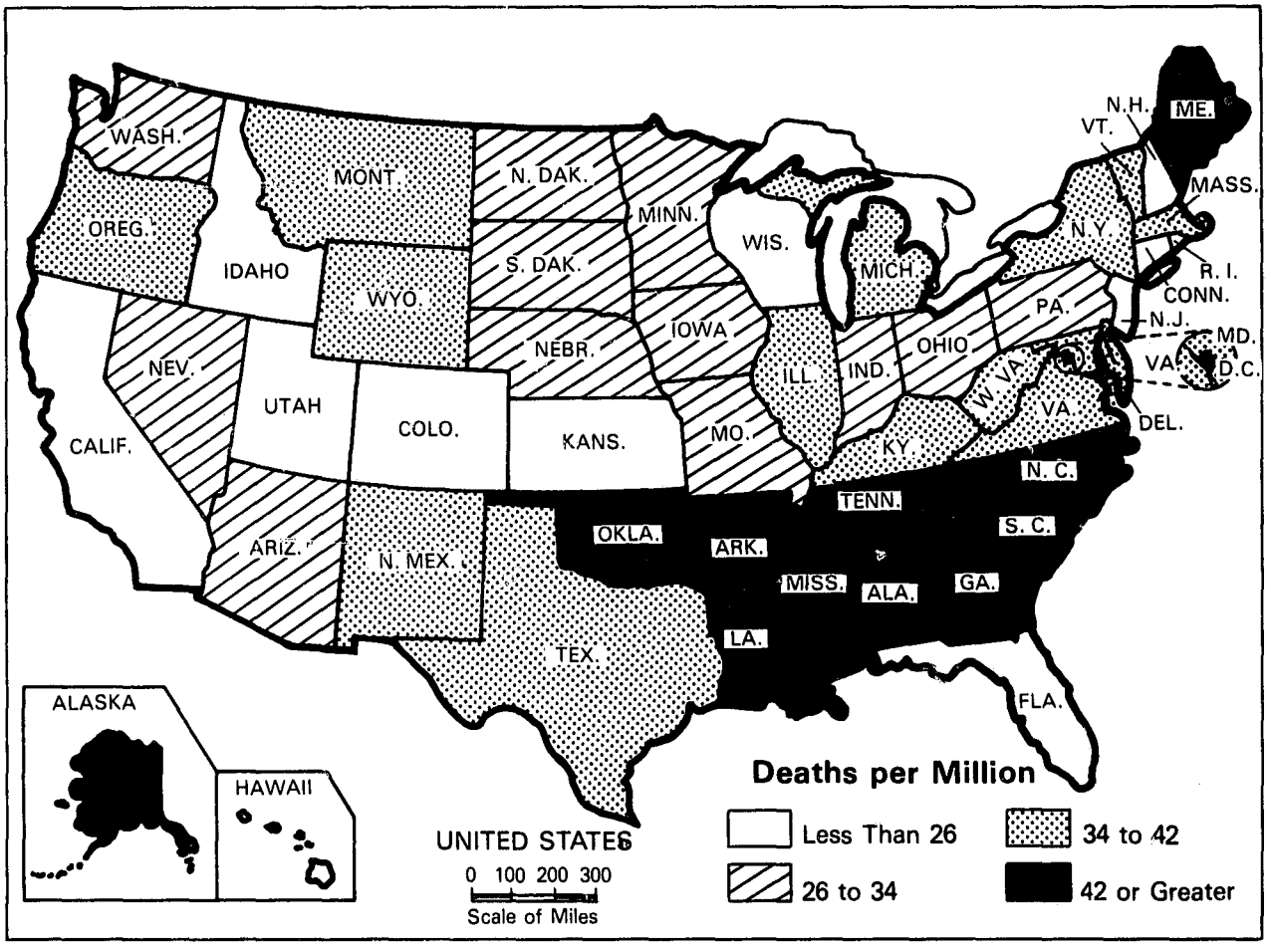
FIRE DEATH RATES BY STATES

Comparison of State fire death rates indicates whether the problem is more severe in some regions than others. The variation in death rates among States is shown in Figure 1. In general, the highest death rates occur in the Southeast; the lowest death rates occur in the West. There are, however, many exceptions. It would be useful to be able to explain why the problem in certain States is so much better or worse than in others, but we have not found satisfactory answers yet. Table 4 lists the States with highest and lowest death rates and indicates certain economic and social characteristics that may be pertinent. Since death rates fluctuate from year to year, especially for States with low population, for any one year they may not be representative. Because of this, for each State we took the larger of the death estimates from the State Fire Marshal and the Center for Health Statistics for 1974 and the larger for 1975, and then averaged those two numbers.

One of the sources for the National Estimates was State Fire Marshal Annual Reports obtained from 34 States and the District of Columbia. The quality of the State data varies greatly. Incomplete reporting of fire incidents to States from local governments occurs frequently, especially from small towns and rural communities.

[14] The Insurance Information Institute reported that property loss in 1976 was about the same as for 1975.

Figure 1. STATE FIRE DEATH RATES – DEATHS PER MILLION POPULATION (CIRCA 1975)



SOURCE: Based on estimation of death rates by State for 1974 and 1975 given in Appendix IV, Table IV-4, except for New York which is based on the 1974 NFPA Survey.

We believe that records on the number of deaths are considerably more accurate. Moreover, preliminary tabulations of most of the death counts from the National Center for Health Statistics, excluding transportation fire deaths, have enabled us to correct death rates from several States and to obtain estimates for States for which we had no State Fire Marshal Annual Reports.

FIRE DEATH RATES BY SEX AND RACE

Males, nonwhites, and most strikingly, nonwhite males, have fire death rates much greater than the general population. This is shown in Figure 2. Males have an 80 percent higher fire death rate than females. Nonwhite males have a fire death rate more than 50 percent greater than nonwhite females. Nonwhites have three times the fire death rate of whites.

While multiple problems associated with poverty and poor housing conditions undoubtedly contribute to the higher risk for nonwhites, they cannot explain the much higher risk of nonwhite males over nonwhite females. Greater likelihood of males to smoke and drink, to fight fires themselves, to work with and around gasoline, and to be involved in rescue efforts may be some possible reasons for their higher death rate. Future studies by NFPCA will be directed toward investigating these characteristics in order to

Table 4. STATES WITH HIGHEST AND LOWEST DEATH RATES

State	Average Fire Death Rate[1] (1974-1975)	Per Capita Income Rank (1975)[2]	Percent Completing High School (1970)[3]	Percent of Families Below Poverty Level (1969)[4]
LOWEST RATES				
Hawaii	11.1	11	62%	8%
Idaho	16.8	33	60	11
Colorado	19.0	23	64	9
Connecticut	19.9	3	56	5
Kansas	22.5	16	60	10
Delaware	23.4	4	55	8
California	23.5	8	63	8
Wisconsin	23.9	26	55	7
Utah	23.9	40	67	9
Rhode Island	24.1	18	46	9
Florida	25.7	29	53	13
New Jersey	25.8	6	53	6
HIGHEST RATES				
Alaska	112.3	1	67%	9%
Mississippi	65.2	51	41	29
South Carolina	54.4	48	38	19
Arkansas	53.6	50	40	23
Maine	52.7	43	55	10
District of Columbia	49.4	2	55	13
Tennessee	48.5	44	42	18
Alabama	44.0	47	41	21
Louisiana	43.9	45	42	22
Georgia	43.8	38	41	17
Oklahoma	43.2	35	52	15
North Carolina	43.1	42	39	16

[1] Average of the maximum rate (deaths per million persons) for each State from the National Center for Health Statistics and the State Fire Marshal report for each year (1974 and 1975).
[2] U.S. Bureau of the Census, *Statistical Abstract of the United States: 1976* (97th Edition), U.S. Bureau of the Census, (Washington, DC: Government Printing Office, 1976), p. 402.
[3] *Ibid.*, p. 126. [4] *Ibid.*, p. 419.

better understand the reasons for the great disparities.

Fire prevention programs should be targeted toward these high risk groups, just as they have been for the elderly and children.

FIRE DEATH RATES BY PROPERTY TYPE

The distribution of deaths from fires in various types of properties is shown in Figure 3. Residential fires alone account for two-thirds of all deaths from fires. Deaths from residential fires in one- and two-family dwellings account for 44 percent of all deaths due to fires.

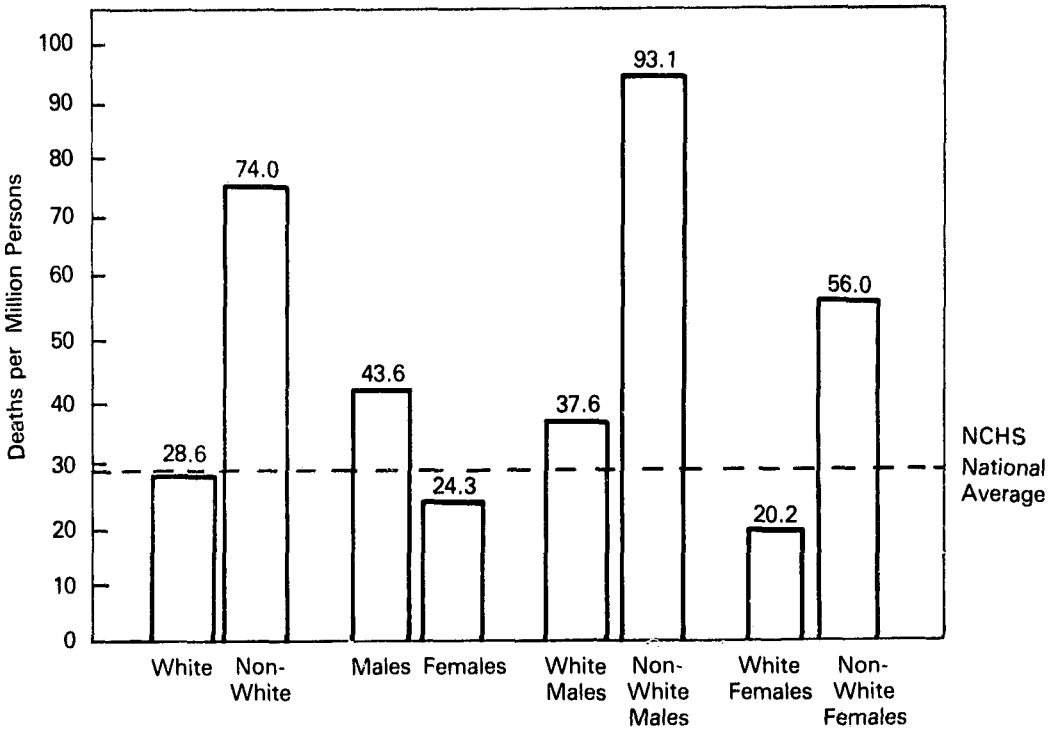
Certainly the residential fire problem must be tackled to reduce fire deaths significantly. We should not, of course, permit these statistics to let us get complacent about the threat of fire in public buildings lest we invite more frequent catastrophes such as the 1977 Southgate, Kentucky, nightclub fire.

FIREFIGHTER DEATHS AND INJURIES

"Firefighters are ahead of all other occupations in death rates, making firefighting the most hazardous type of employment."[15] Flames, falling walls, smoke, and motor vehicle accidents all take their toll, but the most frequent on-duty cause of death is heart attack.[16]

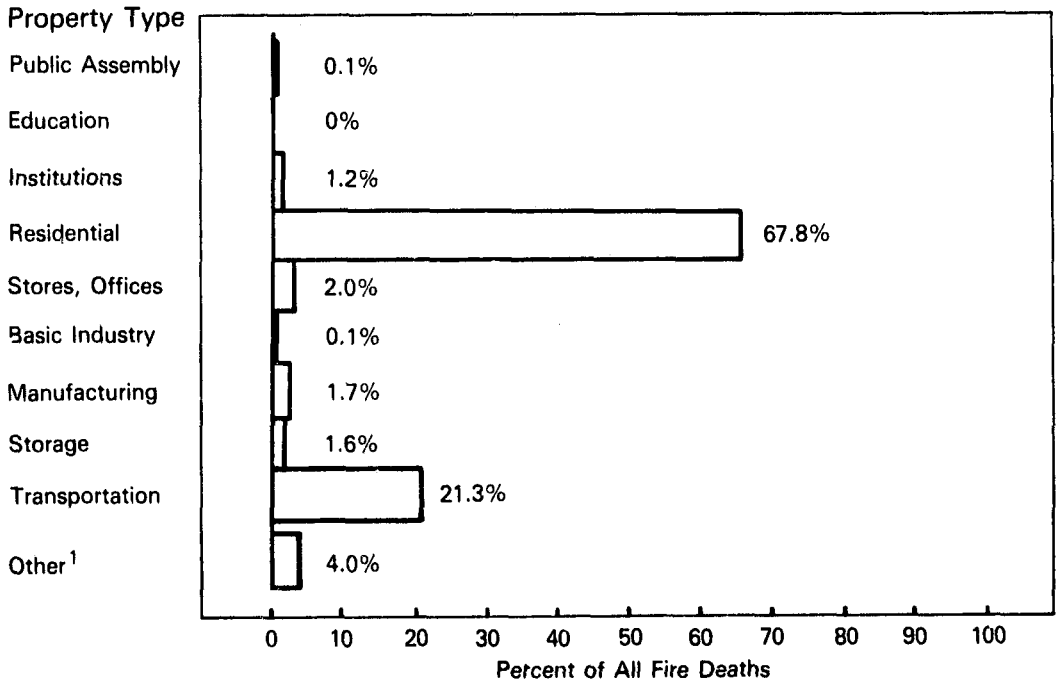
[15] "1974 Annual Death and Injury Survey," *The International Fire Fighter*, November 1975, pp. 8-13.
[16] Balanoff, Thomas, *Fire Fighter Mortality Report* (Washington, DC: International Association of Fire Fighters, for the National Fire Prevention and Control Administration and the Center for Fire Research, Institute for Applied Technology, National Bureau of Standards, May 1976), Contract No. 4-35909.

Figure 2. FIRE DEATH RATES BY RACE AND SEX – 1974



SOURCE: Based on mortality data from the National Center for Health Statistics (which excludes transportation-related fire deaths) and population estimates from the Statistical Abstract of the United States, 1975.

Figure 3. WHERE FIRE DEATHS OCCUR



[1]This category includes mobile and outside properties, as well as other and unclassified properties.

SOURCE: Ohio 1976 NFIRS and California 1975 CFIRS data combined.

Injury rates for firefighters are also high—much higher than would be tolerated in other occupations. More than half the injuries from fires attended by the fire service are to firefighters even though there are many times more civilians exposed than firefighters. The firefighter is exposed to danger much longer and more frequently than the civilian.

Table 5 shows several estimates of firefighter deaths and injuries, including the International Association of Fire Fighters (IAFF) annual number of reported casualties for full-time firefighters. One hundred firefighter deaths were reported to the IAFF in 1974 and 108 deaths in 1975. The number reported to the NFPA in 1974 was about the same as that for IAFF, and slightly less than IAFF's figure for 1975. None of these counts are thought to be complete.

Full-time firefighter deaths have been estimated by the IAFF to be 90.7 per 100,000 firefighters in 1975.

To further illustrate just how serious that problem is, consider that the full-time firefighter death rate from fire is about 25 times that of civilians. And it is 10 to 20 times higher than that of the highest risk civilian groups—black males, the elderly, the very young.

A comparable fire death rate for all firefighters is difficult to arrive at and not attempted here because of uncertainty in the total number of volunteers, uncertainty in the number of deaths they suffer, and the difficulty of developing an equivalent full-time firefighter person-years estimate for the volunteers.

The number of firefighter injuries shown in the table confirms the hazardous nature of firefighting. There was one injury per year for approximately every two full-time firefighters in reporting jurisdictions. The trend in firefighter injuries is not clear. There were almost 9 percent fewer injuries reported to the IAFF in 1975 than in 1974. The NFPA estimate of total injuries (reported plus unreported injuries, including those to volunteers), was about 8 percent more in 1975.

A major effort is needed to reduce firefighter injuries. NFPCA has funded studies toward improving the physical fitness of firefighters,[17] developing better protective clothing and breathing apparatus, and training firefighters in burn safety practices. (More details on firefighter injuries are given in Section IV.)

FIRE LOSSES VERSUS COMMUNITY SIZE: URBAN AND RURAL ESTIMATES

The urban fire problem has been highly publicized and deserves much attention. The rural problem has not received as much attention as it probably needs, especially since about 27 percent of the U.S. population is in rural areas. The relationship between fire loss rates and the population of the community served by individual fire departments is shown in Figure 4. The data are from the NFPA 1974 survey. Fires, deaths, and dollar loss per capita have roughly similar patterns of being high for the two extremes of the population—large cities and rural areas—and low in between. This phenomenon of middle-sized communities having less of a problem than the extremes is commonly found for many community services, not only fire protection.

More specifically, death rates for large cities and rural areas are about twice as large as for the 50,000 to 100,000 population interval. Data supplementing the survey on which Figure 4 is based, gathered from cities over one million population, indicate that the big city fire death rate may be even higher than shown, perhaps exceeding 50 deaths per million on the average.

Reported fire rates are lowest for small towns (5,000 to 10,000 population). Injury rates decrease with community size, falling sharply for communities of less than 10,000 persons (which on the surface is a paradox relative to the death rates). For dollar losses, the rates are quite low in the 10,000 to 250,000 population range and then surge by about 70 percent for communities below 10,000 population.

Figure 5 provides some insight into the U-shaped curve for per capita incident rate of fires (upper left hand graph in Figure 4). The large cities have a higher rate of fires than middle-sized communities mainly because of a higher rate of trash and residential fires. Rural areas have a higher rate than middle-sized communities primarily due to a higher rate of residential fires

[17] Gratz, David G., and McCune, Dennis H., Principal Investigators, *Fire Service Physical Fitness Programs* (Washington, DC: International Association of Fire Chiefs Foundation, June 1977), Fire Administration Grant No. NFPCA-76025.

but also because of higher vehicle and non-residential building fire rates.

Residential fire deaths account for the majority of all fire deaths regardless of community size. The pattern of residential fire death rates in different size communities is similar to the pattern for all fire deaths. Figure 6 shows that both large cities and rural areas have a higher death rate in residential properties than do middle-sized communities. The death rate in public assembly properties increases sharply in rural areas. These two factors account for the "U"-shaped appearance of the top curve of Figure 6.

The rural estimates are not very precise since comparatively few rural communities were sampled in the NFPA survey. This, together with the fact that rural areas comprise about 27 percent of the total U.S. population, results in the rural data contributing most to the overall statistical error in the national estimates. A more extensive rural survey would greatly improve the reliability of the national estimates and is planned.

Table 5. FIREFIGHTER CASUALTIES

(NOTE: None of the reported counts are thought to be complete.)

Source	Data	Firefighters Included	1975	1974
			Fatalities	
National Fire Protection Association	Reported count	Paid + Volunteer	100[1]	96[1]
National Fire Protection Association	Estimate (reported + unreported)	Paid + Volunteer	165[2]	N/A
International Association of Fire Fighters	Reported count	Paid only	108[3]	100[4]
			Injuries	
National Fire Protection Association	Estimate (reported + unreported)	Paid + Volunteer	65,000+[2]	60,000+[5]
International Association of Fire Fighters	Reported count	Paid only	51,312[3]	56,296[4]

[1] Private conversation, Louis Derry (NFPA) to J. Wm. Overbey (NFPCA), September 30, 1977. The count for 1976 was 107.

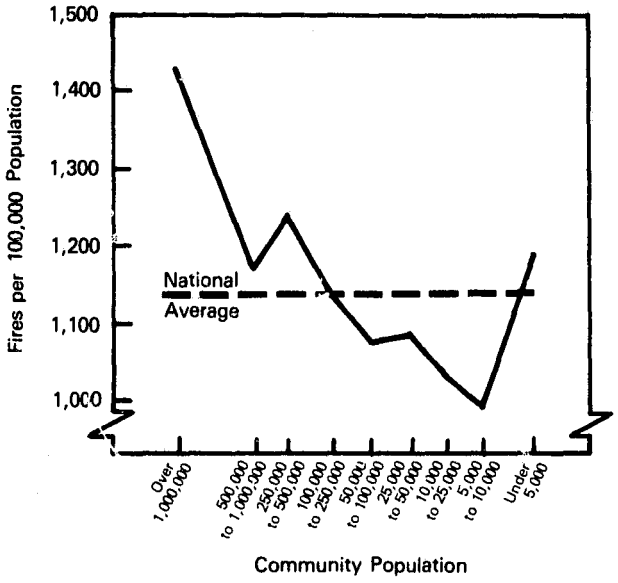
[2] "Fires and Fire Losses Classified, 1975," *Fire Journal*, November 1976, pp. 17-19.

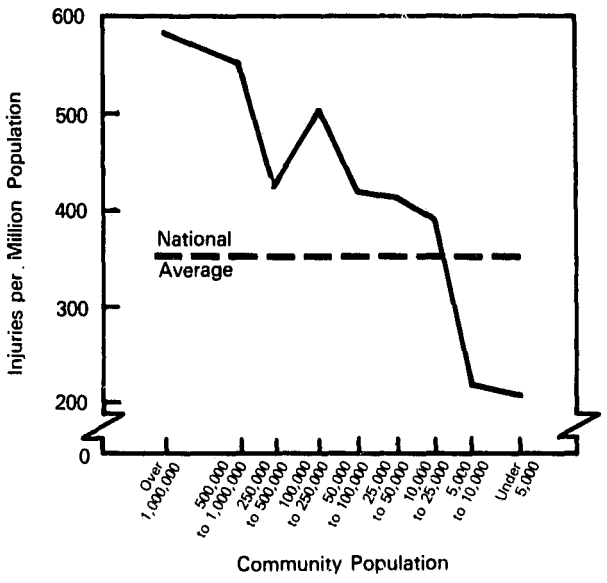
[3] "1975 Annual Death and Injury Survey," *The International Fire Fighter*, November 1976, pp. 9-16. Firefighter deaths reported to the IAFF from government units with 119,392 full-time firefighters.

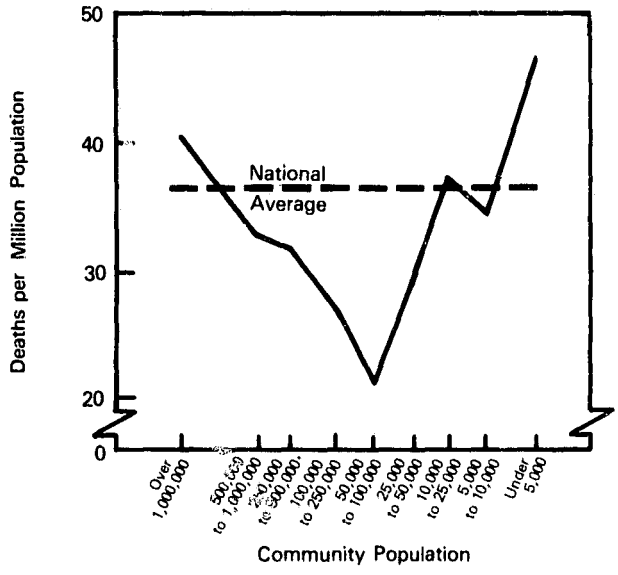
[4] "1974 Annual Death and Injury Survey," *The International Fire Fighter*, November 1975, pp. 8-13. Firefighter deaths reported to the IAFF from government units with 119,062 full-time firefighters.

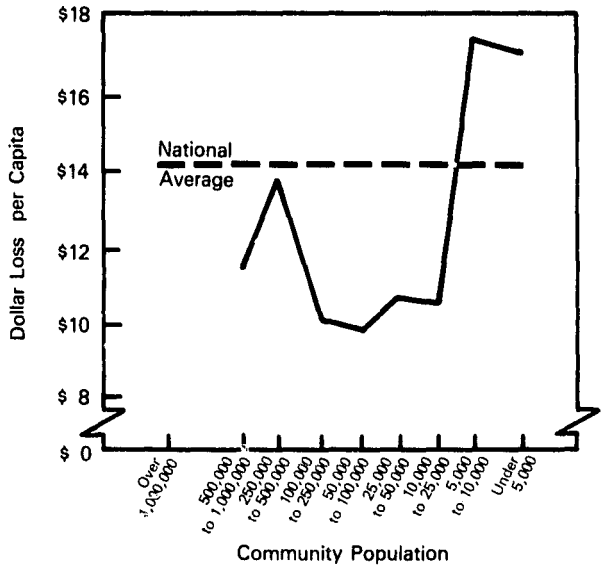
[5] "Fires and Fire Losses Classified, 1974," *Fire Journal*, September 1975, pp. 43-45.

Figure 4. FIRE LOSSES vs. COMMUNITY SIZE (1974 NFPA Survey)







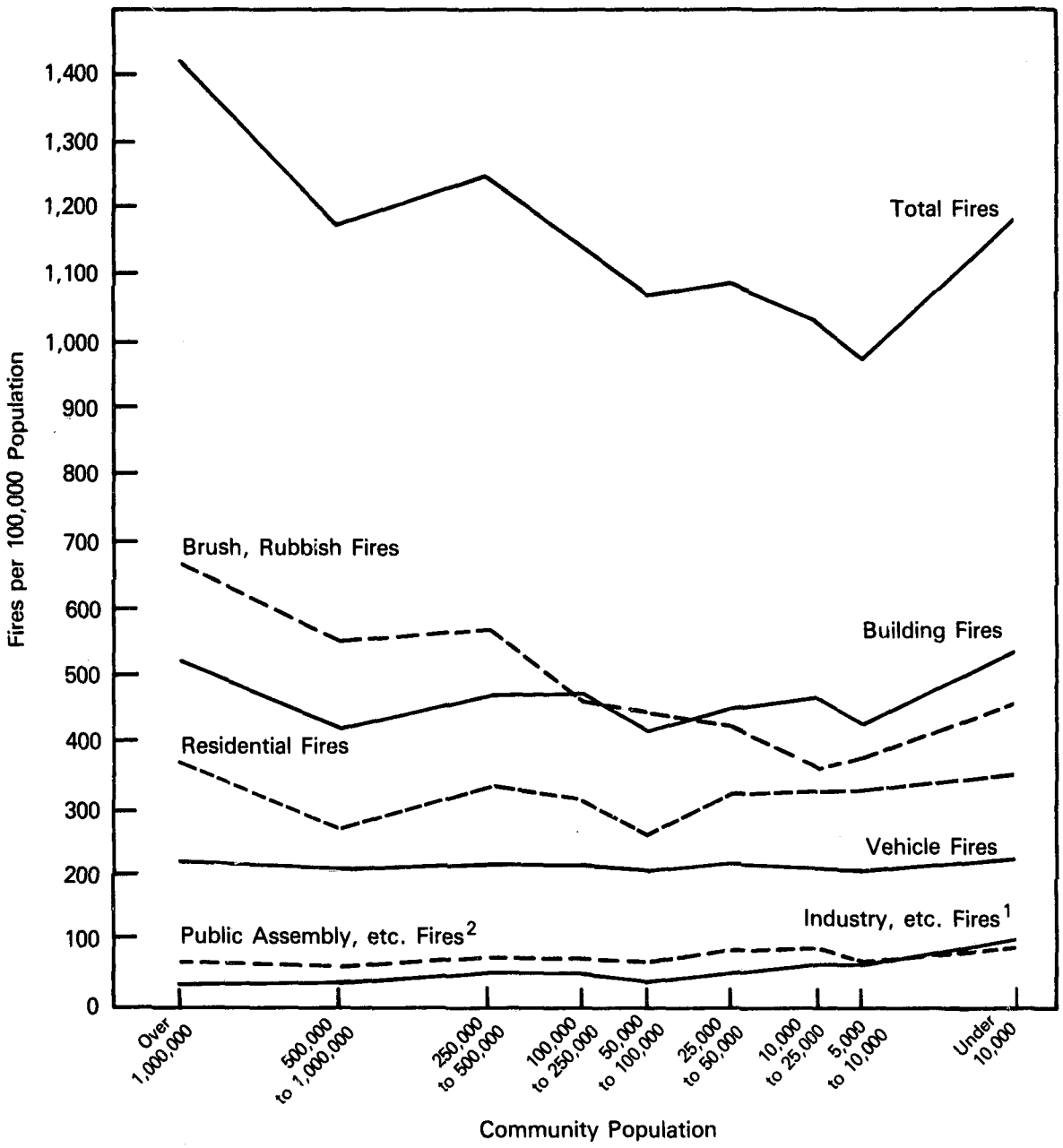


	Metropolis	Large Cities			Medium Cities	Small Cities		Small Towns	Rural
Population Range	Over 1 Million	500,000-1,000,000	250,000-500,000	100,000-250,000	50,000-100,000	25,000-50,000	10,000-25,000	5,000-10,000	Under 5,000
Approximate Number of Fire Departments	6	25	30	95	227	476	1,157	5,200	18,140
Approximate Percent of U.S. Population	9.2%	6.4%	5.1%	7%	8.2%	8.8%	10.5%	18.3%	26.5%

[1]Rough estimate.

NOTE: The National Averages plotted are those developed from the NFPA 1974 Survey results.

Figure 5. FIRE INCIDENT RATE BY PROPERTY TYPE AND COMMUNITY SIZE

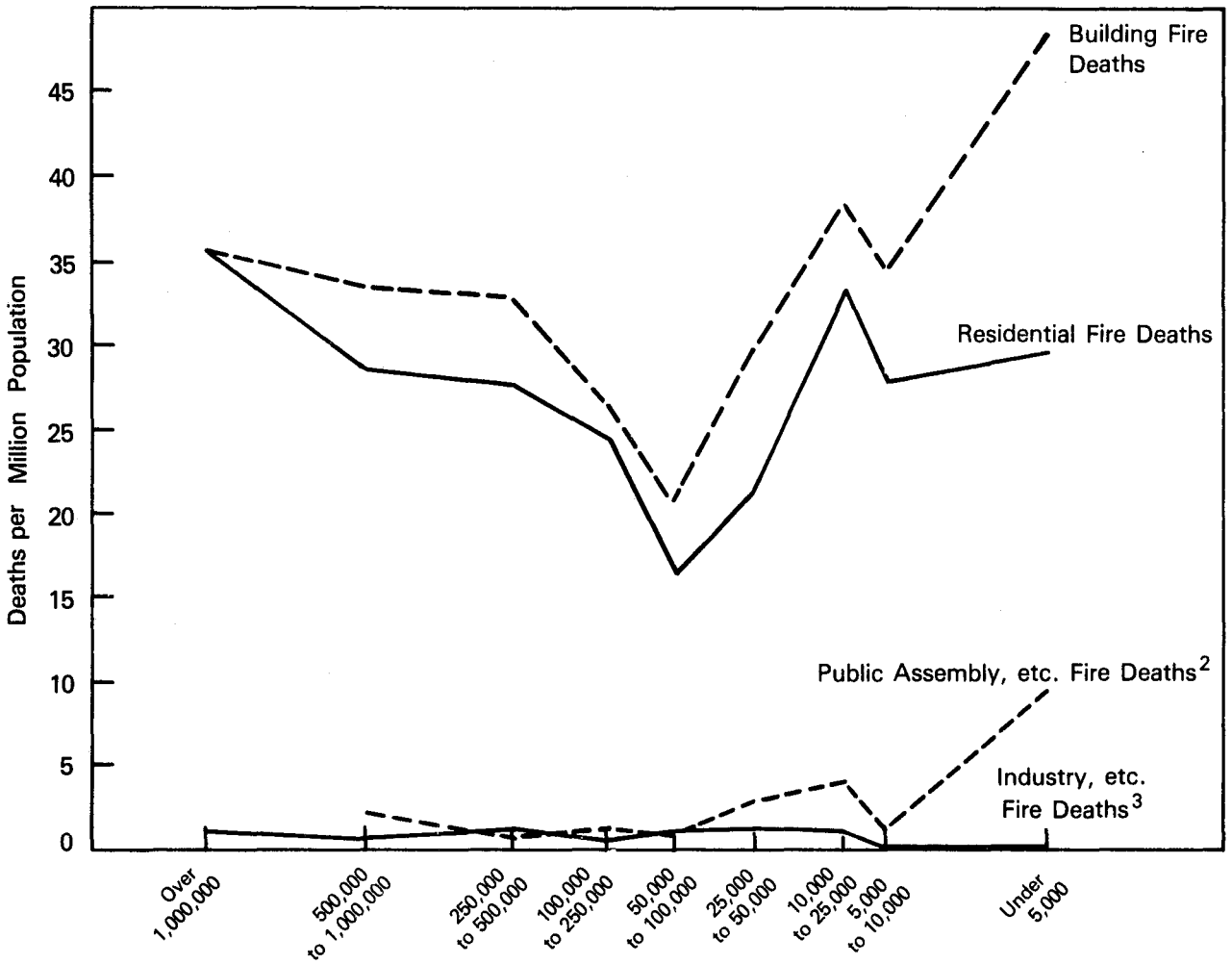


[1] "Industry, etc. Fires" includes those fires occurring in basic industry, utility, defense, manufacturing, storage, and special properties.

[2] "Public Assembly, etc. Fires" includes those fires occurring in public assembly, educational, institutional, and store/office properties.

SOURCE: 1974 NFPA Survey.

Figure 6. BUILDING FIRE DEATH RATE BY BUILDING TYPE AND COMMUNITY SIZE



SOURCE: 1974 NFPA Survey.

[1] Los Angeles County is included; if excluded the total death rate for the big city population interval would be 40.4. The effect of excluding Los Angeles County from the estimate of individual occupancy categories is unknown.

[2] "Public Assembly, etc. Fire Deaths" includes educational, institutional, public assembly, and store/office properties.

[3] "Industry, etc. Fire Deaths" includes basic industry, utility, defense, manufacturing, storage, and special properties.

Section III

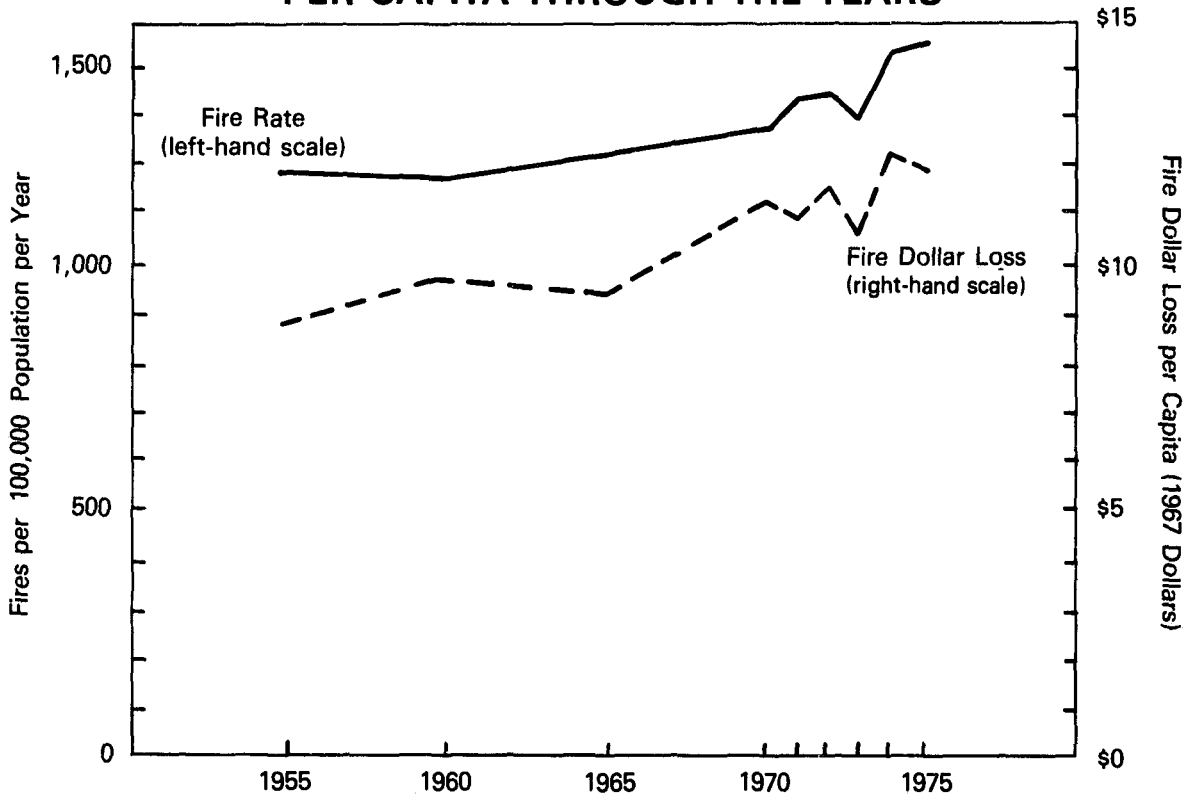
Comparisons: Other Years, Other Hazards, Other Countries

This section compares the U.S. fire problem today to that of other periods, other national problems, and other industrialized countries. These comparisons are intended to help put our fire problem in proper perspective, to help evaluate its importance, and to help determine the appropriate level of resources that should be directed toward a solution.

FIRE INCIDENCE AND LOSSES THROUGH THE YEARS

Per capita fire incident rates have increased by some 23 percent during the last 20 years (Figure 7). The per capita loss has increased about 40 percent over the same period, after adjusting for the effect of inflation by comparing figures on

Figure 7. FIRES AND FIRE DOLLAR LOSSES PER CAPITA THROUGH THE YEARS



SOURCE: Based on fire and fire loss estimates reported annually in "Fires and Fire Losses Classified", Fire Journal, *National Fire Protection Association, Boston, MA, and population estimates from* The Statistical Abstract of the United States, 1976 *Bureau of the Census, p. 5.*

a constant dollar basis. That is, losses have been rising faster than inflation and population—we are burning an increasing amount of property relative to our numbers.

Although the total amount of fire loss has increased several-fold (Figure 8), loss as a fraction of Gross National Product (GNP) has remained approximately constant (Figure 9). Since the GNP represents the total worth of goods and services our Nation produces, fire is claiming about the same share of our annual output. Taken together, these various loss trends imply that we have more things to burn and are therefore losing more when a fire occurs.

FIRE DEATHS THROUGH THE YEARS

Overall Fire Death Rates.—The overall fire death rate has declined significantly during the past 20 years. The data for 1955 through 1975 are shown in Figure 10. However, the U.S. fire death rate is still close to the highest, if not the highest, in the world, as discussed later. The U.S. problem is particularly severe for big cities, rural areas, the elderly, the very young, blacks, and males—as discussed in Section II.

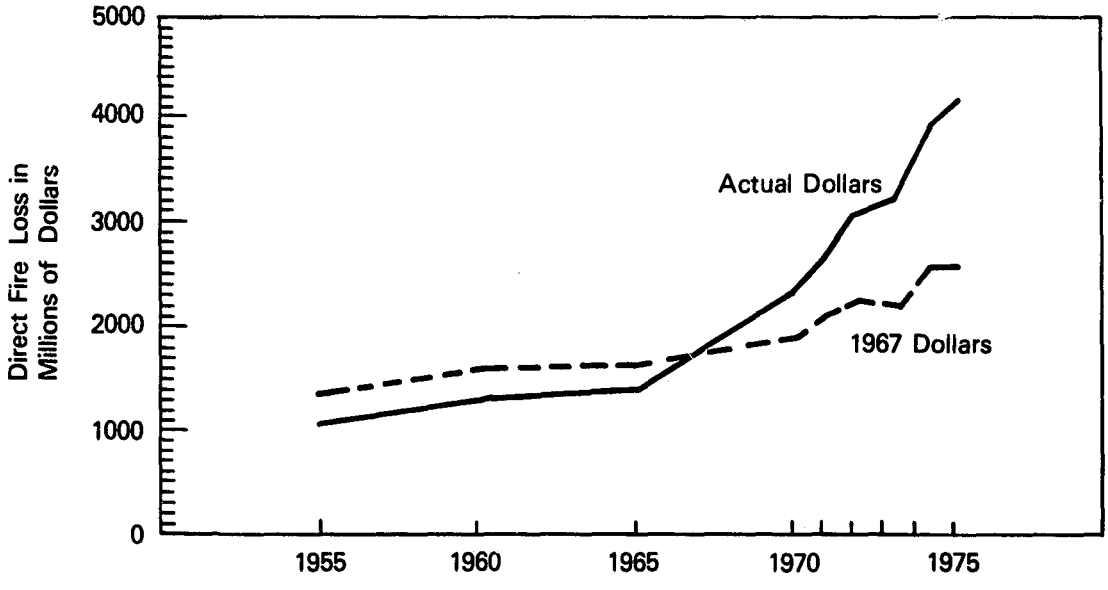
Some reasons have been suggested for the declining trend including:

1. More buildings and equipment built with better passive and active fire protection, largely due to improved building and safety codes and the availability of better materials and equipment.
2. Increased public fire safety education.
3. More numerous, better trained, and better equipped public fire departments.

Death Rates for Catastrophic Fires.—The frequency of fires causing five or more deaths is shown in Figure 11. These fires are decreasing in number, in total persons killed, and in severity (average number of deaths per multiple death fire). Only three to four percent of fire deaths occur in such fires; most fire deaths occur in ones and twos in the victims' own homes.

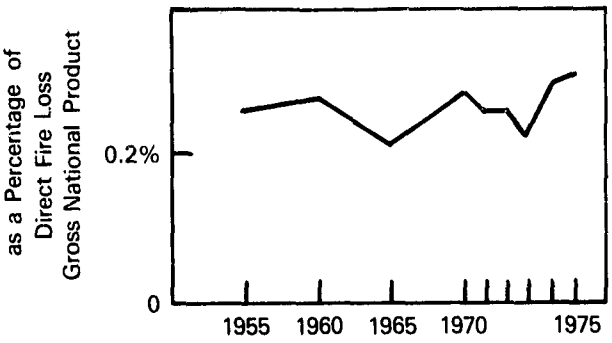
Fire Death Rates by Age Group.—It has long been realized that the elderly and the very young suffer inordinately high fire death rates. For persons 65 years of age and over, the fire death rate has been about three times that of the general population; for children four years of age and under, about twice. In the past few years, the fire

Figure 8. FIRE DOLLAR LOSSES THROUGH THE YEARS



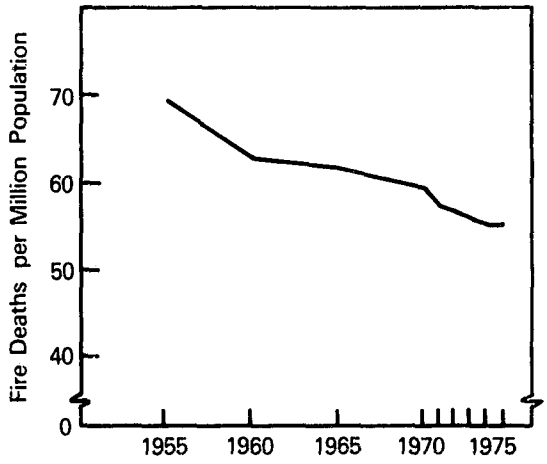
SOURCE: Based on fire loss estimates reported annually in "Fires and Fire Losses Classified," Fire Journal, *National Fire Protection Association, Boston, MA (1973-1975) and "Are We Winning the War Against Fire Waste? A Sequel,"* Fire Journal, *March 1973, p. 51. Conversion to 1967 dollars was made through the use of the Consumer Price Index as reported in* Statistical Abstract of the United States, 1976, *Bureau of the Census, p. 439.*

Figure 9. FIRE DOLLAR LOSS AS A PERCENT OF GNP



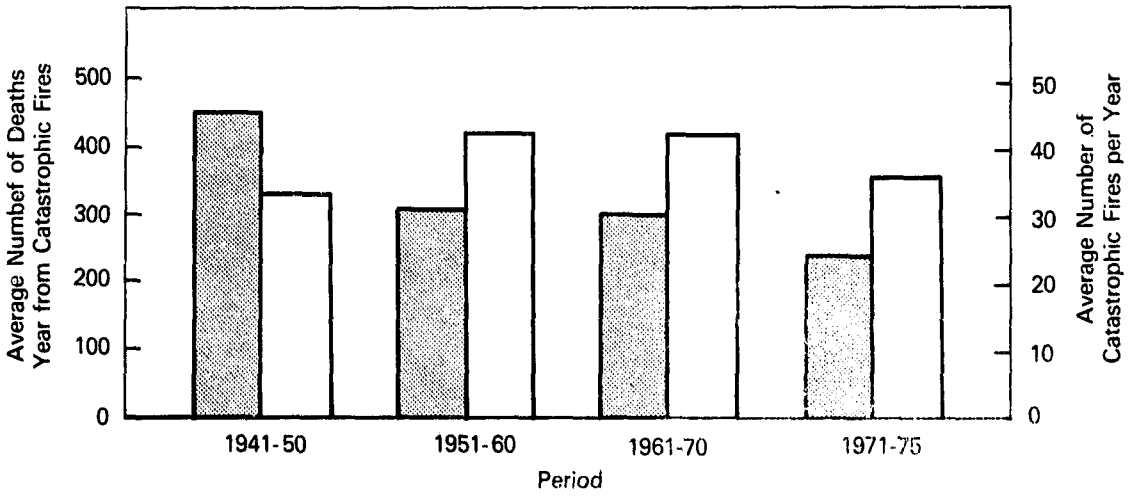
SOURCE: Based on fire loss estimates reported annually in "Fires and Fire Losses Classified," Fire Journal, *National Fire Protection Association, Boston, MA, and the Gross National Product reported in* The Statistical Abstract of the United States, 1976, *Bureau of the Census, and "Are We Winning the War Against Fire Waste? A Sequel,"* Fire Journal, *March 1973, p. 51.*

Figure 10. FIRE DEATH RATES THROUGH THE YEARS



SOURCE: Based on fire fatality estimates reported in "Fires and Fire Losses Classified, 1975", Fire Journal, *National Fire Protection Association, Boston, MA, November 1976, p. 19.*

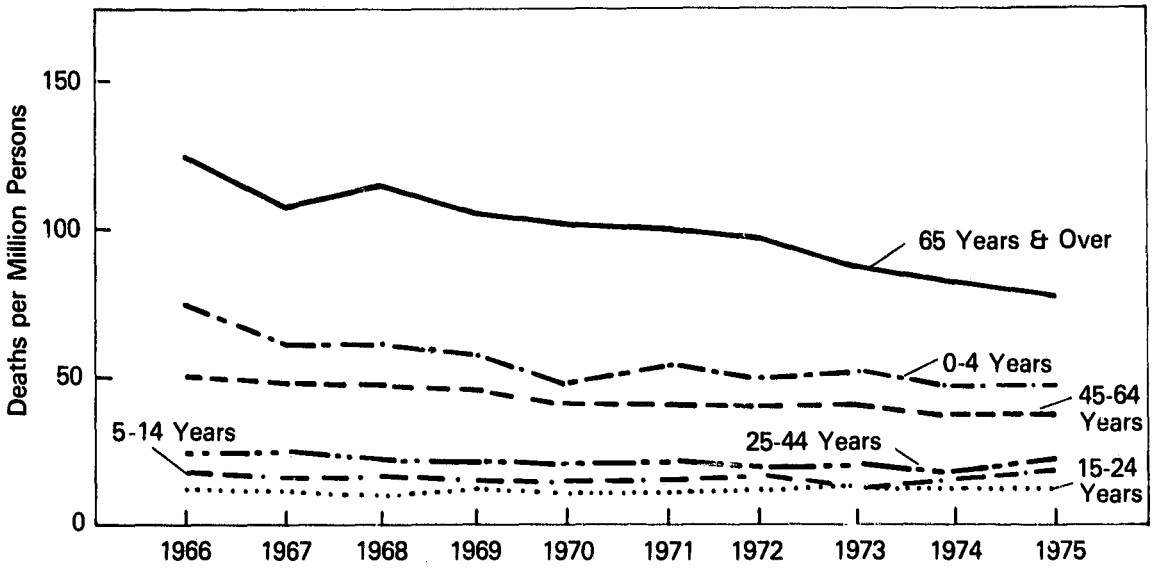
Figure 11. TRENDS IN CATASTROPHIC FIRES AND ASSOCIATED DEATH RATES[1]



▩ Average number of deaths per year for time period shown (left-hand scale).
□ Average number of catastrophic[1] fires per year for time period shown (right-hand scale).
[1] A catastrophic fire is one in which five or more deaths occurred.

SOURCE: Metropolitan Life Insurance Co., Statistical Bulletin, *August 1971, and unpublished data, as reported in U.S. Bureau of the Census,* Statistical Abstract of the United States, 1976 (97th Edition) *(Washington, DC: U.S. Department of Commerce, 1977), p. 67.*

Figure 12. FIRE DEATH RATE BY AGE GROUP, 1966-1975



SOURCE: National Safety Council as reported in Insurance Facts, 1976, *Insurance Information Institute, New York, NY, 1976, p. 35.*

death rates for both groups have been reduced significantly, although they are still much higher than for the population at large (Figure 12). It is not definitely known what caused the improvement, but there has been much fire prevention program effort expended toward this end. Government at all levels and many private organizations have worked to improve fire safety of nursing homes and housing for the elderly and to require that children's clothing be fire resistant, for example.

INCENDIARY FIRES THROUGH THE YEARS

There has been a sharp increase in the reported number of incendiary fires over the last 10 years. Table 6 shows the number of building fires where incendiarism was detected or suspected. To these must be added the undetected and unsuspected incendiary fires, plus fires of incendiary origin occurring in transportation vehicles, crops and wildlands, and outside of buildings. Incendiarism has become one of the most serious fire and crime problems. Part of the reported increase may be due, however, to improved detection or reporting techniques.

WILDFIRES THROUGH THE YEARS

Wildfires[18] destroy thousands of acres of valuable grass and timberland each year. They also harm the environment, which takes years to recover. Wildlife and fish are killed, watersheds destroyed, topsoil eroded, and rivers are polluted with ash and silted with topsoil.

Some of the most disastrous fires in American history have been wildfires.[19] The Peshtigo fire, Wisconsin, 1871, had losses involving 1,500 lives, an undetermined number of structures, and 1,280,000 acres of timberland; the Maine fire, 1947, with 16 lives, 1,200 structures, and 206,000 acres of timber and scenic forest land; the Cayote fire, California, 1964, with 1 life, 118 structures, and 67,000 acres of watershed lands; the Laguna fire, California, 1970, with 5 lives, 382 structures, and 175,000 acres of watershed lands; and most recently the Sycamore fire, 1977, Santa Barbara, California, with no lives, 250 structures, and 800 acres of watershed lands.

[18] A wildfire is a fire in grass, brush, or timberland burning out of control. In the NFPA Uniform Coding for Fire Protection (901 Code), it is classified as an "outside fire."

[19] Private communication from William R. Tikkala, Director, Cooperative Fire Protection, Forest Service, U.S. Department of Agriculture, Washington, DC, October 19, 1977.

Table 6. BUILDING FIRES OF DETECTED INCENDIARY OR SUSPICIOUS ORIGIN

Year	Total Number	Number per 100,000 Persons	Dollar Loss	Loss per Capita
1975	144,100	68	$633,900,000	$3.00
1974	114,400	54	563,000,000	2.70
1973	94,300	45	320,000,000	1.50
1972	84,200	40	285,600,000	1.40
1971	72,100	35	232,947,000	1.10
1970	65,300	32	206,400,000	1.00
1969	56,300	28	179,400,000	.90
1968	49,900	25	131,100,000	.70
1967	44,100	22	141,700,000	.70
1966	37,400	19	94,600,000	.50

SOURCE: "Fires and Fire Losses Classified," *Fire Journal*, September 1967 through 1975, November 1976. Rates based on *Census population estimates for the United States* as reported in U.S. Bureau of the Census, *Statistical Abstract of the United States: 1976* (97th Edition), (Washington, DC: Government Printing Office, 1976), p. 5.

Table 7. WILDFIRES THROUGH THE YEARS ON FEDERAL, STATE, AND PRIVATE PROTECTED LANDS

Year	Federal Protection				State Protection[2]			
	Acres Protected (Millions)	Number of Fires	Acres Burned (Thousands)	Acres Burned per Fire	Acres Protected (Millions)	Number of Fires	Acres Burned (Thousands)	Acres Burned per Fire
1976	680	15,800	519	33	737	157,035	2,118	13
1975	698	12,272	408	33	726	91,026	1,119	12
1974	678	15,040	1,200	80	708	105,835	1,511	14
1973	661	12,806	676	53	627	78,877	1,086	14
1972	652	15,937	1,232	77	631	83,010	1,050	13
1971	647	13,167	1,719	131	574	91,673	1,827	20
1970	647	14,968	719	48	521	101,455	1,541	15
1965[1]	655	9,073	146	16	472	91,495	1,206	13
1960[1]	363	12,090	622	51	403	77,537	1,909	25
1950[1]	247	8,604	2,451	285	361	96,578	3,407	35

[1] These values are for the particular year indicated and are not five or ten year averages.
[2] States protect State and some privately owned lands within their boundaries.

SOURCE: Private communication, William R. Tikkala (Director, Cooperative Fire Protection, U.S. Department of Agriculture, Forest Service) to Philip S. Schaenman (NFPCA), October 19, 1977.

The majority of wildfires do not kill people or burn structures, but the threat is there. Most wildfires burn grass, brush, or timber land and result in lost or delayed production of forage for livestock, browse for wildlife, and trees for paper and timber. The forest and rangelands of the Nation where most wildfires occur are the responsibility of Federal and State fire protection agencies.

Wildland fires in forests and grasslands under Federal protection have been successfully reduced over the past 50 years. Statistics on these fires for the years 1950 through 1975 are shown in Table 7. In 1950, the average fire on Federally-protected lands burned 285 acres before being brought under control; in 1976, it was only 33 acres. The number of fires has changed very little, although there are now many more acres under Federal protection.[20]

The States protect 737 million acres of forest and non-forested watershed on State land and some privately-owned land within their bound-

[20] Statistics for 1977 may be vastly different due to several extremely large fires.

aries. This protection is usually provided through the State forestry organization by the State forester. Financial and technical assistance is provided to the States through the Clarke-McNary Act of 1924.

In 1976, the States reported 157,000 fires burning 2.1 million acres of protected land. In addition, the States estimated 69,000 fires burning 2.5 million acres on 101 million acres outside State fire protection jurisdiction. Statistics on wildfires for the years 1950 through 1976 are also shown in Table 7.

HOW THE UNITED STATES COMPARES TO OTHER NATIONS

It has often been reported that the United States has one of the worst fire records of any developed nation.[21, 22] The different means of reporting and estimating numbers of fires in various countries make comparisons difficult. The most valid bases for comparison probably are the rates of *building* fires and deaths. A recent study by the Georgia Institute of Technology attempts to take into account reporting differences to the extent possible.[23] The study found that the U.S. rate of deaths resulting from building fires is indeed among the worst (Table 8).

This country's per capita dollar loss for building fires is also among the highest. As a fraction of the Gross National Product, per capita dollar loss is about average. However, the U.S. dollar loss per fire and the number of deaths per building fire are below the average of the 13 countries. The Georgia Tech study suggests that fire deaths and losses may be lower in other countries in part because they have devoted a greater part of their fire safety effort to prevention. The generally good U.S. job in suppression is not enough to offset our generally poor job in prevention, with the net effect being higher death and injury rates than in other countries.

HOW FIRE COMPARES WITH OTHER HAZARDS

National policy should determine resources to be devoted to reducing hazards. Resource allocations should depend on the relative severity of various problems, the expected reductions relative to resources needed, and their effect on lifestyles and the public's feeling of security.

To put the fire problem in its proper perspective, fire losses must be compared to losses from other problems, such as crime, accidents, and natural disasters. Such comparisons are presented next, and they make it clear that fire is one of our major national problems.

Fires Versus Crimes, Accidents, and Natural Disasters

As shown in Table 9, fire causes far more loss of life and property damage than all natural disasters combined. Although fire is lower in life and dollar loss than crime or auto accidents, it is of the same scale as these two. Dollar loss estimates are difficult to compare because of differences in definition and selection of the types of costs included in estimation methodologies.[24]

Fire vs. Residential Accident Deaths.—The more common causes of accidental residential deaths are ranked in Table 10. Fire is the second most frequent cause of accidental death in the home, after falls.

Fire vs. Other Catastrophes.—Fire has also been the cause of more catastrophic deaths in recent years than any other cause (Table 11). Some 27 percent of the deaths and 31 percent of the catastrophic incidents are from fires and explosions. Motor vehicle accidents follow with 23 percent of catastrophic deaths and 37 percent of incidents. Tornadoes, floods, hurricanes, and air transport accidents are next. All other causes for catastrophic incidents are of much less import.

[21] *America Burning: Report of the National Commission on Fire Prevention and Control*, Richard E. Bland, Chairman (Washington, DC: Government Printing Office, 1973), p. 1.

[22] Harlow, David W., "International Fire Losses, 1974," *Fire Journal*, November 1975, p. 43.

[23] Rardin, Ronald L. and Mitzner, Morris, *Determinants of International Differences in Reported Fire Loss: Preliminary Investigation* (Atlanta, GA: Georgia Institute of Technology, forthcoming) Fire Administration Grant No. NFPCA-76023.

[24] The NFPCA is currently sponsoring projects to estimate indirect losses from fire more accurately.

Table 8. WHERE THE UNITED STATES STANDS AMONG NATIONS—BUILDING FIRES,[1] 1972-1974

Country	Service Aspects Measured					
	Overall Fire Protection			Ignition Prevention	Fire Suppression	
	Dollar Loss per Capita	Dollar Loss as Percent of GNP	Total Fire Deaths per 100,000 Persons[2]	Reported Fires per 1,000 Persons	Dollar Loss per Fire (In Thousands)	Total Fire Deaths per 1,000 Building Fires[2]
Europe						
Austria	$ 4.70	.13%	.8	2.1	$ 2.4	3.9
Belgium	N/A	N/A	1.3	.9	N/A	14.0
Denmark	12.10	.22	1.7	3.4	3.9	4.9
France	9.00	.18	1.6	.8	12.6	21.7
Germany[3]	8.90	.16	1.0	.9	10.2	11.3
Italy	2.70	.11	.7	1.1	2.7	6.6
The Netherlands	7.70	.17	.7	.8	10.0	8.4
Norway	14.80	.31	1.1	7.8	1.8	1.5
Sweden	11.60	.19	1.3	2.6	4.7	5.2
United Kingdom	6.80	.21	1.8	2.5	2.8	7.2
Asia						
Japan	2.50	.07	1.8	.4	6.8	47.0
The Pacific						
Australia	13.20	.29	1.3	3.0	4.6	4.5
New Zealand	N/A	N/A	1.2	5.4	N/A	2.3
North America						
Canada	10.20	.18	3.2	2.8	3.8	11.7
United States	13.00	.21	3.1	5.7	2.3	5.4
U.S. Rank[4]	11 of 13	9.5 of 13	14 of 15	14 of 15	2 of 13	7 of 15

[1] Only building fires were included in this comparison because differences in definitions and reporting in the systems used by various nations prevent valid comparisons of fire rates based on all fires. Although comparisons of building fires are the most valid, definitional differences arise even for this category. The data here, including those for the United States, are 1972-74 averages.

[2] Total fire deaths were used for comparisons because for the international data the percentage of the total which are building fire deaths in each country was not available.

[3] German Federal Republic.

[4] Lower rank indicates better performance.

SOURCE: Rardin, Ronald L. and Mitzner, Morris. *Determinants of International Differences in Reported Fire Loss: Preliminary Investigation* (Atlanta, GA: Georgia Institute of Technology for the National Fire Prevention and Control Administration, June 1978, Grant No. NFPCA-76023, Table 3-6.

Table 9. COMPARISON OF ANNUAL LOSSES FROM FIRES, ACCIDENTS, NATURAL DISASTERS, AND CRIMES (MID 1970's)

Category	Number of Incidents	Deaths	Injuries	Dollar Loss (In Millions)[1]
Fires[2]	2,600,000 Reported	7,500	110,000 Reported	$ 4,200 Direct
	33,000,000 Total		300,000 Total	$13,600 Direct and Indirect
Accidents[3]	N/A	102,500	11,000,000-61,000,000[4]	N/A
Motor Vehicle	23,744,000	46,402	1,800,000-4,300,000[4]	$19,300 Direct and Indirect
				30,415 Direct and Indirect[5]
Household	N/A	26,000	N/A	N/A
Work	N/A	13,500	2,300,000-8,700,000[4]	$15,300 Direct and Indirect
				14,000 Direct and Indirect[5]
Other Public[6]	N/A	23,000	3,000,000-27,600,000[4]	N/A
Natural Disasters[7] (floods, tornadoes, hurricanes, and tropical storms)	200	400	N/A	$ 1,000[5]
Crimes	11,256,000 Reported[8]	20,465	N/A	N/A
	45,000,000 Total[9]			$97,000 Direct and Indirect[5]

[1] The definitions of dollar losses may not be consistent from one data source to another.
[2] NFPCA estimate, see Table 1. Total includes both reported and unreported fires.
[3] National Safety Council, *Accident Facts*, 1975, except as footnoted otherwise.
[4] National Center for Health Statistics, *National Health Survey.*
[5] Insurance Information Institute, *Insurance Facts*, New York, NY, 1976.
[6] As defined by the National Safety Council, this category includes recreation, transportation (except motor vehicles), and public building accidents.
[7] Office of Statistical Climatology, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, as reported in the *Statistical Abstract of the United States, 1976.*
[8] Federal Bureau of Investigation, *Crime in the United States: Uniform Crime Statistics*, U.S. Department of Justice, 1975.
[9] Total includes both reported and unreported crimes. Unreported crimes obtained from Ramsey Clarke, *On Crime in America*, Simon and Schuster, New York, NY, 1970.

Table 10. WHERE FIRE STANDS AMONG RESIDENTIAL ACCIDENT FATALITIES, 1975

Rank	Cause of Death	Total Deaths	Death Rate[1]
1	Falls	8,400	39.4
2	FIRES, BURNS, AND DEATHS ASSOCIATED WITH FIRES	5,100	23.9
3	Poisoning by solids and liquids	3,300	15.5
4	Suffocation—ingested object	1,900	8.9
5	Firearms	1,400	6.6
6	Poisoning by gasses and vapors	1,000	4.7
7	Suffocation—mechanical	800	3.8
8	All other residential	3,600	16.9
	Total Residential	25,500	119.7

[1] Deaths per million population.
[2] Most important types included are: drowning, electric current, explosive materials, and blow by falling object.

SOURCE: *Accident Facts, 1976* (Chicago, IL: National Safety Council, 1976).

Table 11. CATASTROPHIC ACCIDENTS AND DEATHS BY TYPE OF INCIDENT, 1941-1975 [1]

Type of Accident	1941-45		1946-50		1951-55		1956-60		1961-65		1966-70		1971-75		Total 1941-75	
	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths	No.	Deaths
All Types[2]	482	6,801	568	6,412	678	6,769	855	7,021	724	6,602	616	5,911	520	5,601	4,393	45,117
Fire and explosion	146	2,391	184	2,138	190	1,354	230	1,745	221	1,630	199	1,460	199	1,410	1,369	12,128
Dwellings, apartments	53	326	113	708	135	822	177	1,095	177	1,061	145	908	135	796	935	5,716
Hotels, boarding houses, rooming houses	18	213	18	302	15	119	9	56	8	79	17	164	16	139	101	1,072
Homes for the aged, convalescent homes, hospitals, etc.	8	99	8	182	10	129	7	125	9	156	3	44	14	126	59	861
Places of amusement	5	679					2	26	2	94	1	5	2	31	12	835
Other	62	1,074	45	946	30	284	35	443	25	240	33	339	32	318	262	3,644
Motor Vehicle	128	916	164	1,069	289	1,732	377	2,305	324	2,045	237	1,508	140	941	1,659	10,516
Bus	36	347	23	192	17	136	15	128	16	183	15	130	13	126	135	1,242
Collision with railroad train	9	97	3	42	3	22	2	13	3	63	2	97	3	19	25	283
Other	27	250	20	150	14	114	13	115	13	120	13	103	10	107	110	959
Motor vehicle other than bus	92	569	141	877	272	1,596	362	2,177	308	1,862	222	1,378	127	815	1,524	9,274
Collision with railroad train	34	216	35	215	51	295	43	279	36	223	19	123	10	58	228	1,409
Other	58	353	106	662	221	1,301	319	1,898	272	1,639	203	1,255	117	757	1,296	7,865
Air transportation[2]	27	380	61	991	59	1,043	53	1,090	75	1,327	101	1,541	95	1,384	471	7,756
Water transportation	45	594	44	380	46	421	36	298	26	212	19	204	9	117	225	2,226
Railroad[3]	28	548	17	313	12	193	12	176	3	30	3	22	3	60	78	1,342
Tornadoes, floods, hurricanes, etc.	50	1,163	61	1,129	48	1,649	50	1,033	41	1,062	39	948	46	1,295	335	8,279
Mines and quarries	37	607	16	263	12	207	10	132	9	140	6	158	4	111	94	1,618
All other	21	202	21	129	22	170	37	242	25	156	12	70	24	283	162	1,252

[1] Accidents in which five or more persons were killed.
[2] Excludes military aviation accidents.
[3] Collisions of railroad trains with motor vehicles are classified as motor vehicle accidents.

SOURCE: Metropolitan Life Insurance Co., "Catastrophic Accidents, a 35-Year Review" *Statistical Bulletin,* March 1977, pp. 1-4. Basic data derived from news items in the daily press, reports of the National Weather Service, U.S. Bureau of Mines, and other sources. Data may be incomplete, particularly with regard to accidents taking five to nine lives.

Section IV

Selected Characteristics of Fires

This section presents an analysis of selected characteristics of the fire problem. It includes casualty characteristics, causes of residential and non-residential fires, comparisons among communities of varying sizes, statistics on when fires occur, and the performance of sprinkler systems. Results from the 1974 National Household Fire Survey of residential fires are also discussed. Part II of this report provides much greater detail. Data from 284,000 fire incident reports from the States of California and Ohio were used for this section.

The two States considered here have a combined population of almost 32 million persons, about 15 percent of the U.S. population. The data may or may not be typical of the entire Nation—we do not know yet—but they do cover communities of all sizes, many climates, and diverse geographical regions. Over 2,000 fire departments are represented.

This section illustrates the types of policy-relevant information that can be extracted from the National Fire Incident Reporting System (NFIRS). As more States enter the NFIRS system, the results will, of course, become more representative of the country as a whole.

In developing these results, we were faced with the difficulty of subdividing the fire problem into useful and understandable categories. Evaluations of the problem from many different perspectives aid in understanding its many facets. For example, to evaluate the effectiveness of prevention education, it is useful to distinguish fire causes related to human behavior from causes related to equipment failures. To evaluate prevention approaches dealing with making materials flame resistant, it is useful to group causes by "material first ignited." A major benefit resulting from the detail provided in the data collected by NFIRS is that it permits analyses from these multiple, but necessary perspectives.

The approach taken for the analysis presented in this section is that it must be useful to State and local fire services, especially those officials concerned with fire prevention policy. Many of the analyses are also likely to be of interest to the Federal Government, industry, or researchers. The detailed breakdowns can also be regrouped according to other viewpoints; for example, information on fires involving consumer products can be gleaned from the analyses of heating, cooking, and other types of fires in Part II.

INJURIES CAUSED BY FIRE

The most important aspect of fire protection is personal safety. To reduce casualties, it is important to know what types of injuries occur, where and why they occur, and who is being hurt. Table 12 summarizes the types of injuries and causes of deaths sustained by civilians and firefighters in Ohio in 1976. (More details and data for other States and cities are given in Part II, pages 57 through 149.)

Injuries to firefighters account for over half (56 percent) of all injuries associated with fires attended by the fire service in Ohio. Although there is some question on the extent to which minor injuries to both firefighters and civilians are reported, firefighters clearly account for a substantial portion of the total injuries from fire in Ohio and many other places. Thus, injuries to firefighters require special attention if we are to make a major reduction in overall fire injuries and reduce the exceptional risks run by firefighters.

Smoke inhalation is the most common injury to firefighters in Ohio (25 percent), followed by

Table 12. FIRE CASUALTIES BY NATURE OF INJURY—Ohio (NFIRS 1976)

Nature of Injury	Non-Fatal Injuries							
	Total Civilian		Male Civilian		Female Civilian		Firefighter	
	Number	Percent	Number	Percent	Number	Percent	Number	Percent
Burns & Asphyxia/smoke ..	167	12	97	10	70	14	67	4
Burns only	617	43	443	48	174	35	206	11
Asphyxia/smoke only	397	28	234	25	163	33	464	25
Wound, cut, bleeding	107	8	81	9	26	5	304	17
Dislocation, fracture	22	1.5	14	1.5	8	1.6	50	3
Complaint of pain[1]	24	1.7	11	1.2	13	3	103	6
Shock	17	1.2	8	0.9	9	1.8	7	0.4
Strain, sprain	19	1.3	9	1.0	10	2	316	17
Other	25	1.8	12	1.3	13	3	258	14
Undetermined	26	1.8	17	1.8	9	1.8	58	3
Total	1,421	100%	926	100%	495	100%	1,833	100%

Nature of Injury	Fatalities[2]					
	Total Civilian		Male Civilian		Female Civilian	
	Number	Percent	Number	Percent	Number	Percent
Burns & Asphyxia/smoke ..	124	55	77	57	47	53
Burns only	21	9	10	7	11	12.5
Asphyxia/smoke only	31	14	17	12.5	14	16
Wound, cut, bleeding	3	1.3	1	0.7	2	2
Dislocation, fracture	1	0.4	0	0	1	1.1
Complaint of pain[1]	6	3	5	4	1	1.1
Shock	2	0.9	1	0.7	1	1.1
Strain, sprain	0	0	0	0	0	0
Other	5	2	4	3	1	1.1
Undetermined	31	14	21	15	10	11
Total	224	100%	136	100%	88	99%

[1] Includes heart attacks and strokes.

[2] The nature of injury resulting in a firefighter fatality is not indicated because in 1976 in Ohio there were only five firefighter fatalites reported to NFIRS.

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

SOURCE: Ohio 1976 NFIRS data. Estimated completeness is roughly 50 percent (Reference 11).

strains or sprains (17 percent), and cuts or wounds (17 percent).

Firefighter deaths in Ohio were too few (5 were reported) to make any generalizations. However, as previously mentioned, a recent IAFF study shows that almost 45 percent of on-duty firefighter deaths nationwide are due to heart attack, more than three times the second largest cause of death.[25]

In Ohio, males account for 61 percent of the civilian deaths and 65 percent of the civilian injuries, similar to the totals for the United States as a whole (Figure 2, page 17).

[25] Balanoff, Thomas, *Fire Fighter Mortality Report* (Washington, DC: The International Association of Fire Fighters for the National Fire Prevention and Control Administration and the Center for Fire Research, Institute for Applied Technology, National Bureau of Standards, May 1976), Contract No. 4-35909, p. 111.

The vast majority of civilian casualties in Ohio were due to burns or smoke inhalation—83 percent of injuries and 79 percent of fatalities. The most frequent injury is burns alone (43 percent); the most frequent fatality is from burns and smoke together (55 percent).

WHERE FIRE LOSSES OCCUR

Shown in Table 13 is the relative distribution of California and Ohio fires and fire losses among the major occupancies. The non-residential category is further subdivided into structures, mobile property, and outside property. Mobile homes have been included with residences.

About half of all fires in the two States occur on outside property, such as grass, trees, brush, or rubbish. These are usually small fires which do

Table 13. REPORTED FIRE LOSSES FOR MAJOR OCCUPANCY TYPES[1]— California (CFIRS 1975), Ohio (NFIRS 1976) Combined

Occupancy Type	Fires		Deaths		Injuries		Dollar Loss	
	Number	Percent	Number	Percent	Number	Percent	(Thousands)	Percent
Residential[2]	63,555	22	471	68	5,093	57	$155,609	44
Non-residential Structure	29,275	10	48	7	2,329	26	150,884	43
Mobile Property	43,037	15	148	21[3]	767	9	24,732	7
Outside Property (Rubbish, wildlands, etc.)	148,112	52	28	4	751	8	22,183	6
Total	283,979	99%	695	100%	8,940	100%	$353,408	100%

[1] Reported fire incidents shown do not include all fires attended by fire departments, only those reported to the State (mostly by the fire service). Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Mobile homes are included in this category and excluded from the Mobile Property category.
[3] This percent is higher than the national average. Possible reasons are that Californians drive more or different definitions are used in data collection.

not result in significant losses, though they include some large, dangerous wildland fires.

Apart from these outside fires, residential fires are the principal category of fires and fire losses. More specifically:

Fire Incidents—Residential fires comprised slightly over two-thirds of the structural fires in the two States (and 22 percent of all fires.)

Deaths —Residential fires accounted for 68 percent of deaths; mobile property fires (mostly automobiles) were second with 21 percent. Non-residential structural fires—which include public places such as nightclubs, schools, and stores—accounted for only 7 percent of deaths.

Injuries —Residential fires accounted for 57 percent of injuries; non-residential structural fires were second with 26 percent.

Dollar Loss —Residential and non-residential structural fires accounted for about the same dollar loss, approximately 43 percent each.

Clearly the residential fire problem must receive a high priority if the United States is to achieve a significant reduction in human and economic fire losses.

VIEWING FIRE CAUSES

There are many ways to describe the cause of a fire and to group similar causes in a way that helps in making fire protection decisions. We decided to use the cause categories shown in Table 14 as shorthand for more complex causal factors. How we arrived at that choice is discussed below.

The NFPA 901 Coding System, upon which the National Fire Incident Reporting System is based, does not give a single "cause of the fire," but, rather, it gives a more detailed breakdown that corresponds to the physical environment and contributing factors of cause. An ignition requires three basic ingredients: a source of heat, something to ignite, and a triggering mechanism or agent to bring the two together. The corresponding NFPA 901 data elements are formally called: form of heat of ignition, type of material ignited, and ignition factor. Other 901 data elements cover equipment involved in ignition and form (or usage) of material ignited. These five factors together comprise the cause. By using these factors, one can analyze the causes of fires from several different prevention perspectives, such as human behavior or flammability of materials, as appropriate. One of the major advantages of the NFIRS system is that it collects data on each individual element so that they can be aggregated for analytical purposes into different groups at different times as required.

Viewing the relative frequency of incidents, casualties, or dollar losses separately for each of

Table 14. "CAUSE" CATEGORIES USED IN THIS REPORT

Sorting Sequence	"Cause" Category[1]	Definition
1	Exposure	Caused by heat spreading from another hostile fire.
2	Natural Source	Caused by sun's heat, spontaneous ignition, or chemical, lightning, or static discharge.
3	Incendiary/Suspicious	Fire deliberately set or suspicious circumstances.
4	Explosives, Fireworks	Self-evident; explosives used as incendiary devices included in category 3.
5	Smoking	Cigarettes, cigars, pipes as heat of ignition.
6	Children Playing	Includes all fires caused by children playing with any materials contained in the categories below.
7	Heating Systems	Includes central heating, fixed and portable local heating units, fireplaces and chimneys, water heaters as source of heat.
8	Cooking Equipment	Includes stoves, ovens, fixed and portable warming units, deep fat fryers, open fired grills as source of heat.
9	Air Conditioning, Refrigeration	Includes dehumidifiers and water cooling devices as well as all air conditioning and refrigeration equipment as source of heat.
10	Electrical Distribution	Includes wiring, transformers, meter boxes, power switching gear, outlets, cords, plugs, lighting fixtures as source of heat.
11	Appliances	Includes TV's, radios, phonographs, dryers, washing machines, vacuum cleaners, separate motors, hand tools, electric blankets, irons, electric razors, can openers as heat source.
12	Gas	Material first ignited was a gas: natural, LP, manufactured, anesthetic, acetylene, other gas.
13	Flammable, Combustible Liquid[2]	Material first ignited was flammable liquid: gasoline, ethyl alcohol, ethyl ether, acetone, jet fuel, turpentine, kerosene, diesel fuel, cooking oil, lubricating oil, etc.
14	Open Flame, Spark (Heat from)	Includes torches, candles, matches, lighters, open fire, backfire from internal combustion engine as source of heat.
15	Other Equipment	Includes special equipment (radar, X-ray, computer, telephone, transmitters, vending machine, office machine, pumps, printing press), processing equipment (furnace, kiln, other industrial machines), service, maintenance equipment (incinerator, elevator).
16	Other Heat	Includes all other fires caused by heat from fuel-powered objects, heat from electrical equipment arcing or overloaded, and heat from hot objects not covered by above groups.
17	Unknown	Cause of fire undetermined or not reported.

[1] "Cause" as used here is a shorthand notation for what is sometimes a complex chain of events leading to a fire.
[2] Note that incendiary fires involving flammable liquids are covered in category 3, not 13.

the above five NFPA 901 Ignition Characteristics provides insights into some of the most important components of the fire problem. This is one of the most common types of analysis used by the fire service today. One of the things it can be used to show, for example, is how often specific materials (such as plastics or wood) or products (such as mattresses) are involved in ignitions. Other examples are shown in Appendix VII.

While viewing the data from a single causal factor provides useful information, it is frequently desirable to consider several factors to understand their joint effect, or the "scenario" in which they all played a role. Table 15 shows the relative frequency of death and amount of dollar loss for the top five scenarios of Ohio residential fires. The four factors used for each scenario make up a chain of events which led to the fires. A variety of proposed intervention strategies can be evaluated to determine if any could break that chain and prevent the fire from occurring. The scenario method is an example of aggregating several NFIRS (901) data elements for analytical purposes.

Scenario analysis has several drawbacks when only limited data are available. One arises from spreading a small number of fire incidents over many categories. Frequently a situation results where even the most frequent pattern, or scenario, may appear "trivial" because it accounts for a small percentage of the fires. A related drawback is that a major phenomenon may be masked by being broken into too many little categories. For example, Table 15 distributes fires involving smoking materials that ignite textiles into three scenarios. Other fires involving smoking materials are distributed among many additional scenarios. Smoking, therefore, appears in this table to be a smaller problem than it really is.

To obtain a general overview of the fire problem, it seemed more advantageous to use the aggregated cause categories shown in Table 14.[26] For most fires there is no problem in choosing an appropriate category. However, there are some instances when more than one cause category could be used to describe the same fire incident. For example, one person might describe a fire resulting from children playing with a stove as a "children playing" fire while another person would describe it as a "cooking-related" fire. Rather than assign multiple causes to the same fire—in which case the sum would exceed the total number of fires—we have used a hierarchical approach (sorting sequence) which assigns a single cause category to each fire.

The basic idea in the hierarchical ranking of the categories is that a fire is compared against the first category; if it fits, it is assigned to that cause category. If not, it is checked to see if it fits in the second category, etc. For example, a

[26] This table is also repeated inside the back cover for easy reference. For the reasons given in the text above, those individuals using NFIRS Standard Feedback Reports should note that their reports are not directly comparable with the Tables presented in this volume.

Table 15. EXAMPLE "SCENARIO" DESCRIPTIONS OF RESIDENTIAL FIRES—Ohio (NFIRS 1976)

The Top Scenarios for Deaths in Residential Fires	Percent of Deaths
1. Day/Smoking materials/Textile/Furniture. (e.g., cigarette left on upholstered furniture during the day)	3.9%
2. Night/Smoking materials/Textile/Furniture.	3.9
3. Night/Smoking materials/Textile/Bedding or clothing. (e.g., cigarette dropped on bed at night)	3.9
4. Night/Hot object/Textile/Bedding or clothing.	3.0
5. Night/Smoking materials/Natural products/Furniture.	3.0
The Top Scenarios for Dollar Loss in Residential Fires	**Percent of Dollar Loss**
1. Night/Arc from electric equipment/Wood/Structure or finish.	5.2%
2. Day/Arc from electric equipment/Wood/Structure or finish.	3.8
3. Night/Smoking materials/Textile/Furniture.	1.8
4. Day/Smoking materials/Textile/Furniture.	1.7
5. Day/Open flame/Textile/Bedding or clothing.	1.4

[1] Each scenario is made up of the following sequence of elements: Time of Day/Source of Heat/Material First Ignited/Form of Material First Ignited. Incidents with an unknown value for any element are excluded from the calculation of percentages as well as from the list of top scenarios.

fire unintentionally set by a child playing with gasoline near a stove would be categorized as "children-playing," not as "flammable liquid," and not as "cooking." This approach can be somewhat misleading in that the categories at the beginning of the list are "favored" and tend to appear larger with respect to those at the end of the list than they would under a different hierarchical ranking. For example, if the category "open flame, spark" was placed earlier in the list than "incendiary/suspicious," many fires currently contained in the "incendiary/suspicious" category would switch categories, the relative frequencies would alter, and a different view of the fire problem would result. Another major problem with such categorization schemes is that fires involving a particular material first ignited are scattered across categories and require separate analysis.

Another element of arbitrariness that enters into the simplified cause categories, especially when equipment is involved, concerns the specific types of equipment to be included. For example, if water heaters or fireplaces were separated out from the heating category, this category would appear less important relative to other categories.

Certainly, the approach described in Table 14 cannot serve all purposes. The categories of that table are not in order of importance, but rather the order in which we felt it logical to make meaningful categorizations for guiding prevention efforts. A variety of cause categories have been used for analytical purposes and presentation by different organizations and fire departments. Our selection was a compromise.

CAUSES OF RESIDENTIAL FIRES

The "causes" of residential fires and how they vary by size of community are discussed here. The analysis in this and the next section is based on fires reported to the fire service. The third section discusses the cause of fires not reported to the fire service.

Figure 13 shows the relative frequency of the different causes of residential fires. There are eight major cause categories for fires in residences: cooking, smoking, heating, incendiary/suspicious, electrical distribution, appliances, children playing, and open flames or sparks. These eight do not have the same rank order in both States, but they are the top eight in each State. For example, fires involving "open flames or sparks" is a high-ranking major cause for California, but is a lower ranked cause for Ohio; the reverse is true for children playing. These eight categories account for at least 80 percent of all residential fires, at least 64 percent of all residential fire deaths, at least 77 percent of all residential fire injuries, and at least 62 percent of residential dollar losses.[27] A more detailed description of leading causes follows:

Fire Incidents— The top four major cause categories — cooking, smoking, heating, and incendiary/suspicious — represent the principal causes of reported fires and account for 55 percent of them.

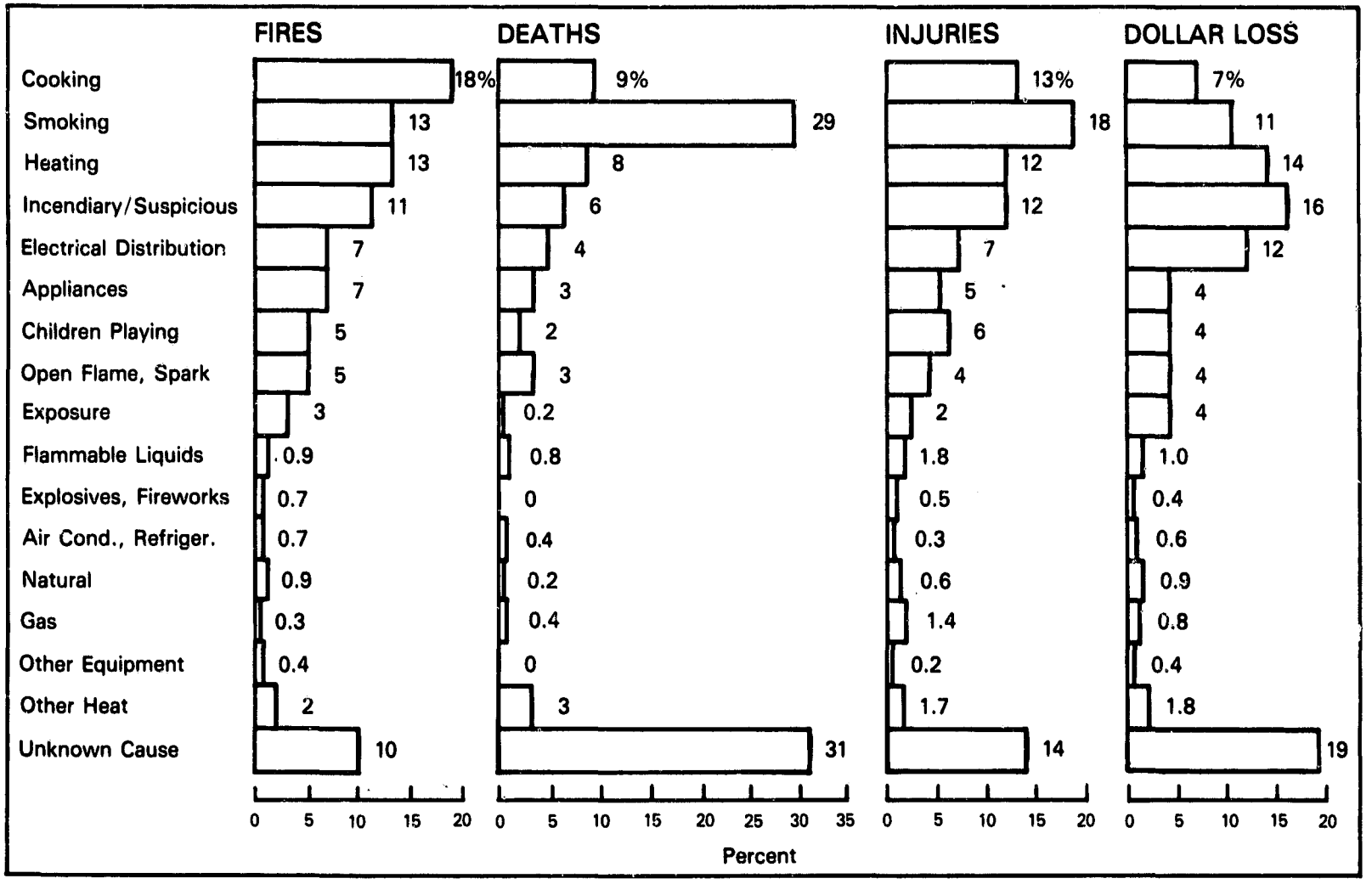
Deaths — Fires resulting from people smoking is by far the principal known cause of fire death (29 percent), with cooking and heating next. The largest category is actually "unknown cause," which applies to 31 percent of the deaths.

Injuries — The top four causes—cooking, smoking, heating, incendiary/suspicious — account for 55 percent of all injuries.

Dollar Loss — Fires of incendiary/suspicious nature result in the most dollar loss, followed by heating, electrical distribution, and smoking fires. Note that electrical distribution fires cause almost double the dollar loss of fires involving cooking, even though cooking fires are more than twice as frequent. Again, the unknown category contains the largest proportion; many of these may well be of incendiary origin.

[27] To the extent that the fires currently classified as being of unknown cause were actually caused by any of these eight causes, the hazard presented by these causes would be greater than shown.

Figure 13. CAUSES OF REPORTED RESIDENTIAL FIRES – California (CFIRS 1975), Ohio (NFIRS 1976) Combined[1]



[1]Based on approximately 64,000 residential fires in California and Ohio. These were fires attended by the fire service and comprised roughly 90 percent of such fires in California and 50 percent in Ohio (Reference 11).

What can be done about the residential fire problem? Some actions that households may take to prevent the leading causes of fires are listed in Table 16. Smoke detectors, coupled with a practical escape plan, can reduce casualties and losses once fire does strike. The fire service (and others) may wish to teach these preventive actions to the public along with providing data to motivate them to take the required action.

FIRE CAUSES IN DIFFERENT SIZE COMMUNITIES

There is considerable variation in fire rates and losses between California and Ohio, and also among cities within each of these States. Large differences in fire loss among cities of varying population size were mentioned earlier in the discussion of data from the 1974 NFPA survey (page 18). Similar differences are found when considering residential fires alone. A better understanding of the reasons for such diversity may be gained by examining variations in fire rates among different sized communities for each of the major causes of residential fires. Figure 14 illustrates the average fire rate for the Ohio cities by population group for each of the eight major cause categories.

The Ohio cities were grouped into four ranges of population: over 200,000 persons, 50,000 to 200,000 persons, 25,000 to 50,000 persons, and less than 25,000 persons. The last group included rural communities as well as small towns. Data from seven cities using the NFPA 901 codes under the Uniform Fire Incident Reporting System (UFIRS) were also included in the comparison.[28, 29] The UFIRS cities provide a fifth group. The fire rate for each of the five groups is plotted in Figure 14 at the mean value of the population range.

The largest differences in fire rates among cities occurred in cause categories dominated by human carelessness or misbehavior—such as smoking or arson, rather than in categories where equipment malfunctions dominate—such as appliances, electrical distribution, and heating. Several interesting points are suggested by this data. First, although the larger Ohio cities probably had more complete reporting than the smaller cities,[30] the differences in fire rates appear to be larger than would result just from differences in reporting completeness. This tends to be supported by the constancy of the equipment-related causes with population—equipment of the same quality tends to be sold all over, whereas socioeconomic mixes and behavior of citizens may vary considerably from large cities to rural areas.

Second, if the differences are indeed real and not data artifacts, they point up the potential for reducing fires caused by carelessness and other "human behavior" problems—citizens in some communities outperform those in others five to one. While the circumstances they face may be vastly different, figuring out how to move the worst rates even part way toward the best rates could have a significant impact on the fire problem. (Determining how to induce the changes is the focus of NFPCA's Public Education Office.)

Third, cities should compare their performance by fire cause to others in their population class. Further detailed analysis of causes by socioeconomic classes within a city should provide information that is important in targeting public education programs more effectively. Several recent studies relate community characteristics to fire rates.[31, 32, 33, 34]

Finally, a note of caution about data for rural areas. The profile here for that class does not agree with that from the NFPA survey data presented earlier. Here it is a low rate; there it is a high rate. Although precision and accuracy are lowest for data from the rural communities, we do not know if this is why the profiles differ or if the differences are real.

[28] These seven are Denver, CO; Jacksonville, FL; Kansas City, MO; Madison, WI; Syracuse, NY; Tucson, AZ; and Wichita, KS.

[29] UFIRS is a fire information system based on the NFPA 901 system and is designed for use by communities.

[30] Eisenberg, Daniel and Getis, Robert, Principal Investigators, *Initial NFIRS Data Validation Study* (Philadelphia, PA: Auerbach Associates, Inc., for the National Fire Prevention and Control Administration, March 1977), Contract No. 6-34583.

[31] Oliver, Raymond B., Project Director, *Baton Rouge Fire Household Study* (Baton Rouge, LA: Louisiana Department of Public Safety, forthcoming), Fire Administration Grant No. NFPCA-7X009.

[32] Karter, Michael J., *Fire Rates and Census Characteristics—A Descriptive Approach* (Boston, MA: National Fire Protection Association, forthcoming), Fire Administration Grant No. NFPCA-76043.

[33] Berl, Walter G. and Halpin, Byron M., "Fire-Related Fatalities: An Analysis of Their Demography, Physical Origins and Medical Causes," presented at the Symposium on Fire Standards and Safety, National Bureau of Standards, Gaithersburg, MD, April 5 and 6, 1976.

[34] Schaenman, Philip et al, *Measuring Fire Protection Outcomes: Some Further Improvements*, Boston, MA: National Fire Protection Association and The Urban Institute, Washington, DC, 1977.

Table 16. ACTIONS TO PREVENT FIRE IN THE HOME[1]

Smoking Fires

1. Don't smoke in bed, especially after drinking alcoholic beverages.
2. Develop the habit of checking for cigarettes under chair cushions before going to bed, after people have been smoking near upholstered furniture.
3. Use safety ashtrays—the type which causes a lit cigarette to fall into the ashtray, not out of it.
4. Leave ashtrays to empty in the morning, to avoid throwing live cigarette butts in with ignitable trash.

Cooking Fires

1. Stay around and pay attention once you have started cooking. Unattended cooking is one of the most common causes of fires.
2. Clean grease from the stove and flue.
3. Keep combustibles—such as curtains or drapes, clothing, packaged foods, and trash—away from stoves.

Heating Fires

1. Have your heater or heating system checked by a competent service man at least once a year.
2. Take special care with fireplaces. Use a spark screen to prevent sparks from flying, and be sure the chimney is unblocked and without too much soot accumulation. Fireplace fires are very common, even in California.
3. Keep combustibles (dust mops, cleaning fluids, aerosols, Christmas decorations, etc.) at least 18 inches away from all heating units.

Electrical Distribution Fires

1. If there is any sign of electrical trouble, shut off power to the circuit and have it checked by a good electrician.
2. Check cords and plugs frequently for signs of broken insulation or frayed wires.

Appliance Fires

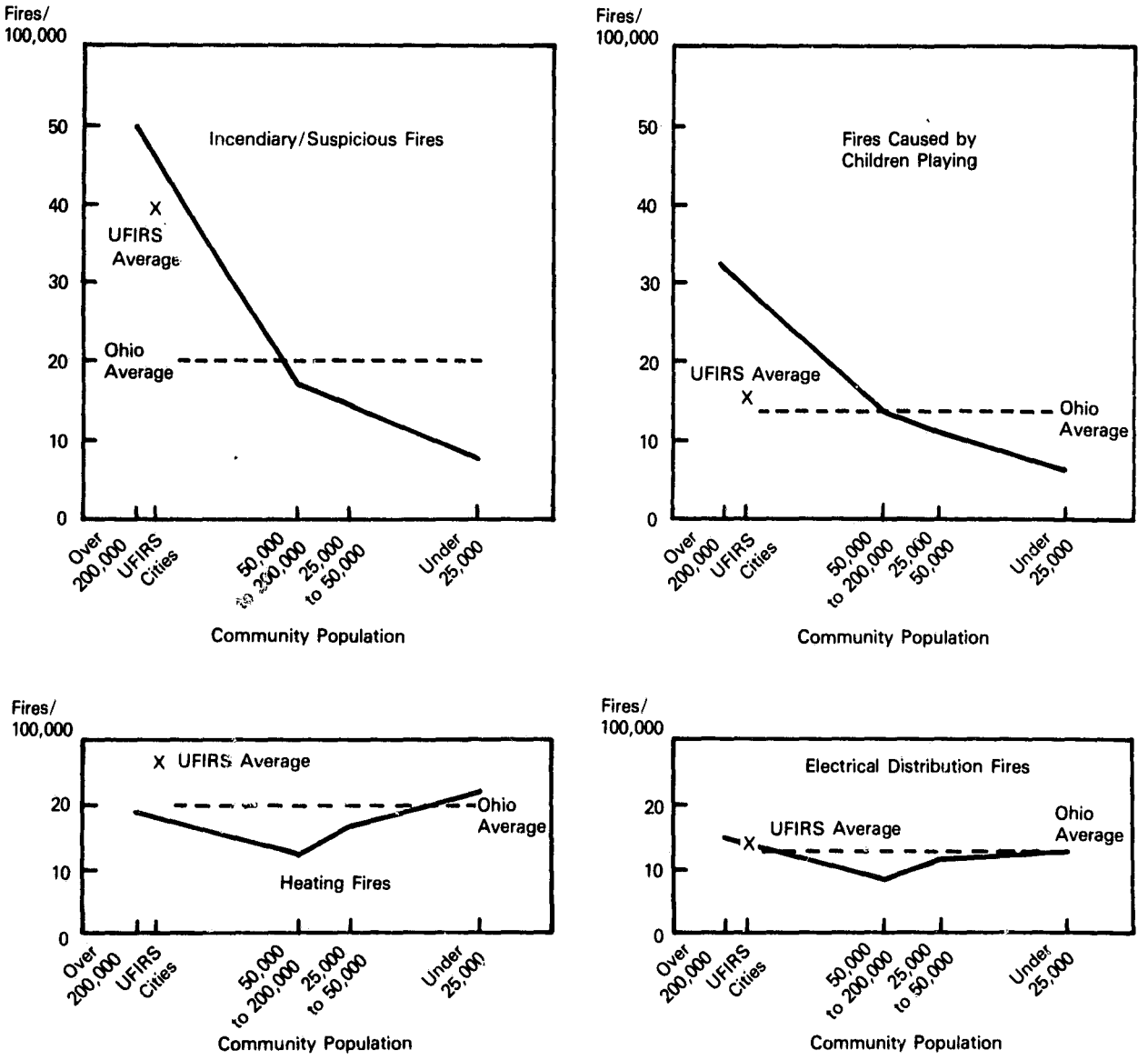
1. Don't overload dryers, and be sure to remove lint regularly.
2. Check your appliances at least once a year to see that they are clean and functioning properly, and that insulation has not broken or cracked.
3. Buy appliances having Underwriters Laboratories or other nationally recognized testing laboratory approval.

Fires Caused by Children Playing or Intentionally Setting Fires

1. Keep matches and cigarette lighters away from children (and senile adults, for that matter).
2. Suggest professional counseling to help children work out problems which motivate fire setting.

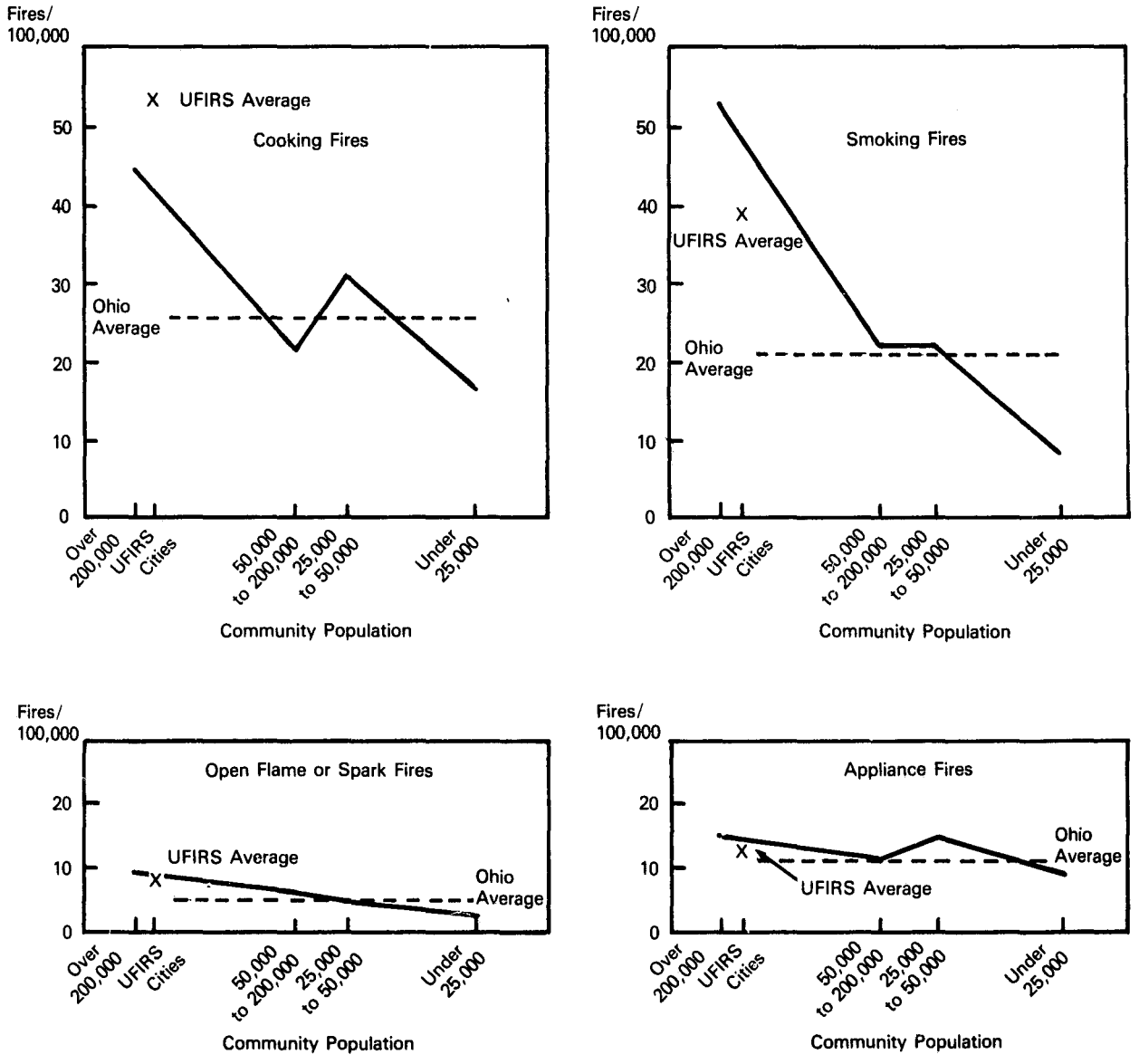
[1] Material for related programs is available from the Public Education Office, National Fire Prevention and Control Administration, U.S. Department of Commerce, P.O. Box 19518, Washington, DC 20036.

Figure 14. COMPARISON OF RESIDENTIAL FIRE RATES BY CAUSE FOR DIFFERENT SIZE COMMUNITIES (Continued)



SOURCE: Ohio 1976 NFIRS data. Small X's indicate the seven-city UFIRS average for each of the eight causes of residential fires. The cities (Madison, WI, Syracuse, NY, Wichita, KS, Tucson, AZ, Kansas City, MO, Denver, CO, and Jacksonville, FL) range in size from 170,000 to 580,000 persons.

Figure 14. (Cont'd.) COMPARISON OF RESIDENTIAL FIRE RATES BY CAUSE FOR DIFFERENT SIZE COMMUNITIES



SOURCE: Ohio 1976 NFIRS data. Small X's indicate the seven-city UFIRS average for each of the eight causes of residential fires. The cities (Madison, WI, Syracuse, NY, Wichita, KS, Tucson, AZ, Kansas City, MO, Denver, CO, and Jacksonville, FL) range in size from 170,000 to 580,000 persons.

UNREPORTED HOUSEHOLD FIRES

Most household fires are not reported to the fire service. These fires are fought and extinguished by the householder, perhaps assisted by neighbors, or they may simply go out by themselves. An understanding of the total fire problem would be incomplete if these fires were ignored, especially since many cause nontrivial injuries and losses.

Under the sponsorship of the National Bureau of Standards and the Consumer Product Safety Commission, the Bureau of the Census conducted a "national household fire survey" of 33,000 households in 1974. These households identified a total of 2,463 fires experienced between April 1973 and April 1974 in residences, yards, autos, garages, boats, etc. A detailed analysis of this survey was completed recently for the National Fire Administration.[35] A consumer-product-oriented analysis by the CPSC has also been prepared.[36]

Some of the highlights of the survey are:

- Less than 9 percent of household fires are actually reported to the fire service.
- Two percent of all fires resulted in loss of one or more days of work; only 57 percent of these were reported fires. That is, almost half of the fires resulting in time lost from work were *not* reported.
- About 15 percent of all fires resulted in one or more injuries or had an estimated damage greater than $200; almost half of these fires were not reported. Of these significant loss fires 15 percent were fires where food or grease was the first item ignited; 91 percent of these food or grease fires were not reported to the fire department. Of the other 85 percent significant loss fires, 50 percent were not reported.
- Five percent of all fires start when no one is home.
- Eighty-two percent of all building fires damaged only contents; that is, did not involve fire, smoke, or water damage to the walls, floor, or ceiling of any room.
- Fifty-five percent of all building fires involving some room damage were in the kitchen.
- Fifty percent of all building fires had only smoke damage and no flame or water damage.
- Five percent of all building fires involved exterior walls; 44 percent of these fires were to buildings having wood siding.
- Less than 0.3 percent of all building fires spread to another building.
- Eighty-three percent of all fires occurred during waking hours—7 a.m. to 10 p.m.
- Forty-seven percent of all fires involved cooking; 3 percent of these cooking fires were reported.
- Twenty-nine percent of all fires involved grease.
- Excluding those fires of unknown location, 65 percent of all fires occurred in the kitchen (53 percent if fires of unknown location are included), 4 percent of these were reported.
- Fifty percent of all fires were extinguished by females of the household, 30 percent by males of the household, and 8 percent by fire departments (others extinguished the remainder).

The Household Survey also yielded information on injuries from fires. Although the results should be considered tentative because they are based on only 138 injuries distributed across many categories, the principal findings are shown in Table 17. Briefly:

- In all fires, males sustained 60 percent more injuries than females.
- Males had four times more injuries from non-household fires than females (this seems to be the principal reason for the male and female injury differences).
- Females sustained 50 percent more injuries from household fires than males.
- Fires from cooking caused 43 percent of the injuries in household fires; trying to put out a (non-cooking) fire caused 17 percent of household injuries.

The University of Wisconsin analysis also showed that household members had a major problem in recalling fires. Survey respondents apparently failed to mention many fires that occurred during the months about which they were asked. In fact, it was estimated that only

[35] Joiner, Brian L., Martin, Richard, and Gaumnitz, Cynthia, *Statistical Analysis of the National Household Fire Survey* (Madison, WI: University of Wisconsin, Statistical Laboratory, September 1977), Fire Administration Grant No. NFPCA-76009.

[36] Wadsworth, Ethel, *Results of the National Household Fire Survey* (Cambridge, MA: Technology and Economics, Inc., August 1977), Purchase Order # CPSC 77-68700.

Table 17. HOUSEHOLD INJURIES BY SEX AND ACTIVITY OF VICTIM (Reported and Unreported Fires)

Activity Causing Injury	Household (Including auto, garage, etc.)			Non-Household			Total		
	Male	Female	Total	Male	Female	Total	Male	Female	Total
	Number								
Cooking	4	23	27	5	7	12	9	30	39
Putting out fire	6	5	11	10	0	10	16	5	21
Other	15	10	25	45	8	53	60	18	78
Total	25	38	63	60	15	75	85	53	138
	Percent								
Cooking	6	37	43	7	9	16	7	22	28
Putting out fire	10	8	17	13	—	13	12	4	15
Other	24	10	40	60	11	71	43	13	57
Total	40%	60%	100%	80%	20%	100%	62%	38%	100%

SOURCE: Joiner, B. L., Martin, R., and Gaumnitz, C., *Statistical Analysis of the National Household Fire Survey* (Madison, WI: University of Wisconsin, Statistical Laboratory, September 1977).

NOTE: Some column totals may not equal the sum of the elements due to round-off error.

about 40 percent of the total fires that had occurred within 12 months prior to the interview were actually reported during the interview. Most of those omitted are believed to be minor fires, for example, grease fires, but many may have been nontrivial.

Making allowance for unrecalled fires, *the estimate of the total number of annual household fires in the country comes to about 13 million,* or nearly one incident per year for every five households.

CHARACTERISTICS OF NON-RESIDENTIAL STRUCTURE FIRES

The causes of fires in non-residential structures are discussed in this section. Figure 15 shows the relative frequency of the different causes of fires reported in non-residential structures in Ohio and California. Fires of incendiary or suspicious origin, the most frequent cause, accounted for 27 percent of all reported non-residential structure fires, 21 percent of the deaths, 19 percent of the injuries, and 27 percent of the dollar loss. A variety of causes are second, depending upon which loss measure is used. Flammable liquids rank second in deaths; while natural causes (lightning or spontaneous ignition) are important in injuries, and heating, for dollar loss. Fires with unknown cause are actually second most frequent after incendiary/suspicious.

Table 18 shows causes of non-residential fires by occupancy type. The values across the bottom of the table give the totals of fires, deaths, injuries, and dollar losses. The entries in the table represent, for each occupancy, the percent of fires attributable to each cause. There appear to be strikingly different patterns of losses and causes for each occupancy type. The three occupancies showing the greatest dollar losses are storage, stores and offices, and manufacturing.

The fire losses shown in the table for industry and manufacturing are probably less than half of the actual total. Since many large businesses and industries maintain their own fire brigades, only a small proportion of their total fires may be reported to local fire departments. Though we may not know the full extent of the fire problem in these properties, the part involving public fire departments is included in the reported data; the unknown part is that which the companies are handling themselves.

To help pinpoint problems on which to focus and to measure success those interested in fire prevention can array the data from their own communities in a manner similar to Table 18. For example, the table illustrates that in these two States most fires in schools are incendiary and relatively few in schools are from smoking. Cooking fires are the most common cause in public assembly properties, particularly in restaurants (as can be seen in the data presented in

Figure 15. CAUSES OF FIRES REPORTED IN NON-RESIDENTIAL STRUCTURES — California (CFIRS 1975), Ohio (NFIRS 1976) Combined — Continued

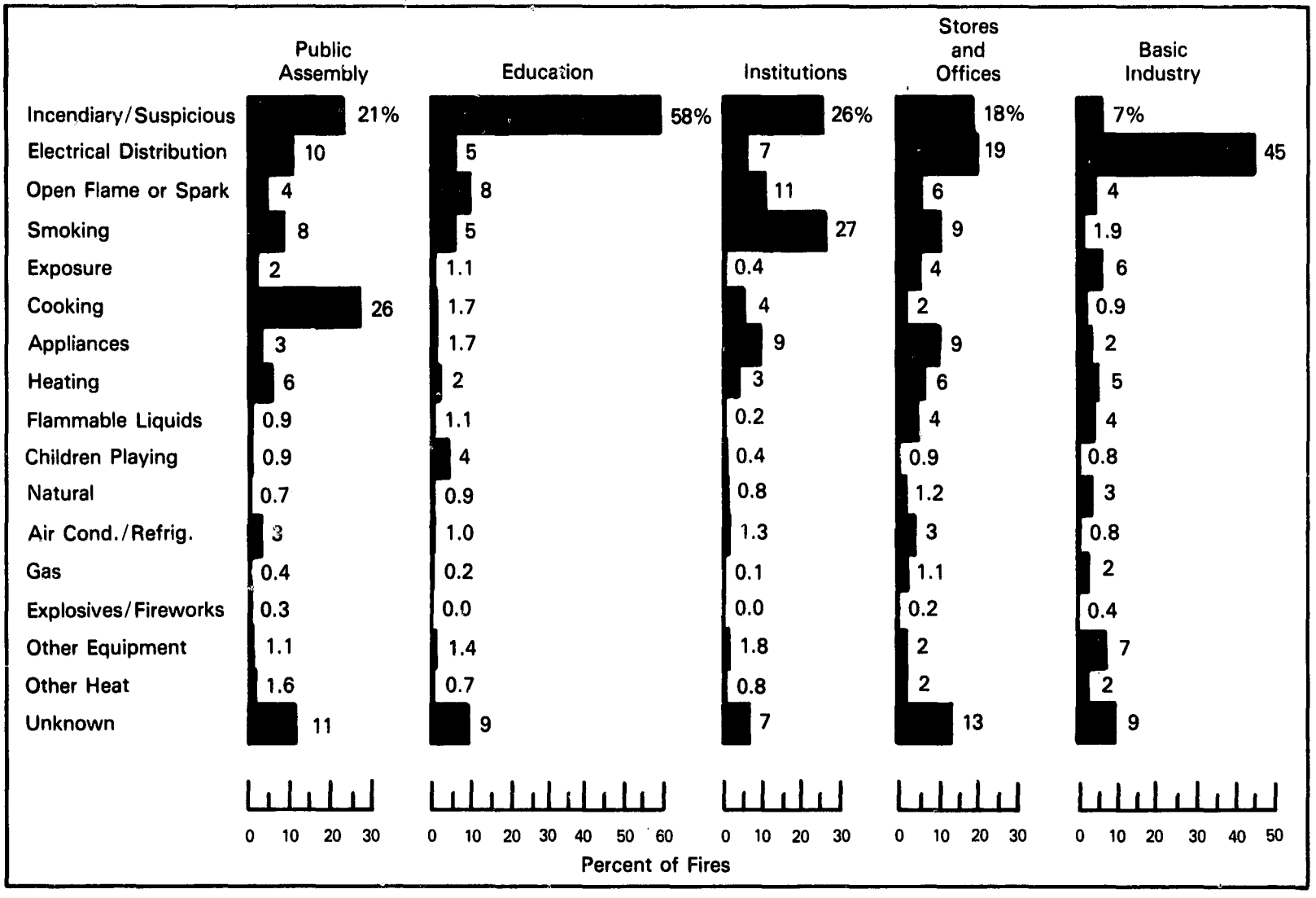
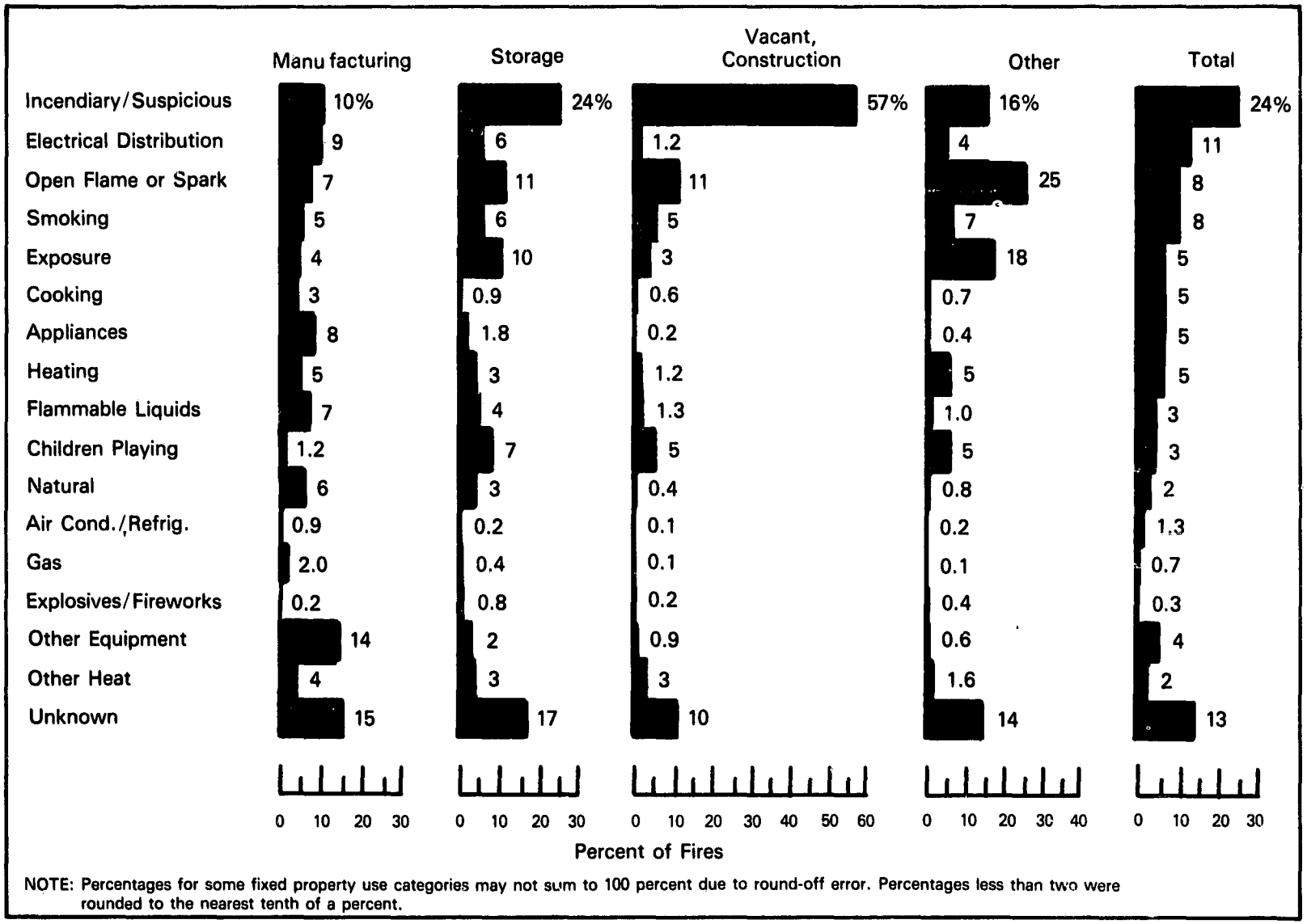


Figure 15 cont'd. CAUSES OF FIRES REPORTED IN NON-RESIDENTIAL STRUCTURES – California (CFIRS 1975), Ohio (NFIRS 1976) Combined



NOTE: Percentages for some fixed property use categories may not sum to 100 percent due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

Table 18. CAUSES OF FIRES REPORTED IN NON-RESIDENTIAL STRUCTURES— California (CFIRS 1975), Ohio (NFIRS 1976) Combined

Fixed Property Type / Cause	Public Assembly	Education	Institutions	Stores & Offices	Basic Industry	Manu-facturing	Storage	Vacant, Con-struction	Other	Total
	Percent of Fires									
Incendiary or Suspicious .	21%	58%	26%	18%	7%	10%	24%	57%	16%	24%
Electrical Distribution	10	5	7	19	45	9	6	1.2	4	11
Open Flame or Spark	4	8	11	6	4	7	11	11	25	8
Smoking	8	5	27	9	1.9	5	6	5	7	8
Exposure	2	1.1	0.4	4	6	4	10	3	18	5
Cooking	26	1.7	4	2	0.9	3	0.9	0.6	0.7	5
Appliances	3	1.7	9	9	2	8	1.8	0.2	0.4	5
Heating	6	2	3	6	5	5	3	1.2	5	5
Flammable Liquid	0.9	1.1	0.2	4	4	7	4	1.3	1.0	3
Children Playing	0.9	4	0.4	0.9	0.8	1.2	7	5	5	3
Natural	0.7	0.9	0.8	1.2	3	6	3	0.4	0.8	2
Air Conditioning & Refrigeration	3	1.0	1.3	3	0.8	0.9	0.2	0.1	0.2	1.3
Gas	0.4	0.2	0.1	1.1	2	2	0.4	0.1	0.1	0.7
Explosives & Fireworks ...	0.3	0.0	0.0	0.2	0.4	0.2	0.8	0.2	0.4	0.3
Other Equipment	1.1	1.4	1.8	2	7	14	2	0.9	0.6	4
Other Heat	1.6	0.7	0.8	2	2	4	3	3	1.6	2
Unknown	11	9	7	13	9	15	17	10	14	13
Total	100%	101%	100%	101%	101%	101%	100%	100%	100%	100%
Total Fires	3,840	1,964	2,713	5,437	1,374	3,834	7,317	1,945	851	29,275
Total Deaths	1	0	8	14	1	12	11	1	0	48
Total Injuries	240	81	169	480	56	578	583	134	8	2,329
Total Dollar Loss in Thousands	$22,315	$8,549	$3,172	$36,824	$3,728	$35,327	$37,907	$2,629	$433	$150,884

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

Part II). Electrical distribution problems were by far the most prevalent cause of fires in basic industry. These are problems that prevention programs should focus on.

Table 19 lists some potential ways to reduce the leading non-residential fire problems. They are simplified summaries of some complex fire prevention programs. In addition, public buildings likely to be occupied by large groups should be sprinklered, have adequate fire and smoke barriers, and have adequate exits that are properly marked. Data on the magnitude of the problems in different occupancy types may not only assist in targeting these prevention efforts, but also may be used to help persuade businesses and institutions to cooperate. For example, telling a California restauranteur that there were 738 cooking-related fires in restaurants in his State, and that they caused 23 injuries and $1,216,000 property damage, might move him to act more quickly than simply arguing in a general way that it's in his "best interest."

Table 19. SOME WAYS TO PREVENT NON-RESIDENTIAL FIRES

Incendiary and Suspicious Fires

1. Ensure that suspicious fires are thoroughly investigated.
2. Make thorough fire prevention inspections of property subject to incendiary fires.
3. Make property secure against intrusion and provide increased surveillance.

Smoking Fires

1. Make sure institutional patients smoke only in safe areas and, if necessary, only when supervised.
2. Enforce "no smoking" regulations in stores, offices, and storage properties.

Cooking Fires (in places of public assembly)

1. Keep stoves and especially grease flues clean. Where practical, install fixed extinguishing systems in exhaust hoods and grease flues.
2. Make sure grease flues meet appropriate codes.

Electrical Distribution Fires

1. Make electrical distribution equipment a prime point of attention when making fire prevention inspections.

Open Flame and Spark Fires

1. Make sure open flames are properly guarded.
2. Set up a permit system for cutting and welding operations, and have a competent fire guard standing by.

Fires Caused by Children Playing (in storage areas)

1. Make storage buildings and areas secure.
2. Remove trash, and cover easily ignited stock.

[1] This represents a simplified summary of some quite complex fire prevention programs.

CHARACTERISTICS OF MOBILE AND OUTSIDE PROPERTY FIRES

Table 20 presents the fire losses from mobile and outside occupancies. Automobiles are, of course, the principal mobile category. Automobile fires account for 75 percent of the fires, 46 percent of the deaths, 56 percent of the injuries, and 49 percent of the dollar loss in the mobile property category.

Most outside fires involve either refuse or trees/grass/brush. Forest and other wildland fires usually occur in remote areas, away from muncipalities.[37] Many of these fires are not reported to fire departments; therefore, the totals for wildfires in Table 20 may be low.[38]

FIRE LOSSES BY DAY, WEEK, AND YEAR

Fires, fire deaths, and fire injuries are spread unevenly over the day, week, and year. Figures 16 (all occupancies) and 17 (residential only) show that most Ohio fires reported to the fire service occur in the afternoon and early evening. But fire deaths peak in the late evening and early morning hours (11 p.m. to 4.a.m.), the time when most people are asleep. One reason for the large number of fire deaths in these hours might be that sleep is usually deepest when a person first falls asleep.

Injuries show two peaks, during the early evening and early morning hours. Perhaps the first peak is for fires in which people are involved in an activity that is associated with fire (for example, cooking), and the second peak may represent fires that occur while people are asleep, but through some good fortune, they escape only with injuries.

Fire deaths are slightly more frequent on a weekend day than a weekday, but the pattern is not pronounced in these two States (see Figure 18). Wednesday is almost as bad for deaths as Sunday. Fire injuries and losses also fail to show a pronounced clustering.

Fire deaths in Ohio show clustering about the beginning of the year (Figure 19), but injuries and losses exhibit only slight fluctuations. The number of Ohio fires peak in April and November.[39]

Local governments should analyze their own data to see what times of the year, days of the

[37] There are, of course, spectacular exceptions such as the 1977 Santa Barbara wildfire which consumed hundreds of homes.

[38] The U.S. Department of Agriculture publishes a variety of statistics on wildfires: See page for summary statistics.

[39] Toledo, for example, reports a large number of grass and brush fires in April, especially when there is a shortage of rain, and a large number of leaf fires in November—certain companies go from one separate incident to another.

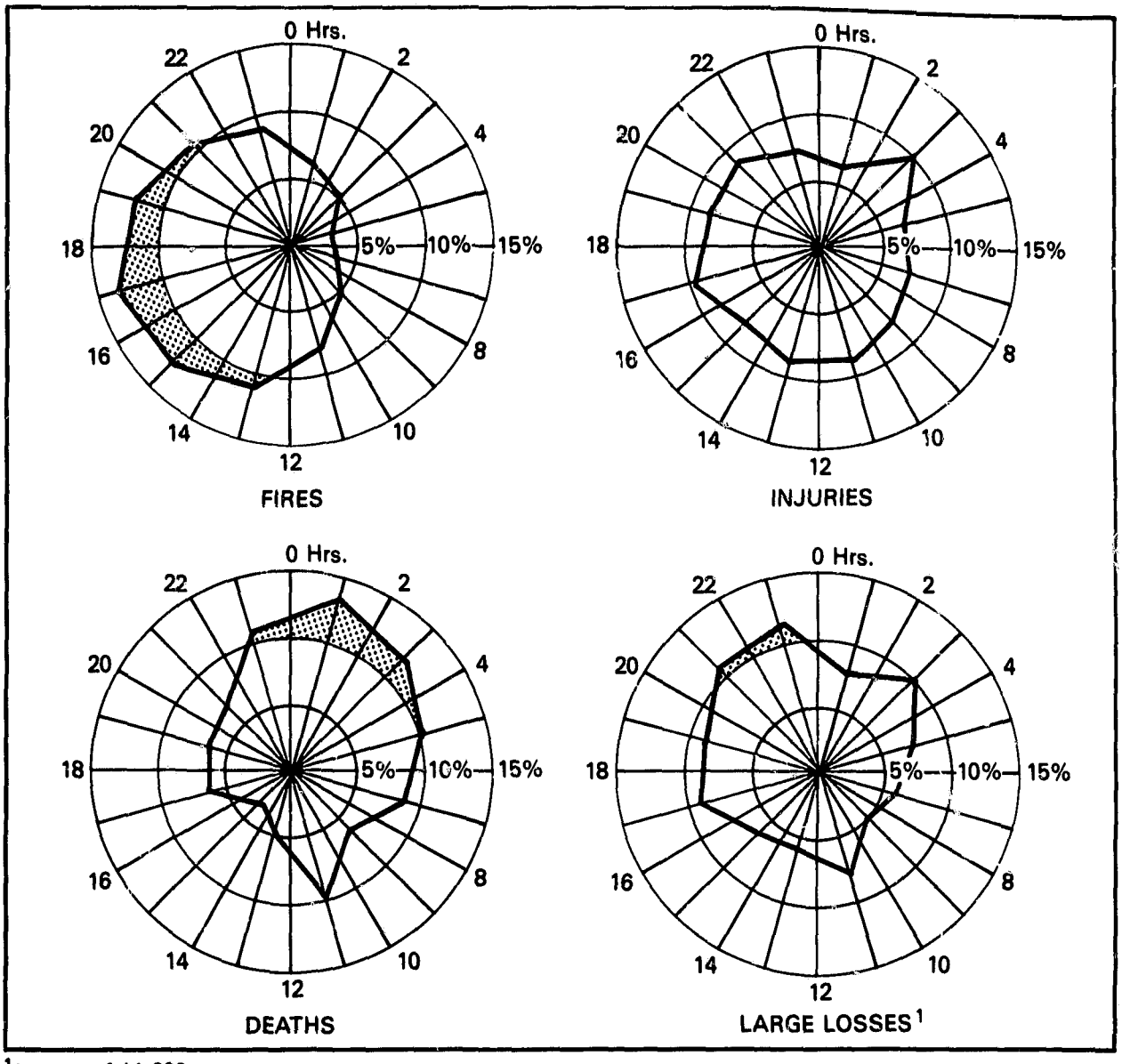
Table 20. SUMMARY OF REPORTED MOBILE AND OUTSIDE LOSSES— California (CFIRS 1975) and Ohio (NFIRS 1976) Combined

Property Type	Fires		Deaths		Injuries		Dollar Loss	
	Number	Percent	Number	Percent	Number	Percent	(In Thousands)	Percent
Mobile								
Automobiles	32,329	75	68	46	429	56	$12,036	49
Other Motor Vehicles	9,148	21	43	29	273	36	7,701	31
Rail, Water & Air Transportation	578	1.3	35	24	37	5	3,154	13
Other Mobile	982	2	2	1.4	28	4	1,841	7
Total Mobile Property	43,037	99%	148	100%	767	101%	$24,732	100%
Outside								
Refuse	42,086	28	0	0	81	11	$3,010	14
Trees, Grass, Brush	66,720	45	6	21	366	49	2,838	13
Forests	39	0	0	0	0	0	6	0
Crops	204	0.1	0	0	5	0.7	202	0.9
Other Outside	39,036	26	22	79	299	40	16,126	73
Total Outside Property	148,112	99%	28	100%	751	101%	$22,182	101%

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

Figure 16. FIRES BY TIME OF DAY, ALL OCCUPANCY TYPES – Ohio (NFIRS 1976)



[1] Losses of $1,000 or more.

Figure 17. FIRES IN RESIDENTIAL OCCUPANCIES BY TIME OF DAY — Ohio (NFIRS 1976)

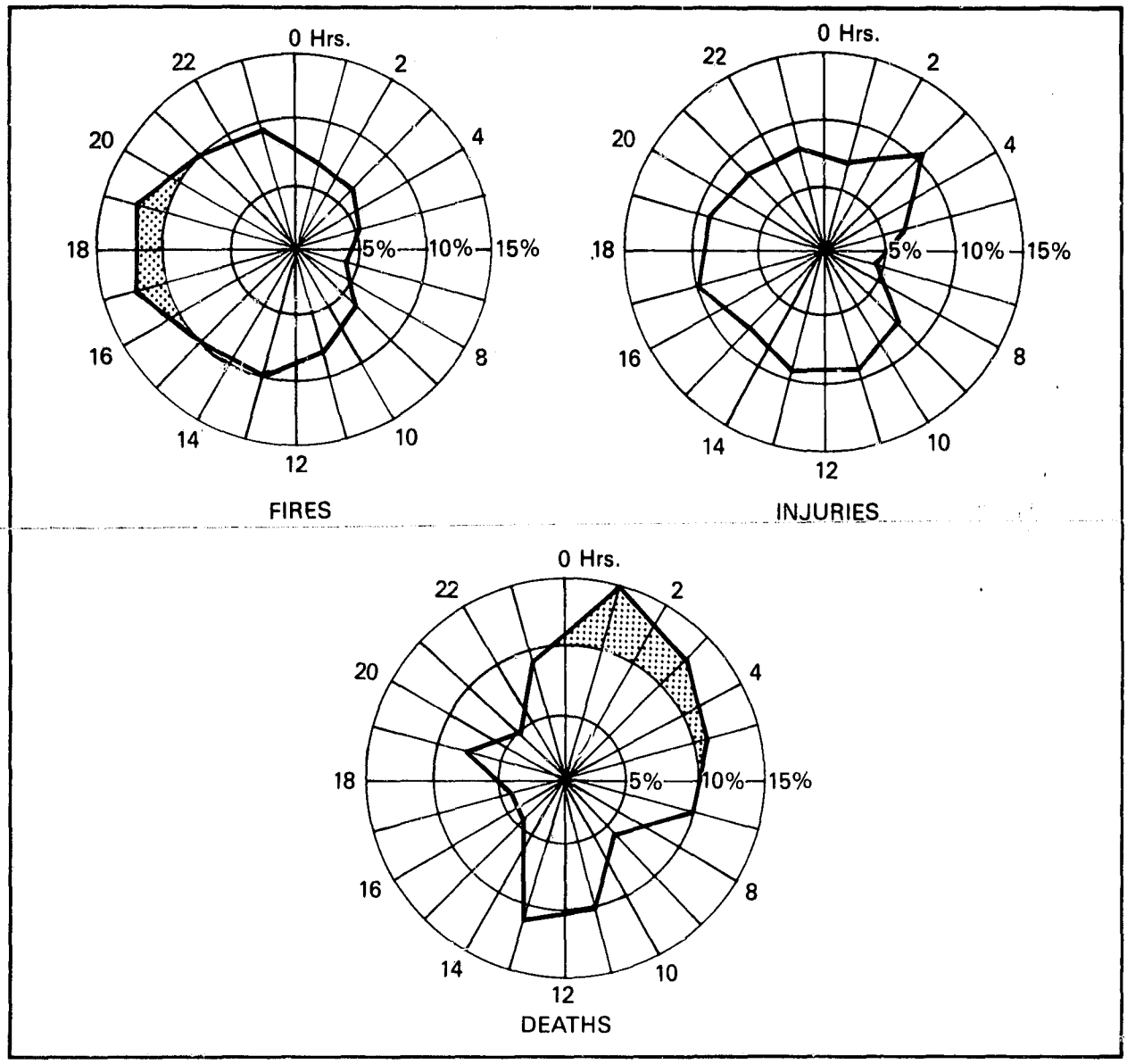
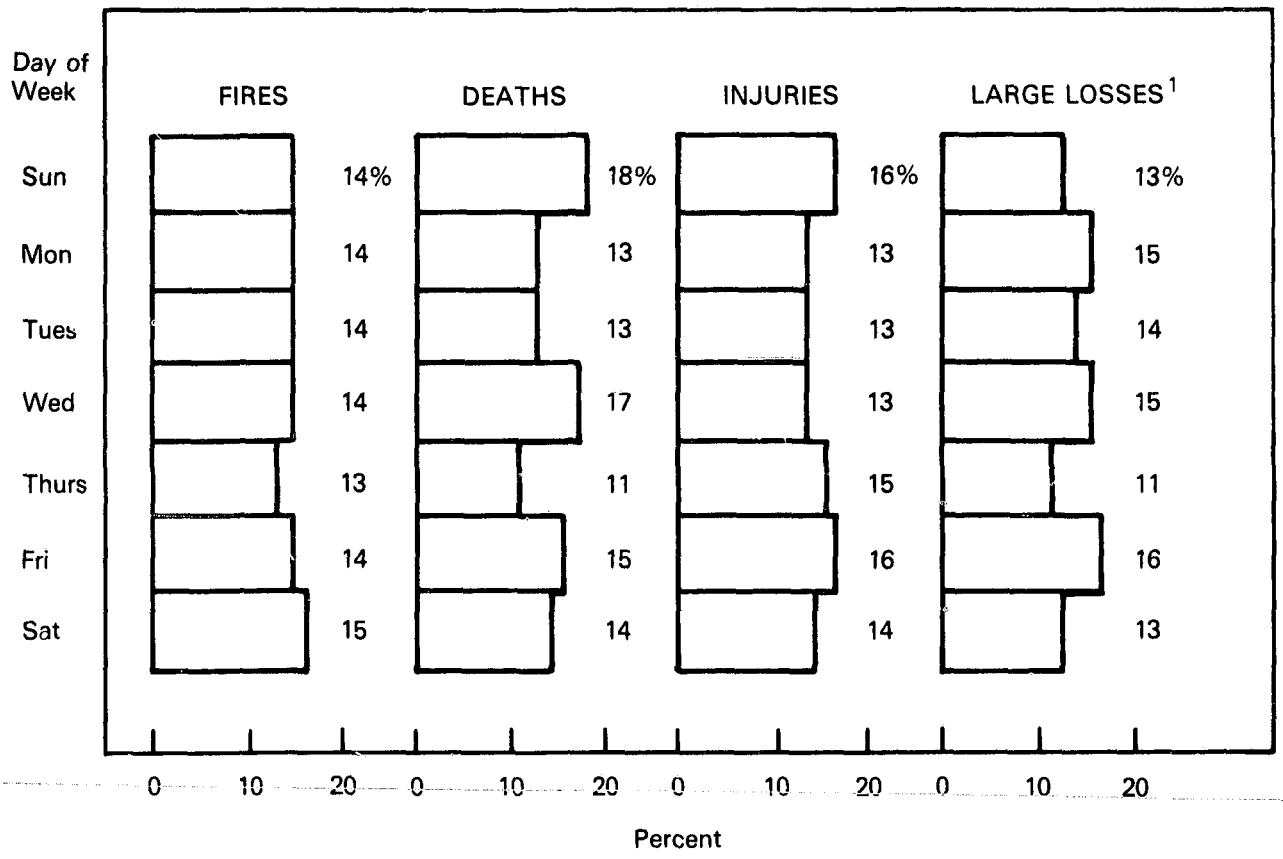


Figure 18. FIRES BY DAY OF WEEK, ALL OCCUPANCY TYPES – Ohio (NFIRS 1976)



[1] Losses of $1,000 or more.

week, and times of day have peak incidence and losses. The pattern of fires may vary a great deal from one community to the next.

PERFORMANCE OF FIRE PROTECTION EQUIPMENT

Two of the most effective ways in which technology can be used to reduce human and property losses from fire involvement are smoke detectors and automatic sprinklers.

Smoke Detector Performance

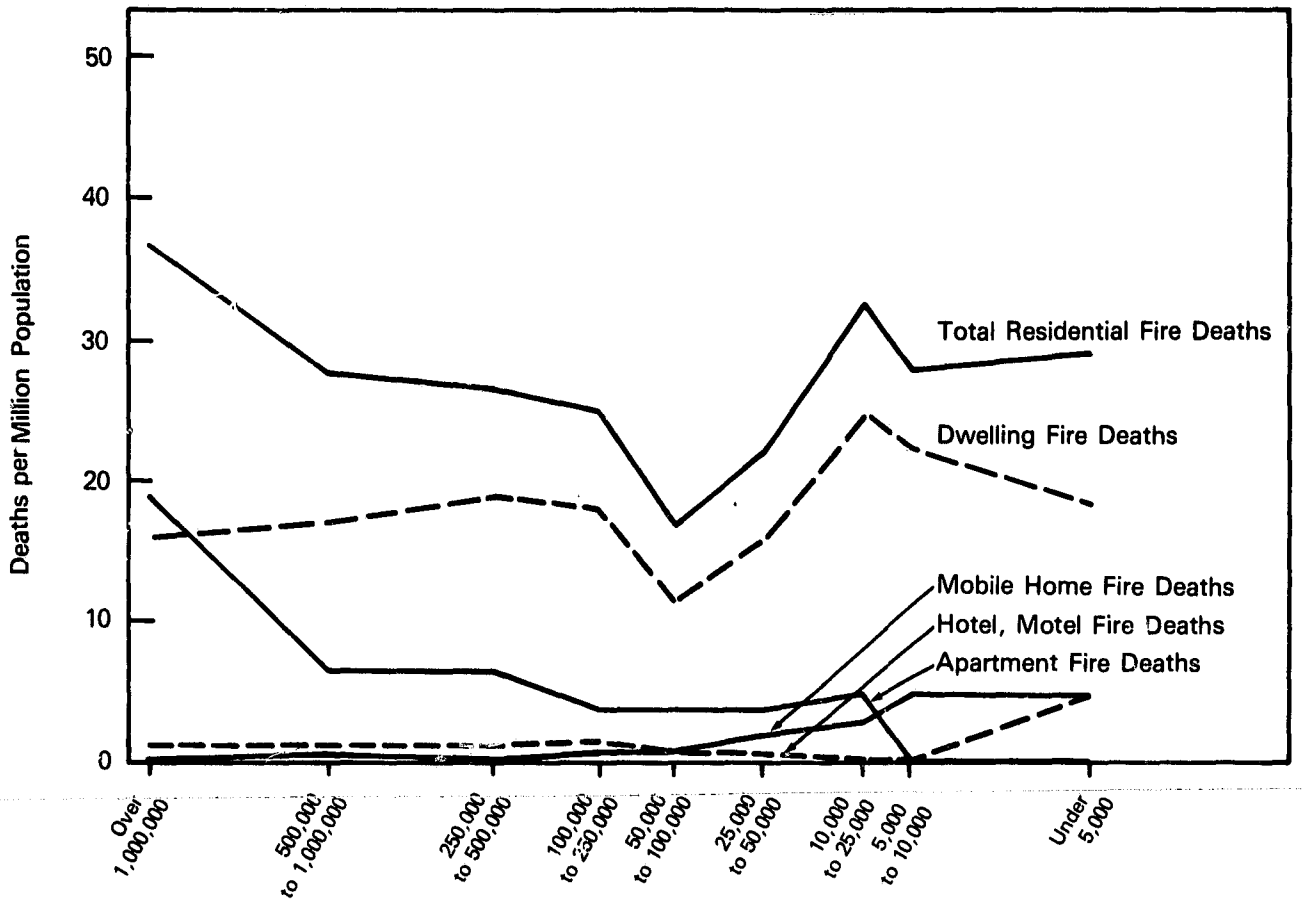
One encouraging recent trend has been the purchase of home smoke detectors by many families. It is estimated that about 10,000,000 units were sold in 1977.[40] With some 4,000,000 in use before then, many millions of households now have early warning protection. Fire deaths probably can be substantially reduced if the units are placed in appropriate locations and receive proper maintenance, and if household members are trained in escaping from their homes.[41]

The Ohio data were examined to see whether fires in which detectors were present and operating resulted in fewer deaths, injuries, and losses than when no detectors were present. However, so few cases were reported where de-

[40] Correspondence with Richard Bukowski, Center for Fire Research, National Bureau of Standards, Gaithersburg, MD.

[41] Halpin, B.M., et al., *The Assessment of Fire Protection Systems Impact on Actual Fire Incidents,* (Laurel), MD: Applied Physics Laboratory, Johns Hopkins University, Fire Problems Program, Technical Report No. 35, August 1977) Fire Administration Grant No. NFPCA-76045. The report indicates that over 90 percent of the fire deaths analyzed in Maryland in 1976 (most of which were residential) probably could have been avoided if smoke detectors had been present.

Figure III-2. RESIDENTIAL FIRE DEATH RATE BY OCCUPANCY TYPE AND COMMUNITY SIZE – 1974 NFPA SURVEY



SOURCE: 1974 NFPA Survey.

tectors were present and operating that the results were not statistically significant. With more detectors coming into use, and more States joining NFIRS, the needed information should be available in the future.

Automatic Sprinkler Performance

The value of automatic sprinklers is illustrated by Table 21. The average loss is significantly less where automatic sprinklers are installed and operating properly than where there are no sprinklers. This is true for all occupancy types examined.

Only 0.2 percent of residential fires and 4.5 percent of non-residential fires attended by the fire service occurred in structures with operating sprinklers.[42] Given the dramatically lower dollar losses with sprinklers, it is likely that increased use of sprinklers could reduce losses much further. They are especially important in public occupancies, where they are needed above all else for life safety.

[42] All but 2 of the 39 residential fires with sprinklers occurred in apartment, dormitory, or hotel buildings. We are not sure at this time if the fires occurred in the living quarters or a garage area, although the latter is suspected.

Table 21. EFFECTIVENESS OF AUTOMATIC SPRINKLERS IN STRUCTURAL FIRES—Ohio (NFIRS 1976)

Property Type	Total Number of Fires[1]	(A) With Sprinklers Operating		(B) Without Sprinklers		Damage Ratio[2]
		Number of Fires	Average Damage per Fire	Number of Fires	Average Damage per Fire	
Residential	16,970	39	$ 585	15,022	$ 3,736	6.4
Public Assembly	783	12	8,958	649	9,820	1.1
Education	271	5	70	230	9,572	136.7
Institutions	474	20	209	307	2,824	13.5
Stores, Offices	1,056	31	9,517	857	16,531	1.7
Basic Industry	96	6	3,767	74	10,739	2.9
Manufacturing	909	182	8,994	523	22,559	2.5
Storage (excluding Residential Garage)	1,238	27	13,859	1,107	17,088	1.2

[1] Reported fire incidents shown here do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11). Fires in which sprinklers were present but failed to operate or for which information was not available are not included in columns (A) or (B). 1,083 structure fires falling in the category "Other Property Type" have not been included because there were only two fires reported in which sprinklers were operating. 1,533 residential garage fires are not included because none involved sprinklers.

[2] Damage ratio $= \frac{\text{Average damage per fire without sprinklers}}{\text{Average damage per fire with sprinklers operating}} = \frac{\text{Column B}}{\text{Column A}}$

PART II

Characteristics of Fires for Selected States and Cities

Section V

Introduction to Part II

This part of the report summarizes detailed fire information from the States of Ohio and California and data from seven cities that use the Uniform Fire Incident Reporting System (UFIRS). Ohio was the first participant in the National Fire Incident Reporting System (NFIRS) and the NFIRS State for which we had the largest amount of standardized data. The California data was collected under the California Fire Incident Reporting System (CFIRS), which is largely compatible with NFIRS.

Although California and Ohio have a combined population of 32 million persons and represent a substantial proportion (15 percent) of the U.S. population, they may not be representative of the country as a whole. In future years, data from many more States will be available so that a detailed nationwide picture may be formed.

Nonetheless, the current data from these States give many insights into the fire problem, and afford some benchmarks for State and local jurisdictions to compare themselves against. The form of the analysis here also may serve as a starting point for State and local jurisdiction to use in their own analyses.

DATA LIMITATIONS

The data presented have significant limitations in both quality and completeness simply due to the newness of NFIRS; the first year of operation was 1976.

In Ohio, especially in the early months of 1976 before data training programs had gotten underway, there were difficulties in interpreting the NFPA 901 codes upon which the detailed reports are based. In instances where misinterpretations may have occurred, these are pointed out in the discussion of the numerical results.

Significant limitations were introduced by not knowing the true percentage of all incidents for which NFIRS reports are submitted. One estimate is that about 50 percent of all fires attended by the fire departments were included in the 1976 Ohio NFIRS data file.[43] California's system is older and believed to have more complete reporting. Although the precise degree of completeness is unknown, it is estimated that about 90 percent of the fires are reported. Were the fraction of fires reported more accurately known, estimates of higher confidence could be formulated.

As a result of these limitations, the estimates here of *absolute* magnitudes of fire rates, and comparison between rates in Ohio and California based upon them, may be invalid and misleading. More complete reporting would make these rates higher in the absolute, with Ohio rates increasing more than California. Thus, when rates in this report from Ohio are higher than California's rates, that relationship is likely to be correct. When the California rate is higher, that may be correct or may be due to more complete reporting than in Ohio.

Because large samples are available from both States, we can be confident that the *relative* magnitude of different types of fires is representative of a large part of that problem in each State. We cannot be sure how representative the data are of the whole State, however, although the figures are probably not far off. This is especially true for the death, injury, and dollar loss data which tend to reflect the more significant fires and which are more likely to be reported by the local fire service to the State.

[43] Eisenberg, Daniel and Getis, Robert, Principal Investigators, *Initial NFIRS Data Validation Study* (Philadelphia, PA: Auerbach Associates, Inc., March 1977), Fire Administration Contract No. 6-34583.

Finally, it is noted that the California data are for calendar year 1975, while the Ohio data are for 1976. In summary, the data here probably can be used to identify major problem areas, but must be used with caution.

ORGANIZATION OF PART II

In the rest of Part II, data are presented in a succession of tables containing progressively more detail. An initial summary is given in Section VI. Section VII discusses characteristics of the *casualties* of fires. *Cause categories* pertaining to residential fires are presented in Section VIII.

Detailed information on the *specific ignition characteristics* involved in residential fires is presented in Section IX. From the large amount of reported data, principal emphasis was given to those characteristics believed to be most relevant to local governments in targeting public education, inspections, and code enforcement.

Section X contains a comparison of fire losses for *different cities*. Included in the comparison are Ohio cities and seven other cities using UFIRS, a system that is largely compatible with NFIRS. These NFIRS cities were ones whose data had reasonable completeness and apparent validity and whose data were received in time for this analysis. Finally, the details of *non-residential* fires and their causes are presented in Section XI.

HIGHLIGHTING

The practice here is to discuss only a few significant items from each table. Since Part I summarizes the results of several tables presented below, the emphasis here is primarily on details of the fire problem not discussed earlier and on differences in patterns.

We occasionally show percentage comparisons for the two States by simply writing, for example, 62 percent (73 percent). Where this is done, the first number, 62 percent, always refers to California; while the number in parentheses, (73 percent), refers to Ohio.

PRECISION

The precision of the numbers appearing in the tables will be low when the number of recorded incidents (fires, deaths, or injuries) is small. The number may be small either as a result of a detailed breakdown into specialized categories of fire, or because the community is small. There is a simple square root formula, discussed in Appendix VI, that relates the precision to the number of reported incidents. Useful benchmarks are: 100 occurrences yields a precision of 10 percent, 25 occurrences 20 percent, 16 occurrences 25 percent, 9 occurrences 33⅓ percent, 4 occurrences 50 percent.[44]

TYPES OF NUMBERS IN THE TABLES

In addition to presenting tables with the *number* of occurrences of fires and casualties, we also have presented tables of *rates*, which are needed for comparing communities, and tables of *percentages*, which show the importance of specific items in relation to the total.

[44] A precision of 10 percent means that the estimate is "good" to plus or minus 10 percent of its value.

Section VI

Fire Frequency and Loss in Major Occupancy Types

This section summarizes losses and frequency of fires by general occupancy types. The intent is not to make comparisons of the rates between the two example States, but rather to determine similarities in patterns of fires. The main value of the data presented is in relative percentages, not in relative rates.

MAJOR OCCUPANCY CLASSES

Table 22 summarizes fire losses for California and Ohio for the four major occupancy classes—residential, non-residential structure (e.g. public assembly, commercial, manufacturing, storage), mobile property (e.g. motor vehicles, air, rail, water transportation), and outside property (e.g. trash, brush, forests). Since fires in residential properties are discussed in great detail in Sections VIII and IX, little discussion of those fires is given here.

The table presents total incidents, rates, and percents. As noted previously, comparison of rates, especially fire rates, may be misleading because Ohio's reporting of fire incidents is less complete for the first year of NFIRS than California's. The reverse may be true for deaths, because California apparently reports primarily those deaths that occur at the scene of the fire. A useful benchmark for comparison is that, since California's 1975 population (21,185,000) is about twice that of Ohio's (10,759,000) if both States had identical fire characteristics, the numbers reported for Ohio would be about one-half those of California.

One of the significant highlights of Table 22 is that the majority of fires in both States occur on outside property, but these result in the fewest deaths. In Ohio the outside fires also result in the fewest injuries and dollar loss.

Another highlight is that the relative proportions of fire losses among the occupancy types are not too different for the two States. Residential fires account for 75 percent of all fire deaths in Ohio, 64 percent in California. In Ohio non-residential structure fires account for a slightly higher percent of dollar loss than do residential fires. In California the residential dollar loss is slightly higher than non-residential. And the California outside fire loss is a slightly larger part of the losses than it is in Ohio.

LARGE STRUCTURAL FIRES

In Table 23, which is confined to structures, a "large fire" is defined as one that extends beyond the room of origin. From the table it can be seen that about two-thirds of the large fires in each State occur in residential occupancies. Most of the deaths and injuries at large fires occur in large residential fires. But roughly half of the dollar loss from large fires are in non-residential occupancies.

Fire rates for large fires are about the same for the two States. This is very different from what was observed for overall fire rates in the previous table and suggests that reporting of significant fires in Ohio may be much more complete than for small fires, or at least comparable to California.

Death and injury rates for large fires in Ohio are more than double those in California.

NON-RESIDENTIAL STRUCTURE FIRES

Table 24 breaks down the non-residential structure fires into the eight principal NFPA 901 categories (except that "vacant" and "under construction" structures have been separated out from the NFPA 901 "special property" category).

Highlights from the table include: Stores and offices are the non-residential occupancy type having the most fires in each State. The category with the most fires in the table is actually storage occupancies (including garages, warehouses, lumberyards, etc.), but this is somewhat deceptive because the main category of storage fires are residential detached garages. For California, manufacturing occupancies were the leading category for non-residential fire deaths and injuries. For Ohio, deaths and injuries in stores and offices, storage, and manufacturing are all high.

LARGE NON-RESIDENTIAL STRUCTURE FIRES

Table 25 shows the fire losses for "large" fires in non-residential structures—those extending beyond the room or compartment of origin.

One-half (California) to two-thirds (Ohio) of non-residential injuries occur in large fires. Over three-quarters of non-residential dollar losses occur in large fires. This situation is different from residential fires, where the bulk of the problem is a large number of small losses. This suggests that non-residential prevention might initially focus on understanding the cause of the relatively small number of fires that lead to the bulk of the problem, and then focus on preventing those types of fires.

In Ohio, 37 percent of non-residential structure fires are "large"; in California, 21 percent. Although the table indicates that a greater proportion of storage fires result in "large fires" than for any other occupancy—38 percent in California, 54 percent in Ohio—this may be due to describing the fire as "confined to building of origin" when the "room" is the only compartment in the building, as is common for residential garages.

MOBILE PROPERTY AND OUTSIDE FIRES

Table 26 summarizes fire losses for the principal subcategories within mobile property and outside fires. Mobile homes are *not* included in the mobile property category, but rather in the residential category. Some highlights are:

- Automobile fires account for 10 percent of all fires attended by the fire service in California, 16 percent in Ohio. This frequency and the related number of fires may be surprisingly large to the public, which probably is not aware of the seriousness of the problem.

- Deaths from motor vehicle fires represent about 16 percent of all fire deaths in both California and Ohio. This value is somewhat higher than the national average estimate (11 percent) from State Fire Marshal data given in Appendix IV.

- In California, losses from outside fires are considerable: 662 injuries, $16.6 million property loss.

- The number of forest and crop fires and their losses are small, but this may be due to failure to report these fires to fire departments. (This "small" appearance clearly is *not* the case in California for 1977.)

Table 22. REPORTED FIRE LOSSES BY PROPERTY TYPE— California (CFIRS 1975), Ohio (NFIRS 1976)

Property Type	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[1]							
							(in thousands)	
Residential	46,585	16,970	270	201	2,745	2,348	$ 94,274	$ 61,335
(Non-Residential)	(169,570)	(50,854)	(153)	(71)	(2,191)	(1,656)	(114,817)	(82,981)
Structure	21,832	7,443	32	16	1,074	1,255	83,651	67,233
Mobile	29,588	13,449	98	50	455	312	14,549	10,183
Outside	118,150	29,962	23	5	662	89	16,617	5,566
Total	216,155	67,824	423	272	4,936	4,004	$209,091	$144,317
	Rate[2]							
Residential	220	158	13	19	130	218	$ 4.45	$ 5.70
(Non-Residential)	(800)	(473)	(7)	(7)	(103)	(154)	(5.42)	(7.81)
Structure	103	69	1.5	1.5	51	117	3.95	6.25
Mobile	140	125	5	5	21	29	.69	.95
Outside	558	278	1	0.5	31	8	.78	.52
Total	1,020	630	20	25	233	372	$ 9.87	$ 13.41
	Percent							
Residential	22	25	64	74	56	59	45	43
(Non-Residential)	(78)	(75)	(36)	(26)	(44)	(41)	(55)	(57)
Structure	10	11	8	6	22	31	40	47
Mobile	14	20	23	18	9	8	7	7
Outside	55	44	5	2	13	2	8	4
Total	100%	100%	100%	100%	100%	100%	100%	100%

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[2] Fires/100,000 persons, deaths/million persons, injuries/million persons, dollar loss per capita. Based on 1975 Census estimates of California and Ohio populations.

NOTE: Some column totals may not equal 100 percent of the sum of their elements due to round-off error.

Table 23. SUMMARY OF LOSSES FROM LARGE STRUCTURAL FIRES[1]— California (CFIRS 1975), Ohio (NFIRS 1976)

Property Type	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number for Large Fires Reported[2]							
							(In Thousands)	
Residential	9,345	4,709	129	143	1,079	1,461	59,951	48,539
Non-Residential Structure	4,672	2,803	10	11	584	834	60,657	56,248
Total	14,017	7,512	139	154	1,663	2,295	$120,608	$104,787
	Rates for Large Fires[3]							
Residential	44	43	6	13	51	136	2.83	4.51
Non-Residential Structure	22	26	0.5	1	28	78	2.86	5.23
Total	66	70	7	14	78	213	$5.69	$9.74
	Percent of Losses from Large Fires							
Residential	67	63	93	93	65	64	50	46
Non-Residential Structure	33	37	7	7	35	36	50	54
Total	100%	100%	100%	100%	100%	100%	100%	100%
	Percent that Large-Fire Loss Is of Total Fire Problem[4]							
Residential	20	28	48	71	39	62	64	81
Non-Residential Structure	21	38	31	69	54	66	73	84
All Fires[5]	6%	11%	33%	57%	34%	57%	58%	73%

[1] "Large fires" are defined as those fires extending beyond the room of origin.

[2] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[3] Fires/100,000 persons, deaths/million persons, injuries/million persons, dollar loss per capita. Based on 1975 Census estimates of California and Ohio populations.

[4] Percentages of large fire losses by property types were calculated as follows:

$$\text{Percent by property type} = \frac{\text{Number due to large loss fires by property type}}{\text{Number due to all fires by property type}} \times 100$$

The number due to all fires by property type may be found in Table 22.

[5] Large fire loss total divided by all fires total (which includes mobile and outside property fires).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error.

Table 24. REPORTED NON-RESIDENTIAL STRUCTURE LOSSES BY PROPERTY TYPE—California (CFIRS 1975), Ohio (NFIRS 1976)

Property Type	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[1]							
							(In Thousands)	
Public Assembly ...	3,057	783	1	0	140	100	$ 15,339	$ 6,976
Education	1,693	271	0	0	57	24	6,332	2,217
Institutions	2,239	474	5	3	84	85	1,973	1,199
Stores, Offices	4,381	1,056	7	7	142	338	20,756	16,068
Basic Industry	1,278	96	1	0	41	15	2,648	880
Manufacturing	2,925	909	12	0	367	211	19,324	16,003
Storage	4,546	2,771	6	5	197	386	15,527	22,380
Vacant, Construction	1,079	866	0	1	41	93	1,329	1,300
Other	634	217	0	0	5	3	224	209
Unknown	0	0	0	0	0	0	0	0
Total Non-Residential	21,832	7,443	32	16	1,074	1,255	$ 83,651	$ 67,233
Total	216,155	67,824	423	272	4,936	4,004	$209,091	$144,317
	Percent							
Public Assembly ...	1.4%	1.2%	0.2%	0%	3%	2%	7%	5%
Education	0.8	0.4	0	0	1.2	0.6	3	1.5
Institutions	1	0.7	1.2	1.1	1.7	2	0.9	0.8
Stores, Offices	2	1.6	1.7	3	3	8	10	11
Basic Industry	0.6	0.1	0.2	0	0.8	0.4	1.4	0.6
Manufacturing	1.4	1.3	3	0	7	5	9	11
Storage	2	4	1.4	1.8	4	10	7	16
Vacant, Construction	0.5	1.3	0	0.4	0.8	2	0.6	0.9
Other	0.3	0.3	0	0	0.1	0.1	0.1	0.1
Unknown	0	0	0	0	0	0	0	0
Total Non-Residential	10	11	8	6	22	31	40	47
Total	100%	100%	100%	100%	100%	100%	100%	100%

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

Table 25. LARGE FIRE NON-RESIDENTIAL STRUCTURE LOSSES BY PROPERTY TYPE[1]—California (CFIRS 1975), Ohio (NFIRS 1976)

Property Type	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number of Large Fires Reported[2]							
							(In Thousands)	
Public Assembly	549	188	0	0	77	57	$ 11,741	$ 5,239
Education	240	21	0	0	34	6	5,029	836
Institutions	220	15	0	1	17	25	885	1,085
Stores, Offices	774	280	6	6	51	239	15,143	14,250
Basic Industry	68	28	0	0	3	6	1,487	628
Manufacturing	576	193	3	0	265	109	14,989	13,007
Storage	1,723	1,505	1	3	109	311	10,268	19,823
Vacant, Construction	343	462	0	1	27	78	976	1,196
Other	179	111	0	0	1	3	138	135
Total Non-Residential Large Fires	4,672	2,803	10	11	584	834	$ 60,657	$ 56,248
Total Large Fires	14,017	7,512	139	154	1,663	2,295	$120,608	$104,787
	Percent of Losses from Large Fires							
Public Assembly	4%	2.5%	0%	0%	5%	2%	10%	5%
Education	1.7	0.3	0	0	2	0.3	4	0.8
Institutions	1.6	0.2	0	0.6	1.0	1.1	0.7	1.0
Stores, Offices	6	4	4	4	3	10	13	14
Basic Industry	0.5	0.4	0	0	0.2	0.3	1.2	0.6
Manufacturing	4	3	2	0	16	5	12	12
Storage	12	20	0.7	1.8	7	14	9	19
Vacant, Construction	2	6	0	0.6	1.6	3	0.8	1.1
Other	1.3	1.5	0	0	0.1	0.1	0.1	0.1
Total Non-Residential Large Fires	33	37	7	7	35	36	50	54
Total Large Fires	100%	100%	100%	100%	100%	100%	100%	100%
	Percent of Problem Due to Large Fires[3]							
Public Assembly	18%	24%	0%	0%	55%	57%	77%	75%
Education	14	8	0	0	60	25	79	38
Institutions	10	3	0	33	20	29	45	90
Stores, Offices	18	27	86	86	36	71	73	89
Basic Industry	5	29	0	0	7	40	52	71
Manufacturing	20	21	25	0	72	52	78	81
Storage	38	54	17	60	55	81	66	89
Vacant, Construction	32	53	0	100	66	84	73	92
Other	28	51	0	0	20	100	62	65
Total Non-Residential Large Fires	21	38	31	69	54	66	73	84
Total Large Fires	6%	11%	33%	57%	34%	57%	58%	73%

[1] Large fires are defined as those fires which extend beyond the room of origin.

[2] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[3] Percentages of large fire losses by property type were calculated as follows:

$$\text{Percent by property type} = \frac{\text{Number due to large loss fires by property type}}{\text{Number due to all fires by property type}} \times 100$$

The number due to all fires by property type may be found in Table 24.

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

CONTINUED

1 OF 4

Table 26. MOBILE AND OUTSIDE LOSSES BY PROPERTY TYPE— California (CFIRS 1975), Ohio (NFIRS 1976)

Property Type	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[1]							
							(In Thousands)	
Mobile:								
Automobiles	21,391	10,938	36	32	242	187	$ 6,818	$ 5,218
Other Motor Vehicles	7,213	1,935	33	10	172	101	5,241	2,460
Rail, Water & Air Transportation	412	166	27	8	26	11	1,449	1,705
Other Mobile	572	410	2	0	15	13	1,041	800
Mobile Subtotal	29,588	13,449	98	50	455	312	$ 14,549	$ 10,183
Outside:								
Refuse	30,234	11,852	0	0	74	7	2,994	16
Trees, Grass, Brush	55,771	10,949	6	0	360	6	2,777	61
Forests	38	1	0	0	0	0	6	0[2]
Crops	177	27	0	0	4	1	178	24
Other Outside	31,930	7,133	17	5	224	75	10,661	5,465
Outside Subtotal	118,150	29,962	23	5	662	89	$ 16,617	$ 5,566
All Fires	216,155	67,824	423	272	4,936	4,004	$209,091	$144,317
	Percent of All Losses							
Mobile:								
Automobiles	10%	16%	9%	12%	5%	5%	3%	4%
Other Motor Vehicles	3	3	8	4	3	3	3	1.7
Rail, Water & Air Transportation	0.2	0.2	6	3	0.5	0.3	0.7	1.2
Other Mobile	0.3	0.6	0.5	0	0.3	0.3	0.5	0.6
Mobile Subtotal	14	20	23	18	9	8	7	7
Outside:								
Refuse	14	17	0	0	1.5	0.2	1.4	0
Trees, Grass, Brush	26	16	1.4	0	7	0.1	1.3	0
Forests	0	0	0	0	0	0	0	0
Crops	0.1	0	0.5	0	0.1	0	0.1	0
Other Outside	15	11	4	1.8	5	1.9	5	4
Outside Subtotal	55	44	5	1.8	13	2	8	4
All Fires	100%	100%	100%	100%	100%	100%	100%	100%

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[2] Less than $500 loss.

NOTE: Some column totals may not equal the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

Section VII

Characteristics of Fire Casualties

The most important aspect of fire protection is life safety. In addition to knowing where and why fires occur, it is necessary to know what groups of people are most likely to be victims and what the circumstances and nature of the casualties are. It is also important to differentiate between firefighter casualties and general public casualties because their nature and the remedial actions called for are likely to be quite different.

This section presents characteristics of civilian and firefighter casualties. Civilian casualties are discussed by age, sex, nature and causes of casualty, and body parts injured. The results are based primarily on NFIRS casualty data for Ohio, since California did not report corresponding details. However, selected comparisons of fire casualties are also presented for the seven UFIRS cities.

In examining the data in this section, it should be noted that casualty data has some special validity problems. Minor injuries may or may not be reported. Major nonfatal injuries cannot be distinguished in the current NFIRS from minor injuries, since the NFIRS reporting form does not contain a data element relating to the severity of a nonfatal injury. Reporting of firefighter injuries may be influenced by local pension and insurance reporting requirements, which differ from place to place. Reporting a minor injury is sometimes discouraged by peer pressures and by the paperwork involved. Because of the problems and the importance of the issue, improving injury reporting is a high priority on the National Fire Data Center's agenda.

OHIO FIRE CASUALTIES BY AGE AND SEX

The distribution of civilian injuries by age and sex, and firefighters injuries by age are shown in Table 27. Highlights of that table are:

- Over half (56 percent) of all injuries from fires attended by the fire service in Ohio are to firefighters. There were five firefighter deaths reported in 1976.
- Sixty-five percent of all civilian injuries and 61 percent of fire deaths in Ohio are to males. This agrees with the National Center for Health Statistics death data presented in Figure 2, page
- The reason for the surprisingly high percentage of male casualties is not known; this subject will receive further study.
- Not only do male victims outnumber female victims overall, but also civilian male fire injuries in Ohio are more frequent that female injuries for all age groups under 65 years. The situation reverses at the over-65 category, possibly because there are many more females surviving to that age than men. Deaths follow the same pattern except for the 6-17 age group.
- Almost two-thirds of firefighter injuries in Ohio are to individuals between the ages of 26 and 45: 39 percent between 26 and 35 years; and 25 percent between 36 and 45 years.
- The age distribution of civilian injuries is quite different from that for civilian deaths. About three-quarters of all civilian injuries occur to persons between 18 and 65 years of age, but only half of the deaths. Persons less than 18 years have only 18 percent of the injuries, but 30 percent of deaths. Persons more than 65 years have only 9 percent of the injuries, but 21 percent of deaths. Clearly, the nature of fire encountered and the response of the victim to the fire situation and to treatment varies significantly with age.

From another point of view, one can consider the relative risk for each age group. Relative risk is the percent of injuries or fatalities in

Table 27. FIRE CASUALTIES BY AGE AND SEX—Ohio (NFIRS 1976)

Age Group	Injuries				Fatalities			
	Total Civilian	Male Civilian	Female Civilian	Fire-fighter	Total Civilian	Male Civilian	Female Civilian	Fire-fighter
	Number Reported[1]							
0-5 Years	78	49	29	NA	32	23	9	NA
6-17 Years	159	110	49	5	28	12	16	0
18-25 Years	300	205	95	227	28	16	12	0
26-35 Years	244	155	89	709	20	14	6	1
36-45 Years	151	107	44	450	10	5	5	1
46-55 Years	161	101	60	310	21	13	8	2
56-65 Years	97	61	36	25	20	14	6	0
66-75 Years	56	27	29	3	12	5	7	0
76 Years and Over	43	19	24	0	31	16	15	0
Unknown	132	92	40	103[2]	22	18	4	1[3]
Total	1,421	926	495	1,833	224	136	88	5
	Percent							
0-5 Years	6%	5%	6%	0%	14%	17%	10%	0%
6-17 Years	11	12	10	0.3	13	9	18	0
18-25 Years	21	22	19	12	13	12	14	0
26-35 Years	17	17	18	39	9	10	7	20
36-45 Years	11	12	9	25	5	4	6	20
46-55 Years	11	11	12	17	9	10	9	40
56-65 Years	7	7	7	1	9	10	7	0
66-75 Years	4	3	6	0.2	5	4	8	0
76 Years and Over	3	2	5	0	14	12	17	0
Unknown	9	10	8	6	10	13	5	20
Total	100%	100%	101%	101%	101%	101%	101%	100%

[1] Tabulations based on numbers reported on the Ohio 1976 NFIRS Casualty Forms.
[2] Includes two miscoded firefighter injuries of ages 4 and 11 years.
[3] Includes one miscoded firefighter death of age 4 years.
NA = Not applicable.
NOTE: Some column totals may not equal 100 percent of the sum of their elements due to round-off error.

each age group divided by the percent of the people in that age group. A relative risk of "one" is by definition normal or average; higher than "one" means higher risk.

As can be seen from Table 28, the greatest risk of death by fire is to those over 75 years, followed by those under 6 years. The results for Ohio are basically in agreement with the death rates for different age groups reported by the National Safety Council (Figure 9, page 25) for the Nation.

OHIO FIRE CASUALTIES BY NATURE OF INJURY

Table 29 summaries the nature of injuries and causes of deaths sustained by civilians and firefighters. As noted previously, there is some ques-

Table 28. RELATIVE RISK OF BECOMING A FIRE CASUALTY

Age Group	Relative Risk Of Injury	Relative Risk Of Death
0-5 Years	0.6	1.5
6-17 Years	0.5	0.6
18-25 Years	1.8	1.1
26-35 Years	1.6	0.8
36-45 Years	1.0	0.9
46-55 Years	1.1	0.9
56-65 Years	0.9	1.2
66-75 Years	0.8	1.1
76 Years & over	1.0	4.6

Table 29. FIRE CASUALTIES BY NATURE OF INJURY—Ohio (NFIRS 1976)

Nature of Injury	Injuries				Fatalities			
	Total Civilian	Male Civilian	Female Civilian	Fire-fighter	Total Civilian	Male Civilian	Female Civilian	Fire-fighter
	Number Reported[1]							
Burns & Asphyxia/smoke	167	97	70	67	124	77	47	1
Burns only	617	443	174	206	21	10	11	0
Asphyxia/smoke only	397	234	163	464	31	17	14	0
Wound, cut, bleeding	107	81	26	304	3	1	2	0
Dislocation, fracture	22	14	8	50	1	0	1	1
Complaint of pain[2]	24	11	13	103	6	5	1	0
Shock	17	8	9	7	2	1	1	0
Strain, sprain	19	9	10	316	0	0	0	0
Other	25	12	13	258	5	4	1	1
Unknown	26	17	9	58	31	21	10	2
Total	1,421	926	495	1,833	224	136	88	5
	Percent							
Burns & Asphyxia/smoke	12%	10%	14%	4%	55%	57%	53%	20%
Burns only	43	48	35	11	9	7	13	0
Asphyxia/smoke only	28	25	33	25	14	13	16	0
Wound, cut, bleeding	8	9	5	17	1	0.7	2	0
Dislocation, fracture	2	2	2	3	0.4	0	1	20
Complaint of pain[2]	2	1	3	6	3	4	1	0
Shock	1	0.9	2	0.4	0.9	0.7	1	0
Strain, sprain	1	1	2	17	0	0	0	0
Other	2	1	3	14	2	3	1	20
Unknown	2	2	2	3	14	15	11	40
Total	101%	100%	101%	100%	99%	100%	99%	100%

[1] Tabulations based on numbers reported on the Ohio 1976 NFIRS Casualty Forms.

[2] Includes heart attacks and strokes.

tion concerning the degree of reporting of injuries, especially minor ones.

For civilians, the data show:

- The most frequent fire injury to civilians is burns alone, with smoke inhalation second. Burn and smoke injuries which occurred separately or together account for 83 percent of injuries.

- Males have many more burn injuries than females and many more wounds than females. There is no category here in which females have significantly more injuries than males.

- The largest category of civilian deaths in Ohio is burns and smoke inhalation at the same time (55 percent). Burns and smoke inhalation, separately or together, account for 78 percent of deaths. (It is not apparent from this data whether smoke inhalation was the prime cause; but other, more detailed studies point that way.[45])

For firefighters, the data show:

- Smoke inhalation is the most common injury in Ohio (25 percent), followed by strains or sprains (17 percent), and cuts or wounds (17 percent). Only 11 percent of firefighter injuries are burns alone.

- Of injuries sustained in connection with a fire in Ohio, 83 percent are incurred during fire control activities.[46] Another 3 percent are incurred in transit to or from the fire, 4 percent during rescue attempts, 6 percent during overhaul, and 4 percent during other activities.

[45] Halpin, Byron M. et al, "Fire-Related Fatalities: An Analysis of Their Demography, Physical Origins, and Medical Causes," *Fire Standards and Safety*, American Society of Testing Materials, STP 614, (1977), pp. 26-54.

[46] This finding is based on additional analysis of the Ohio data.

• Firefighter deaths in Ohio were too few to make any generalizations. However, a recent joint IAFF/NBS/NFPCA study shows that almost 45 percent of on-duty firefighter deaths are due to heart attacks or other cardiovascular accidents.[47]

OHIO FIRE CASUALTIES BY CAUSE OF CASUALITY

Table 30 summarizes the causes of casualties. "Cause" is used here in the sense of the immediate physical condition or action that led to the injury.

[47] Balanoff, Thomas, *Fire Fighter Mortality Report* (Washington, DC: International Association of Fire Fighters for the National Fire Prevention and Control Administration and the Center for Fire Research, Institute for Applied Technology, National Bureau of Standards, May 1976), Contract Number 4-35909.

"Exposure to fire products (including flame, heat, smoke, and gas), chemicals, or radiation" resulted in 75 percent of civilian injuries and 70 percent of civilian deaths. This category is most applicable to burn or smoke inhalation casualties in the previous section, which accounted for 83 percent of injuries and 79 percent of deaths.

Only 44 percent of firefighter injuries are from "exposure to fire products." That is, most firefighter injuries in Ohio (specifically, the remaining 56 percent) are not directly from the fire, but rather from working near the fire and falling or being struck by something or from over-exertion. This suggests that in addition to improving turnout gear and breathing apparatus, there is a need for more training in fire safety.

Table 30. FIRE CASUALTIES BY CAUSE OF INJURY—Ohio (NFIRS 1976)

	Injuries				Fatalities			
Cause of Injury	Total Civilian	Male Civilian	Female Civilian	Fire-fighter	Total Civilian	Male Civilian	Female Civilian	Fire-fighter
	Number Reported[1]							
Caught in, under or between, or trapped by	64	48	16	36	28	15	13	1
Exposure to fire products,[2] chemicals or radiation	1,060	699	361	810	157	93	64	1
Fell or stepped on, over, into	47	29	18	346	1	1	0	0
Overexertion	13	6	7	110	3	3	0	0
Rubbed by, contact with	93	58	35	145	1	1	0	0
Struck by	36	25	11	205	3	2	1	1
Not applicable	16	8	8	19	4	2	2	1
Other	62	38	24	116	5	3	2	0
Unknown	30	15	15	46	22	16	6	1
Total	1,421	926	495	1,833	224	136	88	5
	Percent							
Caught in, under or between, or trapped by	5	5	3	2	13	11	15	20
Exposure to fire products,[2] chemicals or radiation	75	75	73	44	70	68	73	20
Fell or stepped on, over, into	3	3	4	19	0.4	0.7	0	0
Overexertion	0.9	0.6	1	6	1	2	0	0
Rubbed by, contact with	7	6	7	8	0.4	0.7	0	0
Struck by	3	3	2	11	1	1	1	20
Not applicable	1	0.9	2	1	2	1	2	20
Other	4	4	5	6	2	2	2	0
Unknown	2	2	3	3	10	12	7	20
Total	101%	100%	100%	100%	100%	98%	100%	100%

[1] Tabulations based on numbers reported on the Ohio 1976 NFIRS Casualty Forms.

[2] Includes flame, heat, smoke, and gas.

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error.

At least 19 percent of firefighter injuries are caused by falling or stepping on, over, or into something. Another 11 percent of firefighter injuries are due to contact with some object. Approximately 6 percent of firefighter injuries are due to over-exertion. Civilians are much lower in each of these categories, which provides another rough face-validity check. It is not surprising that firefighters get injured by working around the fire; whereas, most civilians flee from the fire if able to do so; and if not injured by smoke or flame, they are unlikely to suffer strains, sprains, or be hit by objects.

OHIO FIRE CASUALTIES BY PART OF BODY INJURED

Table 31 indicates the frequency of injuries to various parts of the body. For both firefighters and civilians, about one-third of all injuries are "internal," mostly from smoke inhalation. The majority of firefighter injuries in Ohio are about equally divided among various parts of the body: 11 percent each for (1) head and neck; (2) hand; (3) body, trunk, and back; and (4) leg. Arm injuries are 9 percent. A recent IAFF study also found firefighter injuries well distributed over the body.[48] These results suggest that improvement is needed for *all* parts of the firefighter's protective outfit—no single weak point is evident. Severe but nonfatal injuries might be more concentrated, however, and should be analyzed before any final conclusions are drawn.

[48] *A Comprehensive Study of Firefighter Injuries and Injury Reporting Systems* (Washington, DC: International Association of Fire Fighters, October 1977), Fire Administration Grant Number NFPCA-76056, p. 82. The study results are based on a survey conducted in 13 cities.

Table 31. FIRE CASUALTIES BY PART OF BODY INJURED—Ohio (NFIRS 1976)

	Injuries				Fatalities			
Part of Body Injured	Total Civilian	Male Civilian	Female Civilian	Fire-fighter	Total Civilian	Male Civilian	Female Civilian	Fire-fighter
	Number Reported[1]							
Head, neck	112	85	27	213	5	3	2	0
Body, trunk, back	85	55	30	200	26	14	12	1
Arm	130	98	32	159	0	0	0	0
Leg	54	31	23	186	0	0	0	0
Hand	205	142	63	210	0	0	0	0
Foot	42	28	14	77	0	0	0	0
Internal[2]	444	251	193	572	55	32	23	1
Multiple parts	281	195	86	68	110	68	42	2
Other	28	15	13	90	6	4	2	0
Unknown	40	26	14	58	22	15	7	1
Total	1,421	926	495	1,833	224	136	88	5
	Percent							
Head, neck	8	9	5	12	2	2	2	0
Body, trunk, back	6	6	6	11	12	10	14	20
Arm	9	11	6	9	0	0	0	0
Leg	4	3	5	10	0	0	0	0
Hand	14	15	13	11	0	0	0	0
Foot	3	3	3	4	0	0	0	0
Internal[2]	31	27	39	31	25	24	26	20
Multiple parts	20	21	17	4	49	50	48	40
Other	2	2	3	5	3	3	2	0
Unknown	3	3	3	3	10	11	8	20
Total	100%	100%	100%	100%	101%	100%	100%	100%

[1] Tabulations based on numbers reported on the Ohio 1976 NFIRS Casualty Forms.

[2] Includes respiratory system and heart.

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error.

Table 32. SUMMARY OF FIRE CASUALTY DATA BY COMMUNITY

	State of Ohio		UFIRS Total		Jackson-ville, Fl.		Denver, Co.[1]		Kansas City, Mo.		Tucson, Az.		Wichita, Ks.		Syracuse, N.Y.		Madison, WI.	
	No.	Rate[2]	No.	Rate[2]	No.	Rate[2]	No.	Rate[2]	No.	Rate[2]	No.	Rate[2]	No.	Rate[2]	No.	Rate[2]	No.	Rate[2]
Firefighter Casualties																		
Firefighter Injuries	1,833	**	689	156	95	88	30	33	254	296	41	104	117	268	101	203	51	199
Burns only	206	**	74	17	22	20	1	1	31	36	2	5	14	32	0	0	4	16
Asphyxia/smoke only	464	**	83	19	1	1	4	4	9	11	18	46	19	43	16	32	15	59
Burns and Asphyxia/smoke	67	**	—	—	1	1	[3]	—	0	0	[3]	—	[3]	—	7	14	0	0
Strain sprain	316	**	—	—	18	17	7[5]	8[5]	62	72	[4]	[4]	24[5]	55[5]	21	42	10	39
Wound, cut, bleeding	304	**	—	—	19	18			63	74	[4]	[4]			19	38	8	31
Firefighter Fatalities	5	**	1	0	1	0.9	0	0	0	0	0	0	0	0	0	0	0	0
Civilian Casualties																		
Civilian Injuries	1,421	132	587	233	57	98	161	307	77	158	90	295	70	267	98	530	34	202
Young (under 18 years)	237	22	104	41	10	17	23	44	17	35	11	36	16	61	22	119	5	30
Elderly (over 65 years)	99	9	58	23	1	2	32	61	2	4	7	23	3	11	6	32	7	42
Burns only	617	57	226	90	29	50	78	149	32	66	28	92	48	183	6	32	5	30
Asphyxia/smoke only	397	37	171	68	10	17	36	69	20	41	38	125	9	34	37	200	21	125
Burns and Asphyxia/smoke	167	16	—	—	7	12	[3]	—	7	14	[3]	—	[3]	—	22	119	6	36
Civilian Fatalities	224	21	63	25	11	19	15	29	15	31	4	13	10	33	8	43	0	0
Young (under 18 years)	60	6	21	8	2	3	2	4	6	12	0	0	5	19	6	32	0	0
Elderly (over 65 years)	43	4	12	5	2	3	4	8	2	4	2	7	2	8	0	0	0	0
Burns only	21	2	19	8	0	0	7	13	2	4	2	7	1	4	7	38	0	0
Asphyxia/smoke only	31	3	21	8	2	3	7	13	1	2	2	7	9	34	0	0	0	0
Burns and Asphyxia/smoke	124	12	—	—	9	16	[3]	—	9	18	[3]	—	[3]	—	1	5	0	0
Total Casualties																		
Total Injuries	3,254	—	1,276	—	152	—	191	—	331	—	131	—	187	—	199	—	85	—
Total Fatalities	229	—	64	—	12	—	15	—	15	—	4	—	10	—	8	—	0	—
Community Characteristics																		
Population	10,759,000 ('75)		2,510,501		597,669 ('76)		523,700('76)		486,500 ('75)		305,200 ('76)		262,000 ('76)		185,000 ('76)		168,432 ('75)	
Number of firefighters	Unavailable		4,413		1,074[2]		899		857		393		437		497		256	

[1] The Denver Fire Department has jurisdiction over Denver City and County.
[2] Civilian injuries/million population, civilian fatalities/million population, firefighter injuries/1,000 firefighters, firefighter fatalities/1,000 firefighters.
[3] The "burns and asphyxia/smoke" category was not designated on the UFIRS Casualty Forms for these cities.
[4] Comparable categories not available.
[5] Category designated was "wound or distorted member."
[6] Includes 763 full paid, 15 part paid, and 296 volunteer firemen.
** Means cannot compute, denominator unavailable.
— Means data not available.

SOURCE: Based on data from the Ohio NFIRS (using the NFPA 901 codes for 1976), and from the UFIRS system of each city (which use the NFPA 901 codes for 1973 and 1971).

FIRE CASUALTIES IN SEVEN UFIRS CITIES

Table 32 summarizes selected casualty data from the seven UFIRS cities previously noted. For comparison, data from Ohio is included in the table.

From the table it can be seen that reported firefighter injury rates vary nearly ten-fold—from 33 per thousand firefighters to 300 per thousand. These enormous differences may be due to different reporting practices or different city characteristics, different firefighting practices, or training. They imply the need for follow-up analysis to improve the comparability of the statistics and to identify any transferable successes in reducing injury rates.

From the table it can also be seen that firefighter injuries range from 16 percent of total reported injuries for Denver to 77 percent for Kansas City. Some of the discrepancies might be due to differences in reporting practices or to the fact that urban firefighters may be exposed to hazardous fires more frequently than rural firefighters—rural fires are included in the Ohio data.

Reported civilian injury rates (injuries per capita) vary five-fold, from an extraordinarily low rate of 98 per million persons, to 530 per million. The number of deaths in the table is too small to provide reliable comparisons.

Section VIII

Residential Fires

This section contains tables showing the relative frequency of the causes of residential fires. In this section we use the same cause categorizations discussed earlier in Section IV, page 33. Appendix IX provides tables showing the same breakdowns, but presents the number of fires and their rates instead of relative frequencies.

SUMMARY OF CAUSES OF RESIDENTIAL FIRES

Table 33 shows the relative frequency of fire losses attributed to different causes of reported residential fires. There are eight major cause categories: cooking, smoking, heating, incendiary or suspicious, electrical distribution, appliances, children playing, and open flame or spark. For fires of *known* cause, these together account for 90 percent (89 percent) of all residential fires, 93 percent (91 percent) of deaths, 92 percent (87 percent) of injuries, and 89 percent (87 percent) of losses.[49]

The top four major known cause categories for both States are cooking, smoking, heating, and incendiary or suspicious. For fires of known cause, these four categories account for well over half the fire problem any way you look at it: 63 percent (60 percent) of all residential fires, 80 percent (66 percent) of deaths, 68 percent (59 percent) of injuries, and 62 percent (55 percent) of dollar losses.[50] These numbers suggest that both States should consider focusing fire prevention programs on these four areas to achieve significant reductions in fire losses. Of course, programs also are needed in other areas to prevent new problems arising.

- *Cooking* is the most frequent cause of all reported residential fires in both States: 19 percent (16 percent). This is no surprise. It is also the second highest cause of death in both: 7 percent (10 percent). This is less obvious; cooking is not often thought of as causing other than trivial fires.
- *Smoking* ranks first by far as the cause of fire deaths in both States: 37 percent (18 percent). It is also first or second as the cause of injuries: 14 percent (12 percent). Further, it is the second most frequent cause of fire[50] in both States: 13 percent (14 percent).
- *Heating fires* are the third most frequent cause of residential fires in both States.
- *Incendiary or suspicious* residential fires are the fourth most frequent cause of residential fires but are the most frequent in both States in dollar loss: 17 percent (14 percent).
- Fires caused by *children playing* rank eighth in California (4 percent), but fifth in Ohio (8 percent).
- Fires caused by *open flame or spark* are a larger part of the problem in California (6 percent) than in Ohio (3 percent). Recall that "open flame or spark" does not include fires that have been assigned to any of the seven preceding cause categories—see priority list, page 36. For example, "children playing with matches" are not included in "open flame or spark."
- *Exposure* causes about 3 percent of reported residential fires. "Exposure" in building fires means "ignited by heat from another hostile fire." The most common mode is from the burning of outside trash. Less frequently, it includes ignition from another building.

[49] Unless specifically noted, the remaining discussions of this section will be in terms of percentages of all fires (i.e. those of known and unknown causes). The first figure refers to California; the figure in parentheses is for Ohio.

[50] Possibly many fires attributed to smoking should more properly be classified as unknown cause.

Table 33. RESIDENTIAL FIRES BY CAUSE— California (CFIRS 1975), Ohio (NFIRS 1976)

Cause	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Percent							
Cooking	19%	16%	7%	10%	14%	12%	6%	8%
Smoking	13	14	37	18	22	13	13	8
Heating	13	13	6	10	13	11	14	14
Incendiary/Suspicious	10	12	7	4	10	13	17	14
Electrical Distribution	7	8	4	4	7	8	10	14
Appliances	7	7	3	3	5	5	5	4
Children Playing	4	8	1.1	3	4	9	3	5
Open Flame, Spark	6	3	3	4	5	3	4	3
Exposure	3	3	0.4	0	1.3	3	4	3
Flammable Liquids	0.9	0.9	1.5	0	1.7	1.9	1	1.1
Explosives, Fireworks	0.8	0.2	0	0	0.5	0.4	0.6	0.1
Air Conditioning, Refrigeration	0.8	0.7	0.7	0	0.3	0.3	0.6	0.6
Natural	0.6	1.8	0	0.5	0.4	0.9	0.3	1.9
Gas	0.3	0.3	0.4	0.5	1.3	1.5	0.4	1.4
Other Equipment	0.3	0.5	0	0	0.1	0.3	0.3	0.5
Other Heat	1.6	3	1.9	5	1.3	2	1.7	2
Unknown	11	8	27	35	13	15	18	20
Total Percent Residential	99%	99%	100%	99%	100%	100%	100%	101%
Total Number Residential[1]	46,585	16,970	270	201	2,745	2,348	$94,274[2]	$61,335[2]

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[2] Dollar loss in thousands.

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

- Fires of *unknown* cause comprise 11 percent of all fires in California and 8 percent in Ohio. It is the leading dollar loss category in both States: 17 percent (14 percent). In Ohio unknown cause is also the leading category for deaths (35 percent), occurring almost twice as often as smoking which is the most frequent of the known causes; in California unknown causes (27 percent) are second to smoking (37 percent). In Ohio unknown cause also leads the list of causes for injuries (15 percent).[51]

[51] A change in any year in the relative frequency of fires of unknown cause may create some difficulty when monitoring trends for individual cause categories. For example, an apparent decrease in incendiary/ suspicious fires or smoking fires may actually be the result of reporting more fires of doubtful cause as fires of unknown cause. This problem can be reduced by considering causes as a percent of fires with known causes, rather than as a percent of all fires.

FREQUENCY AND CAUSES BY TYPE OF RESIDENCE

Table 34 shows how causes are distributed among different types of residences. Fires occur most frequently in one and two family dwellings —three times as often as fires in apartments in both States. They account for 68 percent (75 percent) for all residential fires, 62 percent (72 percent) of deaths, 64 percent (74 percent) of injuries, and 71 percent (79 percent) of dollar loss. However, one- and two-family dwellings do not necessarily represent a higher fire risk than apartments or mobile homes. This type of analysis would require knowing the relative number of buildings or households of each type.

Hotels and motels as well as other miscellaneous residences such as dormitories, are sites of a very minor part of residential fires today. But

Table 34. CAUSES OF RESIDENTIAL FIRES BY DWELLING TYPE— California (CFIRS 1975), Ohio (NFIRS 1976)

Cause	One and Two Family Dwellings		Apartments, Tenements, and Flats		Mobile Homes		Hotels, Motels, Inns, and Lodges		Other Residential		Total Residential	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Percent of Fires											
Cooking	19%	15%	23%	22%	15%	11%	6%	12%	7%	4%	19%	16%
Smoking	8	11	22	22	12	5	47	33	20	24	13	14
Heating	16	15	7	5	11	23	5	5	6	5	13	13
Incendiary/Suspicious	10	12	12	16	9	5	14	16	25	25	10	12
Electrical Distribution	8	9	4	4	15	16	5	9	6	7	7	8
Appliances	7	8	5	5	6	6	3	5	2	4	7	7
Children Playing	5	8	4	10	3	6	0.4	3	5	3	4	8
Open Flame, Spark	6	3	6	4	3	2	6	3	7	12	6	3
Exposure	4	3	2	1.7	5	3	0.8	2	3	3	3	3
Flammable Liquids	1	0.9	0.7	0.6	0.7	0.8	0.2	0.7	0.6	0	0.9	0.9
Explosives, Fireworks	1.1	0.2	0.3	0	0.2	0	0.1	0	0.6	1.9	0.8	0.2
Air Conditioning, Refrigeration	0.9	0.5	0.5	0.4	1.6	0.4	0.9	0.7	0.3	0.9	0.8	0.7
Natural	0.6	2	0.5	0.7	0.6	1.1	0.3	0.7	0.6	0	0.6	1.8
Gas	0.4	2	0.2	0.1	1.2	1.3	0.2	0.7	0.3	0	0.3	0.3
Other Equipment	0.3	0.5	0.3	0.6	1.2	1.9	0.6	0	0.6	0	0.3	0.5
Other Heat	1.8	3	1.3	3	1.8	2	1.2	3	0.9	1.9	1.6	3
Unknown	12	8	10	6	15	14	10	6	14	10	11	8
Total Percent Residential	101%	101%	100%	101%	101%	100%	101%	100%	99%	100%	99%	99%
Total Number[1]												
Residential Fires	31,866	12,680	11,771	3,382	1,217	527	1,387	275	344	106	46,585	16,970
Residential Deaths	168	145	74	37	16	16	8	3	4	0	270	201
Residential Injuries	1,754	1,747	783	477	74	68	105	42	29	14	2,745	2,348
Residential Dollar Loss in Thousands	$66,396	$48,581	$22,122	$8,374	$3,072	$2,488	$1,958	$1,592	$723	$298	$94,274	$61,335

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 10).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

again, one would need to know the number of persons occupying these types of residences before saying that the rate of danger is especially high or low.

The cause profile for apartments is somewhat different than for single-family dwellings in both States. This difference suggests a need for different emphasis in prevention programs. For example, smoking-related fires account for twice the percentage of apartment fires, 22 percent (22 percent), as one- and two-family dwelling fires, 8 percent (11 percent). Fires involving heating equipment are half the percentage of apartment fires, 7 percent (5 percent), as in one- and two-family dwellings, 16 percent (15 percent).

Although not shown in Table 34, fires involving people smoking are the principal cause of death for *each* residential occupancy.

Section IX

Detailed Characteristics of Residential Fires

This section presents more detailed information on the characteristics of the major causes of residential fires that were previously identified for California and Ohio. From the various data elements included in the NFIRS reporting form, we have selected those cause categories most likely to be useful in targeting local fire prevention programs. For the cause categories primarily involving equipment, the most important additional information needed is the ignition factor. For causes not involving equipment, information on the form of heat of ignition, type of material ignited, form of material ignited, and area of origin may also be pertinent.

For each of the equipment cause categories, detailed breakdowns are given by the principal NFPA 901 code subcategories of equipment. As noted previously, this breakdown makes it possible to redefine cause categories, if desired. For example, one could separate fireplace fires from the general heating category or include portable heaters or hot plates in the appliance category.

For each equipment category, the causes of ignition are subdivided into malfunction, design-construction-installation deficiency, and misuse or carelessness. The NFPA 901 codes further subdivide misuse according to misuse of heat, misuse of material ignited, and operational deficiency.

The order in which the leading causes are discussed below is their relative frequency for both States combined; the most frequent cause, cooking, is discussed first.

RESIDENTIAL COOKING FIRES

According to the 1974 National Fire Household Survey, the vast majority of fires in the home arise from cooking. (See Section IV, page 44 for a summary.) Most of these fires are not reported to the fire service—they are small and are extinguished by the resident or go out by themselves. The reported cooking fires tend to be more serious.

According to the data in Table 35, in both Ohio and California human errors account for about three-fourths of residential fires involving cooking. In both States this same factor accounts for a similar fraction of the injuries, deaths, and dollar losses. Mechanical failure or malfunction usually account for much less than one-fourth as many fires, injuries, deaths, or dollar losses as carelessness.

The single most common specific cause of fires involving cooking is leaving cooking "unattended"—43 percent of the cooking fires in Ohio and 27 percent in California. This ignition factor also accounts for the highest percent of cooking-related injuries, deaths, and dollar losses. It includes a person being physically absent from the kitchen, but may also apply to any situation, not otherwise more specifically classified, when the person is conscious, but inattentive to the cooking. This behavioral problem far outnumbers mechanical problems, such as shorts and part failures. Comparatively few cooking fires are reported as caused by somebody starting to cook then falling asleep, though some of these might have been reported as "unattended."

"Accidentally turned on or not turned off" equipment is the second most common type of misuse: 9 percent (5 percent) of all cooking fires. In California, "combustible-too-close" ranks a close third.

Although not shown in Table 35, almost 90 percent of residential cooking fires have stoves and ovens as the type of equipment involved. This probably is due to their vast predominance over other types of cooking equipment.[52] The

[52] See Appendix X for the frequency distribution of cooking fires.

Table 35. RESIDENTIAL COOKING FIRES BY TYPE OF EQUIPMENT AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)—Continued

Ignition Factor	Stoves and Ovens		Deep Fat Fryer		Portable Cooking Unit		Open-Fired Grill		Other Equipment	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Percent									
Misuse or Operational Deficiency										
Unattended	30%	44%	19%	47%	22%	23%	7%	29%	9%	23%
Accidentally turned on, not turned off	5	10	2	7	5	11	0	0	2	8
Other operational deficiency	2	3	9	7	4	6	4	0	0.9	5
Abandoned, discarded material	1	0.6	2	0	0.7	0	5	0	0.7	0
Falling asleep	2	5	5	7	2	6	0	0	0.5	3
Inadequate control of open fire	3	2	3	0	0.7	1	7	13	0.9	3
Unconscious[1]	1	0.6	3	0	2	0	1	0	0.2	0
Other misuse of heat of ignition	17	6	28	7	9	0	2	0	25	13
Fuel spilled	1	2	0	4	2	2	4	0	0.7	0
Improper container for material ignited	0.5	4	3	0	1	5	3	17	0.3	5
Combustible too close to heat	5	2	0	0	9	2	9	0	2	0.9
Other misuse of material	6	5	3	4	4	5	26	17	5	3
(Subtotal Misuse)	(74)	(82)	(78)	(82)	(61)	(63)	(69)	(75)	(47)	(64)
Mechanical Failure, Malfunction										
Short circuit	4	5	0	2	8	13	0	0	4	14
Part failure, leak, break	5	5	2	0	4	1	3	17	3	5
Lack of maintenance, worn out	2	0.8	0	2	2	2	2	0	2	2
Other mechanical failure, malfunction	3	4	16	11	17	20	1	0	5	7
(Subtotal Mech. Failure)	(13)	(14)	(17)	(14)	(32)	(35)	(6)	(17)	(14)	(28)
Design, construction, installation deficiency	0.8	0.6	2	0	0.7	0	5	8	0.9	6
Other	12	0.9	3	0	7	1	20	0	38	3
Unknown	0.1	2	0	4	0	1	0.6	0	0.3	0
Total Percent of Fires	100%	100%	100%	100%	101%	100%	101%	100%	100%	101%
Total Number of Fires[2]	7,863	2,476	58	57	292	96	162	24	573	107
Total Number of Deaths	18	19	0	1	0	1	1	0	1	0
Total Number of Injuries	335	240	6	12	13	17	8	0	22	18
Dollar Loss in Thousands	$4,712	$3,958	$155	$133	$382	$319	$266	$15	$479	$197

[1] This category also includes "mental, physical impairment; drug, alcohol stupor."

[2] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 35 cont'd. RESIDENTIAL COOKING FIRES BY TYPE OF EQUIPMENT AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)

Ignition Factor	Total Fires		Total Deaths		Total Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Percent							
Misuse or Operational Deficiency								
Unattended	27%	43%	20%	24%	20%	32%	25%	32%
Accidentally turned on, not turned off	5	9	0	5	5	8	9	20
Other operational deficiency	2	3	0	0	2	4	2	3
Abandoned, discarded material	1	0.5	0	0	1	0.3	1	0
Falling asleep	2	5	5	5	3	5	2	4
Inadequate control of open fire	3	2	0	0	0.3	1	3	0.8
Unconscious[1]	1	0.5	10	10	0.5	1	1	0.6
Other misuse of heat of ignition	17	6	20	0	19	10	16	5
Fuel spilled	1	2	5	0	4	4	1	3
Improper container for material ignited	0.5	4	0	14	0.8	4	0.4	2
Combustible too close to heat	5	1	10	5	5	2	5	2
Other misuse of material	6	5	5	14	14	10	8	4
(Subtotal Misuse)	(72)	(81)	(75)	(76)	(75)	(82)	(74)	(76)
Mechanical Failure, Malfunction								
Short circuit	4	5	5	0	1	0.7	1	10
Part failure, leak, break	5	4	0	5	3	5	6	3
Lack of maintenance, worn out	2	0.9	0	0	0.5	0.7	0.9	0.5
Other mechanical failure, malfunction	3	5	0	10	5	9	5	8
(Subtotal Mech. Failure)	(13)	(15)	(5)	(14)	(10)	(15)	(13)	(21)
Design, construction, installation deficiency	0.9	0.9	0	5	2	2	2	1
Other	13	0.9	20	5	13	0.3	11	0.8
Unknown	0.1	2	0	0	0	0.3	0.1	1
Total Percent of Fires	99%	100%	100%	100%	100%	100%	100%	100%
Total Number of Fires[2]	8,948	2,760	—	—	—	—	—	—
Total Number of Deaths	—	—	20	21	—	—	—	—
Total Number of Injuries	—	—	—	—	384	287	—	—
Dollar Loss in Thousands	—	—	—	—	—	—	$5,995	$4,623

characteristics of these fires are further analyzed below.

Residential Cooking Fires Involving Stoves and Ovens

The nature and frequency of specific causes of residential fires involving stoves or ovens for cooking, shown in Table 36, appear to depend in part upon whether the appliance is gas or electric. The source of heat is unknown for many reported cooking fires, because there are several ways to code certain causes, some of which do not indicate whether a gas or electric source of heat is involved. The relative risks cannot actually be assessed without a more accurate determination of electric or gas and without knowing relative numbers of each in homes.[53] However, if we look just at the incidents where gas versus electric *is* coded, patterns of incidents emerge which can be used in identifying the specifics of the cooking problem and in planning prevention programs.

Some highlights of Table 36 include:

- Stoves are much more often the source of fires than ovens in the two States, possibly because of more frequent use and the presence of an open heating element.
- In Ohio, fires from electric stoves outnumber fires involving gas stoves by almost 35 percent. In California, however, they are tied.
- In California, gas oven fires outnumber electric oven fires by two to one. In Ohio, gas oven fires also are more frequent, but not by as much as in California. Note again that these are not relative *rates* of failure for each type of appliance relative to its numbers, but rather the *proportion* of cooking fires that involved them.
- Fires caused by "accidentally turned on or not turned off" stoves are more frequent for electric than for gas stoves.
- A larger percentage of fires for gas stoves involve "part failures" than for electric stoves—but this may be a reporting artifact, since part failures leading to shorts might not be included for electric stoves.

Material Ignited in Cooking Fires

Table 37 shows that the material most frequently ignited in stoves and ovens is, as expected, grease: 48 percent (57 percent). The next most important is food: 18 percent (14 percent). Together these are the first ignited materials in over two-thirds of stove and oven fires. Plastic on electric stoves and ovens also is ignited fairly often. On the other hand, fabric is ignited much more often for gas.

RESIDENTIAL SMOKING-RELATED FIRES

Fires involving people smoking are the second most frequently occurring type of residential fire. Table 38 presents statistics on the origin of fires related to smoking.

In Ohio, 94 percent of fires related to smoking are caused by cigarettes, but in California only 69 percent. The difference may be more apparent than real, however, and may be the result of different coding practices when one is not certain that a cigarette was involved. In California, the unknown smoking materials category represents a relatively high proportion, 27 percent, compared with only 3 percent in Ohio. With the unknowns deleted, the profiles in the two States would be very similar.

"Falling asleep" was reported as a factor in a surprisingly small percentage of smoking-related fires—11 percent in California and 14 percent in Ohio. But it accounts for a large proportion of smoking-related deaths, especially in California, 44 percent (17 percent), and injuries, 28 percent (23 percent). The condition "unconscious" was not reported in any of the fires.

In both States over 40 percent of smoking-related fires occur in the bedroom and 26 percent in the living room; one-third occur elsewhere. Of the smoking-related fires causing *deaths,* 51 percent start in the bedroom in California; whereas in Ohio, 63 percent of fires causing deaths start in the living room.

Materials First Ignited in Smoking Fires

Knowledge about the material first ignited is important, especially for setting State or Federal flammability standards or conducting research into flammability of materials exposed to burning cigarettes, and in alerting industry to the potential need for improved products. Both the form (or usage) of the material as well as the type (or composition) are relevant. The breakdown in Table 39 is according to the NFPA 901 codes.

[53] Analysts can use sales or consumer product consensus data to convert the raw cause data to rates.

Table 36a. RESIDENTIAL COOKING FIRES IN STOVES AND OVENS BY TYPE OF FUEL AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)
STOVES

Ignition Factor	Gas		Electric		Other[1]		Total Stoves	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent of Fires							
Misuse or Operational Deficiency								
Unattended	32%	39%	41%	59%	12%	22%	32%	46%
Accidentally turned on, not turned off	4	9	9	13	2	5	5	10
Other operational deficiency	2	2	2	1	1	6	2	2
Falling asleep	4	8	2	4	2	2	3	5
Inadequate control of open fire	5	4	2	1	2	2	3	2
Other misuse of heat of ignition	21	6	26	8	9	5	20	7
Combustible too close to heat	5	3	5	0.6	2	0.9	4	1
Other misuse of material ignited	7	13	8	9	4	8	7	10
(Subtotal Misuse)	(81)	(84)	(94)	(95)	(33)	(47)	(76)	(84)
Mechanical Failure, Malfunction								
Short circuit	0.0	0.1	0.2	0.2	14	27	3	4
Part failure, leak, break	10	10	0.2	0.2	5	5	5	4
Other mechanical failure, malfunction	3	3	1	2	7	13	3	4
(Subtotal Mech. Failure)	(13)	(13)	(2)	(2)	(25)	(44)	(11)	(13)
Design, construction, installation deficiency	0.8	0.9	0.3	0.3	1	2	0.7	0.7
Other	5	0.6	4	0.8	40	1	12	0.8
Unknown	0.1	1	0.1	1	0.1	6	0.1	2
Total Percent of Fires	100%	100%	100%	99%	99%	100%	100%	100%
Total Number of Fires[2]	2,526	775	2,501	1,044	1,335	333	6,362	2,152

[1] Includes liquid and solid fueled equipment, as well as unknown fuel.

[2] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 36b. RESIDENTIAL COOKING FIRES IN STOVES AND OVENS BY TYPE OF FUEL AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)
OVENS

Ignition Factor	Gas		Electric		Other[1]		Total Ovens	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent of Fires							
Misuse or Operational Deficiency								
Unattended	24%	30%	25%	39%	8%	12%	21%	30%
Accidentally turned on, not turned off	4	6	6	6	1	3	4	6
Other operational deficiency	6	6	5	9	2	6	5	7
Falling asleep	1	3	1	3	0.3	2	0.9	2
Inadequate control of open fire	2	1	0.5	0	2	2	2	0.9
Other misuse of heat of ignition	19	12	19	9	10	5	17	9
Combustible too close to heat	9	2	9	2	2	2	7	2
Other misuse of material ignited	13	20	14	15	6	9	12	16
(Subtotal Misuse)	(77)	(81)	(79)	(82)	(32)	(39)	(68)	(73)
Mechanical Failure, Malfunction								
Short circuit	0.1	0	0.5	0.9	25	29	6	6
Part failure, leak, break	5	9	0.8	2	15	9	6	6
Other mechanical failure, malfunction	8	6	6	11	13	20	9	11
(Subtotal Mech. Failure)	(13)	(15)	(8)	(14)	(52)	(58)	(20)	(23)
Design, construction, installation deficiency	1	0	2	0	0.9	2	1	0.3
Other	9	1	11	3	14	0	11	2
Unknown	0	2	0	2	0.3	2	0.1	2
Total Percent of Fires	100%	99%	100%	101%	99%	101%	100%	100%
Total Number of Fires[2]	773	142	392	116	336	66	1,501	324

Table 37. RESIDENTIAL COOKING FIRES IN STOVES AND OVENS BY TYPE OF FUEL AND MATERIAL FIRST IGNITED—California (CFIRS 1975), Ohio (NFIRS 1976)

Material Ignited	Gas Stoves		Gas Ovens		Electric Stoves		Electric Ovens		Other Fuel		Total	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[1]											
Fat, grease (food)	1,013	366	425	76	1,714	768	225	61	401	146	3,778	1,417
Food, starch	739	151	141	25	335	120	71	21	119	19	1,405	336
Natural gas	347	96	62	14	0	1	0	0	141	23	550	134
All flammable, combustible liquids[2]	71	27	10	4	68	18	3	3	23	6	175	58
Fabric, textile, fur	63	35	20	5	41	16	14	3	62	7	200	66
Polish, paraffin, wax	45	4	6	2	53	8	3	0	11	4	118	18
Plastic (all forms)	25	17	14	4	72	35	22	15	164	34	297	105
Paper, untreated	21	19	9	2	27	14	12	2	8	7	77	44
Wood	24	14	11	1	30	20	5	2	22	29	92	66
Adhesive, resin, tar	35	8	2	0	1	1	0	0	1	0	39	9
Grease (non-food)	16	1	8	1	23	9	3	1	10	2	60	14
Other wood, paper	19	10	17	0	32	15	11	2	58	18	137	45
Other material	95	24	40	7	75	11	20	3	589	85	819	130
Unknown	13	3	8	1	30	8	3	3	60	19	116	34
Total	2,526	775	773	142	2,501	1,044	392	116	1,671	399	7,863	2,476
	Percent											
Fat, grease (food)	40	47	55	54	69	74	57	52	24	36	48	57
Food, starch	29	19	18	18	13	11	18	18	7	5	18	14
Natural gas	14	12	8	10	0	0.1	0	0	8	6	7	5
All flammable, combustible liquids[2]	3	3	1	3	3	2	0.8	3	1	1	2	2
Fabric, textile, fur	2	5	3	4	2	2	4	3	4	2	3	3
Polish, paraffin, wax	2	0.5	0.8	1	2	0.8	0.8	0	0.7	1	2	0.7
Plastic (all forms)	1	2	2	3	3	3	6	13	10	8	4	4
Paper, untreated	0.8	2	1	1	1	1	3	2	0.5	2	1	2
Wood	1	2	1	0.7	1	2	1	2	1	7	1	3
Adhesive, resin, tar	1	1	0.3	0	0.1	0	0	0	0.1	0	0.5	0.4
Grease (non-food)	0.6	0.1	1	0.7	0.9	0.9	0.8	0.9	0.6	0.5	0.8	0.6
Other wood, paper	0.8	1	2	0	1	1	3	2	3	5	2	2
Other material	4	3	5	5	3	1	5	3	35	21	10	5
Unknown	0.5	0.4	1	0.7	1	0.8	0.8	3	4	5	1	1
Total	100%	98%	99%	101%	100%	100%	99%	102%	99%	100%	100%	100%

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[2] Includes both fuel and non-fuel flammable liquids.

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 38. CHARACTERISTICS OF SMOKING FIRES IN RESIDENTIAL OCCUPANCIES—California (CFIRS 1975), Ohio (NFIRS 1976)

Fire Characteristics	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Percent							
Form of Heat of Ignition:								
Cigarette	69	94	93	97	80	95	79	93
Pipe	0.5	0.8	0	3	1	0.7	0.6	0.3
Cigar	0.3	0.6	1	0	0.2	0.3	0.3	1
Other	3	1	3	0	3	0.7	4	1
Unknown	27	3	2	0	15	3	16	4
Total	100%	99%	99%	100%	99%	100%	100%	99%
Ignition Factor:								
Abandoned (cigarette)	57	78	51	74	45	72	64	81
Falling asleep	11	14	44	17	28	23	15	10
Children playing	2	2	3	0	5	0.7	2	1
Unattended	0.6	0.1	0	0	0.2	0	0.7	0.4
Other	30	5	2	9	23	4	18	7
Unknown	0.1	0.5	0	0	0	0	0	0.2
Total	101%	100%	100%	100%	101%	100%	100%	100%
Area of Origin:								
Bedroom	41	44	51	26	49	46	38	27
Living room	26	26	41	63	34	38	37	36
Kitchen	5	6	3	6	4	4	6	6
Trash area	5	2	0	0	0.2	0	0.4	0
Garage area	3	0.8	0	0	0.9	0.3	2	1
Bathroom	2	3	0	0	2	3	2	2
Supply storage	1	1	0	0	0	0	0.6	0.6
Roof	1	0.3	0	0	0.2	0	0.6	0
Other	15	15	4	6	8	9	12	24
Unknown	0.6	1	1	0	2	0.7	2	3
Total	100%	99%	100%	101%	100%	101%	101%	100%
							(In Thousands)	
Total Number[1]	6,011	2,287	91	35	582	304	$11,507	$4,745

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Upholstered chairs and sofas, mattresses, and bedding are the items most frequently involved in residential fires caused by smoking, 57 percent (69 percent). It should be noted that the distinction between bedding materials and mattresses may not always be correctly coded. There are significant differences reported between California and Ohio. Although bedding materials account for the same percentage of residential smoking fires in both States, they account for twice the percentage of deaths in California than in Ohio, 29 percent vs. 14 percent. On the other hand, residential smoking fires involving upholstered chairs or sofas account for about half the percentage of deaths in California than in Ohio, 36 percent vs. 60 percent, although again the category accounts for about the same percentage of fires, 31 percent and 28 percent. In other words, smoking fires occur in the same places in both States, but they happen to result in more lethal fires in beds in one and in upholstered furniture in the other. Whether this is happenstance or has an underlying reason remains to be seen. The number of deaths is small, so that the precision is low.

Ignition of fabric (including natural or man-made fabrics or fur) resulted in 61 percent (64 percent) of smoking fires, 77 percent (69 percent) of deaths, 73 percent (75 percent) of injuries, and 65 percent (67 percent) of dollar loss. The type of material most often involved was reported as cotton or rayon; but in upholstery, synthetics

Table 39. TYPE AND FORM OF MATERIAL FIRST IGNITED IN RESIDENTIAL SMOKING FIRES—California (CFIRS 1975), Ohio (NFIRS 1976)--Continued

Form of Material	Cotton, rayon		Man-made fabric		Unknown fabric		Paper		Natural fiber	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[1]									
Upholstered chair or sofa ...	738	250	393	273	51	37	0	2	33	36
Mattress	1,011	489	147	112	22	26	0	0	63	56
Bedding	305	89	45	18	16	29	0	0	7	8
Wearing apparel not on person	58	42	20	17	4	4	0	0	0	1
Trash	5	3	1	0	2	0	473	141	1	0
Newspapers etc.	0	0	0	0	0	0	38	30	0	0
Other	105	35	57	32	697	7	48	77	1	1
Unknown	0	1	0	2	0	0	4	2	0	0
Total Fires	2,222	909	663	454	792	103	563	252	105	102
Total Deaths	45	15	17	8	8	1	5	1	1	6
Total Injuries	237	148	107	63	80	17	32	13	7	9
Dollar Loss in Thousands	$4,472	$1,341	$1,872	$1,457	$1,174	$398	$952	$417	$129	$90
	Percent									
Upholstered chair or sofa ...	33	28	59	60	6	36	0	0.8	31	35
Mattress	45	54	22	25	3	25	0	0	60	55
Bedding	14	10	7	4	2	28	0	0	7	8
Wearing apparel not on person	3	5	3	4	0.5	4	0	0	0	1
Trash	0.2	0.3	0.2	0	0.3	0	84	56	1	0
Newspapers, etc.	0	0	0	0	0	0	7	12	0	0
Other	5	4	9	7	88	7	9	31	1	1
Unknown	0	0.1	0	0.4	0	0	0.7	0.8	0	0
Total Fires	100%	101%	100%	100%	100%	100%	101%	101%	100%	100%

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 39 cont'd. TYPE AND FORM OF MATERIAL FIRST IGNITED IN RESIDENTIAL SMOKING FIRES—California (CFIRS 1975), Ohio (NFIRS 1976)

Form of Material	Other		Unknown		Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[1]											
Upholstered chair or sofa	475	103	6	3	1,696	704	33	21	199	112	$4,059	$2,482
Mattress	77	37	5	7	1,325	727	17	5	106	107	1,608	786
Bedding	33	11	3	1	409	156	26	5	119	23	1,721	323
Wearing apparel not on person	6	8	1	0	89	72	0	0	7	11	156	109
Trash	427	98	7	9	916	251	3	1	30	16	1,039	370
Newspapers, etc.	13	4	0	0	51	34	1	0	2	0	150	57
Other	540	196	66	6	1,514	304	11	3	119	28	2,735	516
Unknown	6	11	1	23	11	39	0	0	0	7	39	102
Total Fires	1,577	468	89	49	6,011	2,287						
Total Deaths	13	1	2	0			91	35				
Total Injuries	109	45	10	9					582	304		
Dollar Loss in Thousands	$2,457	$818	$451	$224							$11,507	$4,745
	Percent											
Upholstered chair or sofa	30	22	8	6	28	31	36	60	34	37	35	52
Mattress	5	8	6	14	22	32	19	14	18	35	14	17
Bedding	2	2	3	2	7	7	29	14	20	8	15	7
Wearing apparel not on person	0.4	2	1	0	1	3	0	0	1	4	1	2
Trash	27	21	8	18	15	11	3	3	5	5	9	8
Newspapers, etc.	0.8	0.9	0	0	0.8	1	1	0	0.3	0	1	1
Other	34	42	74	12	25	13	12	9	20	9	24	11
Unknown	0.4	2	1	47	0.2	2	0	0	0	2	0.3	2
Total Fires	100%	100%	101%	99%	99%	100%	100%	100%	98%	100%	99%	100%

occurred with moderate frequency; in Ohio they occurred more frequently than cotton or rayon.

RESIDENTIAL HEATING-RELATED FIRES

Fires involving heating equipment are the third most frequently occurring residential fires in both States, despite differences between their climates. In fact, California has many more such fires per capita than Ohio (more even than are likely to be accounted for by under-reporting).

Table 40 provides a breakdown of causes of residential heating fires by type of heating equipment. Overall, central heating is the most frequently involved type of heating in Ohio (29 percent). Fixed local heating equipment is most frequent in California (27 percent), probably reflecting differences in climate and construction practices. In both States, fireplaces rank a close second—24 percent of heating fires in Ohio and 23 percent in California. Water heaters rank third.

In California, heating fires are caused about as often by misuse of equipment (40 percent) as by equipment failures or design-construction-installation deficiencies (37 percent); the miscellaneous category ("other") is also large (22 percent). In Ohio, equipment and design/construction problems dominate (56 percent), although misuse still accounts for 37 percent.

Of residential fires involving central heating, "combustibles stored too close" and various mechanical failures account for most incidents in California. In Ohio, a variety of mechanical and other problems account for the majority of the central heating equipment fires.

Among fires in central heating equipment, the most frequent involve mechanical malfunctions: 52 percent (58 percent). The most frequent fires with a design-construction-installation deficiency cause occur in chimney-flue-and-connectors (for California) and fireplaces (for Ohio).

For fires in fixed local heating, the major problem in California is "combustibles stored too close." Part failure is also a frequent problem. In Ohio, no single cause dominates for fires in fixed local heating.

For portable heaters and water heaters, again, "combustibles stored too close" is the leading problem in California. In Ohio, "improper container" is most frequent; this may represent a data coding problem rather than an actual problem. Short circuits are also common in both States.

For fires in fireplaces, faulty construction, installation, or design are the principal causes in Ohio. No single cause dominates in California fires of this type. Relevant to this problem, the 1976 Montana State Fire Marshal's report said:

> "With the cost of heating being what it is, many people are going more and more towards using fireplaces, coal stoves, and wood burning stoves for heating their homes. Many of these people are not aware of the proper maintenance of these types of heating equipment and are, therefore, letting soot build up in the chimneys or using no spark screens. These have been the two largest problems in the reported heating equipment fires. Also improper installation has been a problem. Fire departments throughout the state would do well to make the people in their community aware of these problems, thereby possibly eliminating a tragedy or fire problem." [54]

Type of Fuel Used in Central Heating

The relative frequency of fires in residential central heating by type of heating fuel and cause of the fire is shown in Table 41.

For fires in central heating for which the fuel type was reported, gas was the predominant type involved. However, to determine the relative risks of the different types of central heating, one must know the relative frequency of use of fuel types. Although not included here, it is desirable to make this type of analysis. It is also useful to know how the type of fuel used in central heating affects the causes of fires.

Table 41 also shows that for gas fuel, only 30 percent (42 percent) of heating-related fires are due to malfunctions and another 44 percent (37 percent) are due to misuse of the material ignited. However, the large number of fires where the type of fuel was not recorded might change these proportions.

[54] *Montana State Fire Marshal Bureau—Annual Report 1976* (Helena, MT: Department of Justice, 1976), p. 13.

Table 40. RESIDENTIAL HEATING FIRES BY TYPE OF HEATING AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)—Continued

Type of Heating / Ignition factor	Central Heating		Fixed Local Heating		Portable Heaters		Water Heaters		Chimney Flue and Connector	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent									
Mechanical Failure, Malfunction										
Short circuit	11%	11%	2%	4%	9%	11%	1%	2%	0.2%	0.5%
Automatic control failure	8	12	2	7	0.8	3	2	3	0.7	0
Lack of maintenance, worn out	10	8	5	4	2	0.7	3	3	10	16
Part failure, leak, break	11	7	7	9	4	2	10	8	3	10
Other malfunction	12	19	4	11	4	7	3	6	0	3
(Subtotal Mech. Failure)	(52)	(58)	(20)	(35)	(20)	(23)	(19)	(23)	(15)	(30)
Misuse or Operational Deficiency										
Fuel spilled	0.6	2	0.7	2	0.4	0.7	11	9	0.5	0
Cleaning, refinishing, painting with flammable material	0.7	0.8	0.7	1	0.8	0	7	11	0	0
Improper container for flammable material	0	9	0.1	10	0	22	0.4	26	0	6
Combustible too close to heat	20	3	31	3	25	8	22	9	4	1
Improper storage of flammable material	1	1	1	0.7	0.8	1	4	7	0	0.5
Other misuse of material ignited	1	3	3	4	1	0.7	5	4	2	4
Inadequate control of open fire	0.1	0	0.1	0.7	0.8	0	0.1	0.3	2	3
Other misuse of heat of ignition	2	2	3	3	13	16	0.7	1	3	3
Unattended	0.1	0.6	2	2	4	9	0.2	0	0.2	0
Overloaded	0.6	2	0.5	3	0.4	0.7	0	0	1	1
Other operational deficiency	3	4	4	8	5	4	3	3	4	7
(Subtotal Misuse)	(29)	(28)	(47)	(38)	(52)	(63)	(53)	(71)	(18)	(25)
Design, Construction, Installation Deficiency										
Design deficiency	1	0.8	1	2	0.4	0	0.6	0	6	6
Construction deficiency	0.9	1	2	6	1	0	1	0.9	10	10
Installed too close to combustibles	4	4	6	7	4	6	2	2	12	15
Other design, construction, installation	4	2	5	4	4	2	3	0.9	12	9
(Subtotal Design)	(9)	(8)	(13)	(19)	(9)	(8)	(6)	(4)	(40)	(40)
Other	9	2	20	2	19	0.7	22	1	26	2
Unknown	0.1	5	0.2	6	0	4	0.1	2	0.7	3
Total Percent of Fires	99%	101%	100%	100%	100%	99%	100%	101%	100%	100%
Total Number of Fires[1]	909	625	1,631	294	248	142	1,234	319	401	209
Total Number of Deaths	2	9	7	1	3	3	2	1	0	0
Total Number of Injuries	26	86	94	27	26	34	139	51	9	17
Dollar Loss in Thousands	$1,517	$2,147	$3,727	$1,437	$1,038	$605	$3,620	$762	$719	$615

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 40 cont'd. RESIDENTIAL HEATING FIRES BY TYPE OF HEATING AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)

Type of Heating / Ignition factor	Fireplaces		Other and Unknown		Total Fires		Total Deaths		Total Injuries		Dollar Loss	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent											
Mechanical Failure, Malfunction												
Short circuit	0%	0.2%	2%	9%	3%	5%	0%	0%	0.8%	0.4%	1%	3%
Automatic control failure	0	0	2	7	2	5	13	5	3	4	2	7
Lack of maintenance, worn out	10	5	2	2	7	7	0	0	1	1	3	3
Part failure, leak, break	1	3	3	9	6	6	6	11	3	5	8	10
Other malfunction	1	2	10	9	4	9	6	16	5	13	5	15
(Subtotal Mech. Failure)	(12)	(10)	(19)	(36)	(22)	(33)	(25)	(32)	(13)	(24)	(20)	(39)
Misuse or Operational Deficiency												
Fuel spilled	0.4	0.4	2	4	3	3	0	0	13	6	9	2
Cleaning, refinishing, painting with flammable material	0.1	0	0	0	2	2	6	0	10	3	2	0.5
Improper container for flammable material	0.2	5	0	11	0.1	11	0	11	0.8	23	0.1	11
Combustible too close to heat	6	0.8	5	0	19	4	31	0	21	2	26	4
Improper storage of flammable material	0.5	0.2	0.4	2	2	2	0	0	0.6	3	2	1
Other misuse of material ignited	9	6	10	7	5	4	0	5	10	10	5	3
Inadequate control of open fire	3	3	0	0	0.9	1	0	0	1	0.7	2	0.3
Other misuse of heat of ignition	4	3	9	4	3	3	6	11	4	5	3	4
Unattended	1	1	2	7	1	2	0	0	1	1	2	2
Overloaded	3	2	0.4	2	1	2	0	5	0	1	0.4	1
Other operational deficiency	6	4	1	4	4	5	0	5	0.3	7	2	4
(Subtotal Misuse)	(34)	(25)	(30)	(42)	(40)	(37)	(44)	(37)	(62)	(59)	(53)	(33)
Design, Construction, Installation Deficiency												
Design deficiency	5	9	1	0	2	3	6	0	3	0.4	2	1
Construction deficiency	8	25	2	0	4	8	0	0	3	5	4	7
Installed too close to combustibles	3	11	4	13	4	7	19	0	3	4	5	6
Other design, construction, installation	7	10	12	4	5	5	0	11	3	4	5	5
(Subtotal Design)	(23)	(56)	(20)	(18)	(15)	(23)	(25)	(11)	(12)	(13)	(15)	(19)
Other	30	2	31	2	22	2	6	0	13	0.4	12	0.9
Unknown	0.9	6	0	2	0.3	5	0	21	0.3	4	0.2	8
Total Percent of Fires	100%	99%	100%	100%	99%	100%	99%	101%	100%	100%	100%	100%
Total Number of Fires	1,382	502	250	45	6,055	2,136	—	—	—	—	—	—
Total Number of Deaths	1	2	1	3	—	—	16	19	—	—	—	—
Total Number of Injuries	53	48	9	8	—	—	—	—	356	271	—	—
Dollar Loss in Thousands	$2,382	$1,439	$470	$263	—	—	—	—	—	—	$13,474	$7,268

Table 41. CENTRAL HEATING FIRES IN RESIDENTIAL OCCUPANCIES BY TYPE OF FUEL AND IGNITION FACTOR--California (CFIRS 1975), Ohio (NFIRS 1976)

Type of Fuel / Ignition Factor	Gas Fueled Equipment		Liquid Fueled Equipment		Solid Fueled Equipment		Other and Unknown		Total Fires		Dollar Loss in Thousands	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Number Reported[1]											
Mechanical Failure, Malfunction	145	69	9	48	1	6	320	238	475	361	605	1,243
Design, Construction, Installation Deficiency	69	14	0	3	1	6	15	24	85	47	268	228
Misuse of Material Ignited	198	60	0	5	0	11	20	44	218	120	443	320
Misuse of Heat of Ignition	15	1	0	2	0	1	5	8	20	12	13	45
Operational Deficiency	17	9	0	0	0	3	13	29	30	41	47	121
Other	33	5	0	0	0	0	47	6	80	11	134	12
Unknown	1	7	0	0	0	2	0	24	1	33	7	178
Total Fires	478	165	9	58	2	29	420	373	909	625	—	—
Total Dollar Loss in Thousands	$1,147	$796	$7	$185	$15	$213	$347	$952	—	—	$1,517	$2,147
	Percent											
Mechanical Failure, Malfunction	30	42	100	83	50	21	76	64	52	58	40	58
Design, Construction, Installation Deficiency	14	8	0	5	50	21	4	6	9	8	18	11
Misuse of Material Ignited	41	36	0	9	0	38	5	12	24	19	29	15
Misuse of Heat of Ignition	3	0.6	0	3	0	3	1	2	2	2	0.9	2
Operational Deficiency	4	5	0	0	0	10	3	8	3	7	3	6
Other	7	3	0	0	0	0	11	2	9	2	9	0.6
Unknown	0.2	4	0	0	0	7	0	6	0.1	5	0.5	8
Total Fires	99%	99%	100%	100%	100%	100%	100%	100%	99%	101%	100%	101%

[1] Reported fires shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

RESIDENTIAL INCENDIARY OR SUSPICIOUS FIRES

In the combined data for California and Ohio, fires of incendiary or suspicious origin are the fourth most frequently occurring type of residential fire. Those fires, accounting for 11 percent of all residential fires, require information different from that of other fires; for example, characteristics and motivation of the perpetrators —their age, relation to property burned, and motivation (e.g. fraud, revenge, vandalism). The information routinely provided by NFIRS is necessarily much narrower in scope than this and requires supplemental data from in-depth studies in the future.

Nevertheless, Table 42 reveals some important findings on incendiary and suspicious fires, based on currently available data. Suspicious fires (that is suspected, but not confirmed, as incendiary) comprise over 40 percent of the total reported as "incendiary or suspicious." This, together with the large percent of fires of "unknown" cause, suggest the need for better arson detection methods and training.

Incendiary devices are listed as the source of ignition relatively infrequently, 5 percent (10 percent). These fires do not account for much of the losses. The most common source of ignition is a match or other flame. However, the "unknown" source of ignition is listed for a sub-

Table 42. CHARACTERISTICS OF INCENDIARY/SUSPICIOUS FIRES IN RESIDENTIAL OCCUPANCIES—California (CFIRS 1975), Ohio (NFIRS 1976)

	Fires		Deaths		Injuries		Dollar Loss	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
Fire Characteristics	Percent							
Type of Fire:								
Incendiary, not civil disturbance	57	54	75	33	44	50	48	48
Suspicious not civil disturbance	42	45	25	67	55	50	51	51
Incendiary, during civil disturbance	0.9	0.6	0	0	0.7	0	0.5	0.2
Suspicious, during civil disturbance	0.7	0.5	0	0	0	0	0.6	0.5
Total	101%	100%	100%	100%	100%	100%	100%	100%
Form of Heat of Ignition:								
Incendiary device	5	10	15	0	4	8	3	13
Match	42	33	20	0	26	20	27	18
Other flame	10	30	30	33	16	40	12	40
Cigarette	1	1	0	0	2	0.6	1	0.5
Fireworks	1	0.3	0	0	0.7	0	0.4	0.1
Other	4	4	0	22	2	7	3	4
Unknown	37	22	35	44	49	25	55	24
Total	100%	100%	100%	99%	100%	101%	101%	100%
Material Ignited:								
Gasoline	5	8	10	22	6	9	5	9
Kerosene	1	3	0	0	0.7	3	0.7	5
Other flammable liquid	9	6	55	0	10	6	15	7
Paper	14	14	0	0	9	8	6	4
Wood	10	22	0	11	11	26	12	24
Fabric	27	21	15	33	21	18	17	16
Other	19	15	5	0	19	17	14	16
Unknown	15	11	15	33	24	14	31	20
Total	100%	100%	100%	99%	101%	101%	101%	101%
Total Number[1]	4,871	2,107	20	9	287	315	$16,468	$8,774

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than two were rounded to the nearest tenth of a percent.

stantial proportion of these fires, 37 percent in California, 22 percent in Ohio, and some of these may be from incendiary devices.

Gasoline, kerosene, and other flammable liquids are seldom listed as the material first ignited. Only about 16 percent of these fires list flammable liquids as the material first ignited. Paper is used slightly less often. Fabric and wood are high: 37 percent (43 percent). This may be due to misreporting, since wood and fabric may be the second material ignited, not the first. This is something to be checked in the future.

RESIDENTIAL ELECTRICAL DISTRIBUTION FIRES

Residential fires involving electrical distribution equipment constitute 7 percent of the residential total. A variety of electrical components is included in the electrical distribution category: fixed wiring, lamps and lighting fixtures, cords and plugs, switches and outlets, light bulbs, and so forth. Light bulbs are somewhat different from other items in the category and should perhaps be placed in a separate class. If a fire originates from an electrical rather than a light bulb malfunction, it should not be coded as a light bulb fire, although this practice may not always be followed.

Among electrical distribution fires shown in Table 43, fixed wiring is the most frequent source in both States, 25 percent of electrical fires in California, 31 percent in Ohio. "Cords and plugs" rank second in both States.

Regardless of the particular electrical component involved, equipment malfunction is the principal reported cause of electrical fires, 59 percent in California and 77 percent in Ohio. "Short circuit" is the most frequently reported malfunction, 37 percent (56 percent) of all fires. According to the data, overloaded circuits are much less frequently cited, although still important. However, overloads produce heating which might be reported as a short circuit. Many fire officers have raised caution flags about the accuracy of the reporting of the precise cause of electrical fires.

In California "combustibles too close to heat" is a frequent specific cause for lamp and fixture fires (19 percent) and also for light bulb fires (27 percent). Although in Ohio "improper container" is most frequently reported for light bulbs, much of this difference may be due to differing interpretations of the codes or to encoding error.

RESIDENTIAL FIRES INVOLVING APPLIANCES

Characteristics of fires involving "appliances," which account for 7 percent of the residential fires, are shown in Table 44 by appliance type and cause. "Appliances" here include TV's, dryers, washing machines, irons, electric blankets, and assorted other items. Appliances used in cooking (e.g. ovens, stoves, deep-fat fryers) and heating (e.g. portable space heaters), air conditioners, and refrigerators are covered elsewhere under those separate headings.

The data in the table indicate that dryers are the appliance in this category most frequently involved in residential fire, 32 percent in California, 38 percent in Ohio. Television and radio fires occur second most frequently, 26 percent (29 percent), but are most frequent in dollar loss by far. TV and radio fires also accounted for most of the small number of deaths resulting from "appliance" fires.

Malfunctions are reported as the ignition factor for 60 percent (73 percent) of the appliance fires. The appliance category with the greatest proportion of fires reported due to malfunctions is TV/radio, 85 percent (89 percent). The appliance category having the greatest proportion of misuse reported is "portable appliances producing heat" (such as irons), 34 percent (33 percent).

For all appliance fires except those involving dryers, short circuits are reported as the principal type of malfunction. As noted when discussing electrical distribution fires, this may be a euphemism for a variety of electrical problems. For appliance fires involving dryers, "worn out or lacking maintenance" and "automatic control failure" are cited more frequently than short circuits.

As with previous categories such as heating and electrical distribution, "combustibles too close" (California) and "improper container" (Ohio) are the most common forms of reported misuse of appliances.

Table 43. ELECTRICAL DISTRIBUTION FIRES IN RESIDENTIAL OCCUPANCIES BY ELECTRICAL COMPONENT AND IGNITION FACTOR— California (CFIRS 1975), Ohio (NFIRS 1976)—Continued

Electrical Component / Ignition factor	Fixed Wiring		Lamps, Fixtures		Cords, Plugs		Switch, Outlets		Light Bulbs		Other	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent											
Mechanical Failure, Malfunction:												
Short circuit	51%	64%	24%	39%	52%	59%	48%	63%	12%	18%	13%	59%
Part failure, leak, break	5	2	5	2	3	1	9	3	0.6	2	4	2
Lack of maintenance, worn out	4	3	5	0.5	11	3	4	0.9	2	0	2	1
Automatic control failure	0.4	0.2	0.3	0	0.7	0	0.6	0	0	0	0.3	2
Other malfunction	12	17	8	12	12	17	12	17	3	11	13	19
(Subtotal Mech. Failure)	(72)	(86)	(42)	(53)	(79)	(82)	(73)	(83)	(18)	(31)	(33)	(82)
Design, Construction, Installation Deficiency	10	5	8	14	4	3	8	3	12	8	3	4
Misuse or Operational Deficiency:												
Misuse of heat of ignition	0.5	0.7	5	3	0.8	2	0.2	2	9	8	0.5	0.7
Improper container for flammable material	0	0.2	0	4	0	1	0	0	0	25	0	0.7
Combustible too close to heat	0.4	0	19	5	1	0	0.8	0	27	6	0.7	0
Other misuse of material ignited	0.5	0	5	5	0.9	1	2	2	2	0	0.8	2
Overloaded	3	4	2	2	7	7	2	5	0.6	0	2	4
Unattended	0.2	0.2	3	3	0.3	0.4	0.2	2	2	0	0.5	0
Accidentally turned on, not turned off	0.1	0	3	3	0.3	0.4	0.3	0	4	2	0.3	2
Other operational deficiency	3	1	3	6	0.9	1	2	2	8	9	2	2
(Subtotal Misuse)	(8)	(6)	(40)	(30)	(12)	(13)	(9)	(12)	(53)	(49)	(7)	(11)
Other	10	1	10	3	5	1	10	0.9	16	6	57	0.7
Unknown	0.1	2	0	0	0.4	1	0	0.9	0.6	6	0	3
Total Percent of Fires	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Total Number of Fires[1]	837	426	375	199	741	269	482	108	179	65	743	302
Total Number of Deaths	0	2	2	1	5	3	2	2	1	0	0	1
Total Number of Injuries	52	68	18	19	62	39	18	16	6	6	34	37
Total Dollar Loss in Thousands	$3,157	$3,594	$1,105	$729	$2,747	$1,197	$923	$618	$671	$186	$1,488	$2,022

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent. The percent of fires involving light bulbs and improper containers may result from misinterpretation of codes or encoding errors.

Table 43 cont'd. ELECTRICAL DISTRIBUTION FIRES IN RESIDENTIAL OCCUPANCIES BY ELECTRICAL COMPONENT AND IGNITION FACTOR— California (CFIRS 1975), Ohio (NFIRS 1976)

Ignition factor	Total Fires		Total Deaths		Total Injuries		Dollar Loss	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent							
Mechanical Failure, Malfunction:								
Short circuit	37%	56%	30%	11%	41%	55%	43%	55%
Part failure leak, break	5	2	0	0	1	0	2	0.3
Lack of maintenance, worn out	5	2	0	0	2	2	3	2
Automatic control failure	0.4	0.5	0	0	0	0	1	0.3
Other malfunction	11	16	30	67	13	22	14	28
(Subtotal Mech. Failure)	(59)	(77)	(60)	(78)	(56)	(79)	(63)	(86)
Design, Construction, Installation Deficiency	7	6	10	11	15	6	7	3
Misuse or Operational Deficiency:								
Misuse of heat of ignition	2	2	10	0	2	0.5	1	0.8
Improper container for flammable material	0	2	0	0	0	3	0	1
Combustible too close to heat	4	1	10	0	2	0.5	3	0.1
Other misuse of material ignited	2	1	0	0	2	0.5	3	0.2
Overloaded	3	4	0	0	5	4	4	3
Unattended	0.7	0.7	0	0	1	0.5	0.4	0.3
Accidentally turned on, not turned off	0.7	1	0	0	0.5	0	0.3	0.7
Other operational deficiency	2	2	0	0	0.5	2	2	2
(Subtotal Misuse)	(15)	(14)	(20)	(0)	(12)	(11)	(13)	(8)
Other	20	2	10	11	16	3	17	0.9
Unknown	0.1	2	0	0	0.5	0	0	2
Total Percent of Fires	101%	101%	100%	100%	100%	99%	100%	100%
Total Number of Fires[1]	3,357	1,369	—	—	—	—	—	—
Total Number of Deaths	—	—	10	9	—	—	—	—
Total Number of Injuries	—	—	—	—	190	185	—	—
Total Dollar Loss in Thousands	—	—	—	—	—	—	$10,091	$8,346

Table 44. APPLIANCE FIRES IN RESIDENTIAL OCCUPANCIES BY APPLIANCE TYPE AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)—Continued

Appliance Type / Ignition Factor	Dryer		TV, Radio Phonograph		Portable Appliance Producing Heat[1]		Washing Machine		Other[2]	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent									
Mechanical Failure, Malfunction:										
Short circuit	8%	14%	46%	58%	28%	33%	32%	39%	20%	37%
Part failure, leak, break	7	4	14	5	5	2	14	7	7	4
Lack of maintenance, worn out	12	15	3	3	6	2	13	4	5	5
Automatic control failure	8	16	0	0.9	5	11	1	1	1	3
Other malfunction	11	16	23	22	13	18	17	20	14	17
(Subtotal Mech. Failure)	(47)	(66)	(85)	(89)	(57)	(65)	(76)	(72)	(47)	(67)
Design, Construction, Installation Deficiency	4	2	2	0	2	0.8	0.8	1	3	3
Misuse or Operational Deficiency:										
Misuse of heat of ignition	1	2	0.5	0	10	4	1	3	5	6
Improper container for flammable material	0.1	6	0	0.9	0	4	0.4	0	0	3
Combustible too close to heat	6	2	0.5	0	1	3	1	0	4	0.5
Other misuse of material ignited	8	4	0.3	1	5	4	3	1	2	6
Overloaded	3	3	1	0.9	0.6	2	6	11	3	2
Unattended	2	4	0.6	0.9	7	10	0.8	0	2	3
Accidentally turned on, not turned off	0.2	0	0.3	0.6	9	7	0.4	0	2	2
Other operational deficiency	6	6	3	1	3	0	2	4	3	3
(Subtotal Misuse)	(27)	(26)	(6)	(6)	(34)	(33)	(16)	(19)	(21)	(27)
Other	22	2	7	0.6	7	0	7	3	29	0
Unknown	0.1	4	0.1	4	0	0.8	0.4	5	0.3	2
Total Percent of Fires	98%	100%	100%	100%	102%	100%	100%	100%	100%	99%
Total Number of Fires[3]	978	459	785	347	310	129	244	74	733	206
Total Number of Deaths	2	0	4	7	1	0	0	0	0	0
Total Number of Injuries	24	25	23	43	31	12	1	3	44	29
Total Dollar Loss in Thousands	$555	$353	$1,576	$1,068	$931	$279	$70	$60	$1,133	$605

[1] Includes electic blankets, steam irons, and other appliances producing controlled heat. Portable cooking equipment contained in Table 35.

[2] Includes vacuum cleaners, motors, generators, electric hand tools, portable appliances not producing heat, and unknown equipment.

[3] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 pecent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 44 cont'd. APPLIANCE FIRES IN RESIDENTIAL OCCUPANCIES BY APPLIANCE TYPE AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)

Ignition Factor	Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent							
Mechanical Failure, Malfunction:								
Short circuit	24%	34%	0%	14%	30%	29%	31%	38%
Part failure, leak, break	9	5	0	0	2	8	6	3
Lack of maintenance, worn out	7	8	0	0	3	4	2	3
Automatic control failure	4	8	0	0	6	7	4	4
Other malfunction	16	18	43	57	15	29	15	24
(Subtotal Mech. Failure)	(60)	(73)	(43)	(71)	(55)	(79)	(58)	(71)
Design, Construction, Installation Deficiency	3	2	14	0	0	0	4	1
Misuse or Operational Deficiency:								
Misuse of heat of ignition	3	2	0	0	3	2	4	2
Improper container for flammable material	0.1	3	0	0	0	2	0	3
Combustible too close to heat	3	1	0	0	4	0	5	0.5
Other misuse of material ignited	4	3	14	0	15	7	6	3
Overloaded	2	2	0	0	0	2	1	0.5
Unattended	2	3	0	0	3	3	4	4
Accidentally turned on, not turned off	2	1	0	0	7	0	3	4
Other operational deficiency	4	3	0	0	2	4	4	4
(Subtotal Misuse)	(20)	(21)	(14)	(0)	(33)	(19)	(27)	(21)
Other	17	1	29	0	11	0.9	12	1
Unknown	0.2	4	0	29	0.8	2	0	6
Total Percent of Fires	99%	100%	100%	100%	102%	101%	101%	100%
Total Number of Fires[3]	3,050	1,215	—	—	—	—	—	—
Total Number of Deaths	—	—	7	7	—	—	—	—
Total Number of Injuries	—	—	—	—	123	112	—	—
Total Dollar Loss in Thousands	—	—	—	—	—	—	$4,265	$2,365

Table 45. RESIDENTIAL FIRES CAUSED BY CHILDREN PLAYING LISTED BY IGNITION CHARACTERISTIC—California (CFIRS 1975), Ohio (NFIRS 1976)

Ignition Characteristic	Fires		Deaths		Injuries		Dollar Loss	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent							
Form of Heat of Ignition:								
Matches	56	68	67	50	62	69	66	54
Lighter	8	13	0	0	6	15	11	13
Candle	6	4	0	0	10	3	9	9
Fireworks	0	0.9	0	0	0	0.5	0	0.9
Gas fueled equipment	5	3	33	0	6	1	2	1
Electrical equipment	3	1	0	33	3	3	0.6	1
Other	7	8	0	0	13	8	7	12
Unknown	16	2	0	17	2	0.5	4	9
Total	101%	100%	100%	100%	102%	100%	100%	100%
Area of Origin:								
Bedroom	35	48	67	67	49	42	45	46
Living area	9	10	0	0	4	17	14	16
Kitchen	7	8	0	0	5	7	3	5
Bathroom	3	2	0	0	2	1	2	0.3
Closet	5	5	0	0	8	7	9	5
Supply storage	1	4	0	33	0.8	5	0.3	2
Laundry room	1	2	33	0	7	0.5	1	0.9
Garage	8	1	0	0	11	1	9	1
Other	17	17	0	0	14	20	15	18
Unknown	14	2	0	0	0	0	1	7
Total	100%	99%	100%	100%	101%	101%	99%	101%
Type of Material Ignited:								
Cotton or rayon fabric	32	41	0	17	30	40	31	34
Man-made fabric	8	14	0	0	11	12	12	18
Other fabric	4	6	33	0	10	8	8	7
Paper	13	11	0	33	10	10	14	10
Wood	4	6	0	0	3	6	6	12
Natural fiber	2	4	0	0	0.8	7	2	3
Polyester plastic	0	3	0	33	0	1	0	2
Gasoline	3	1	33	0	13	4	3	3
Other	19	11	0	0	16	11	15	8
Unknown	15	3	33	17	6	2	10	3
Total	100%	100%	99%	100%	100%	101%	101%	100%
Form of Material Ignited:								
Mattress	17	27	0	0	12	17	8	17
Bedding	9	13	67	17	16	13	16	15
Upholstered chair or sofa	6	11	0	0	4	24	10	19
Wearing apparel not on person	7	10	0	0	11	11	15	10
Trash	8	8	0	0	0	4	7	4
Roof covering	0.8	0.5	0	0	0.8	0	2	0.3
Newspaper, etc.	4	4	0	33	4	3	6	4
Curtain, drapery	3	3	0	0	2	1	3	2
Fuel	3	0.6	33	0	12	4	2	2
Toy	3	1	0	33	0	1	1	0.4
Box, carton, bag	2	2	0	0	2	0.5	0.7	0.6
Cooking material	2	0.8	0	0	0.8	0.5	0.2	0.7
Wearing apparel on person	0.3	0.9	0	0	4	3	0.2	0.4
Other	34	17	0	0	33	14	28	16
Unknown	0.4	2	0	17	0	2	1	8
Total	100%	101%	100%	100%	102%	101%	100%	99%
Total Number[1]	1,982	1,420	3	6	120	193	$3,197,000	$3,184,000

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some column totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

The accuracy of the reasons for failure of dryers and other appliances is uncertain. For example, it is difficult to be certain if the cause of a given fire in a dryer was due to an overload condition, failure to clean out lint, or a malfunction. This may be difficult to determine with the investigative resources available for most fires.

RESIDENTIAL FIRES RESULTING FROM CHILDREN PLAYING

In the combined data for California and Ohio, residential fires resulting from children playing are the seventh most frequently occurring type of fire. These fires account for 5 percent of all residential fires. The relative frequency of these fires by ignition characteristic is shown in Table 45.

Among the highlights of Table 45 is that matches are the most frequent ignition source in residential fires caused by children playing. Matches were used in 56 percent of fires in this category in California, 68 percent in Ohio. Cigarette lighters were second, 8 percent (13 percent).

Residential fires caused by children playing occur in just about any room, but most frequently in bedrooms, 35 percent (48 percent). In California garages are also a frequent location.

Mattresses or bedding are the forms of material most frequently ignited by children playing, 23 percent (39 percent). In Ohio, upholstered chairs or sofas are second (11 percent); in California, however, trash is second (8 percent). Clothes that are not being worn at the time is another item frequently ignited by children.

Relatively few fires caused by children playing ignite clothing worn by children, 8 incidents in California, 13 in Ohio. Possible reasons for this surprisingly low number are (1) standards for making ignition-resistant clothes for children, which were initiated about 1970, may be having significant effect; and (2) clothing ignitions are traditionally under-reported to the fire service. In many cases the child is rushed immediately to the hospital without calling the fire department.

Section X

City by City Fire Data

Up to this point, we have discussed statewide and national results. But the fire problem varies in its detail from community to community, and each must consider its own problems and establish its own priorities. Setting the priorities for solving problems in each community is the heart of master planning for fire protection.[55]

Many communities also are interested in knowing how their fire experience compares to others, both in specific areas and overall. It is also important from a national perspective to know how diverse the problem is from place to place, to aid in developing appropriately responsive programs. And it is also important to identify communities that are performing exceptionally well. Why have they been successful? Can their techniques be transferred to other communities?

For all of these purposes, the fire problem requires looking at the data community by community and not just aggregating at the State or national levels. This section describes the statistical differences in fire and loss rates among Ohio cities and among seven of the cities using the NFPA Uniform Fire Incident Reporting System (UFIRS). (As mentioned earlier, this was the data available for this study; a broader base is expected in future years.) The comparisons were made first according to major occupancy type, and then in more detail for residential fires. There is a risk in doing this. The rate comparisons are affected by differences in reporting among the various communities. In addition, the numbers of fires, deaths, and injuries, and the dollar losses in the city tables are, of course, much fewer than in the previous State tables. This means that the precision at the city level will be much lower than at the State level, as noted in Section V, page 59 and discussed more fully in Appendix VI. This lower precision in turn lessens the confidence in the inferences that can be drawn from the data.

There are important differences between communities which affect fire rates and losses, and which are beyond control of the fire service or even the community. Ideally, comparisons should be made only between cities with similar "uncontrollable" conditions. The question of which factors should be used to group like communities is currently being investigated by NFPCA, NFPA, and others.

SUMMARY OF CITY BY CITY FIRE DATA

Although the first year's data from NFIRS for the Ohio cities is known to be incomplete, we will discuss it here anyway, to illustrate the types of inter-city analyses that can be made. The data on the absolute numbers of fires and their rates per capita (Tables 46, 47 48) do not accurately indicate the fire performance of the cities involved. However, the numbers of fires shown indicate the size of the samples we worked with. They are non-random samples but are sufficiently large that they do indicate the broad characteristics of the fire picture in these cities with reasonable accuracy. The information on percent of residential fires by cause (Table 48) is likely to be closer to the mark than either the absolute numbers of fires or the fire rates.

Tables 46 and 47 summarize fire incidents and losses by major occupancy category for each of the 20 largest Ohio cities. These are also the Ohio cities designated as "central cities" by the Bureau of Census. All have a population over 50,000. The remaining Ohio communities are shown only as totals for two groups: 25,000-

[55] *Urban Guide for Fire Prevention and Control Master Planning*, prepared by the Mountain View and Los Angeles City Fire Departments and the Mission Research Corporation (Washington, DC: Government Printing Office 1977), Fire Administration Grant No. NFPCA-75006.

Table 46. REPORTED FIRES AND FIRE LOSSES BY COMMUNITY AND TYPE OF OCCUPANCY

Community (Source of Data)	Population Estimate (Year)	Residential Fires	Non-Residential Structure Fires	Mobile Property Fires	Outside Property Fires	Total Fires	Total Deaths	Total Injuries	Dollar Loss in Thousands
		Number Reported[1]							
NFIRS States:									
California (1)	21,185,000 (75)	46,585	21,832	29,588	118,150	216,155	423	4,936	$209,091
Ohio (2)	10,759,000 (75)	16,970	7,443	13,449	29,962	67,824	272	4,004	$144,317
Ohio Communities (2):	(73)								
Cities over 200,000 persons	2,499,113	7,102	3,186	5,533	13,281	29,102	95	1,366	$ 33,450
Cleveland	678,615	1,737	1,060	1,718	4,912	9,427	28	217	9,514
Columbus	540,933	1,456	430	1,205	2,823	5,914	23	362	5,075
Cincinnati	426,245	1,423	478	946	1,942	4,789	16	220	5,779
Toledo	377,423	1,024	655	673	1,966	4,318	10	196	5,350
Akron	261,520	693	237	388	363	1,681	10	107	3,350
Dayton	214,377	769	326	603	1,275	2,973	8	264	4,382
Cities 50,000-200,000 persons	1,052,049	1,426	523	945	1,740	4,634	11	415	8,562
Youngstown	133,452	170	52	73	20	315	3	43	1,391
Canton	106,897	127	48	15	35	225	3	46	883
Parma	101,482	59	24	61	10	154	1	14	489
Lorain	79,025	114	47	101	331	593	2	30	869
Springfield	78,032	154	93	150	240	637	0	33	177
Kettering	72,051	57	12	52	162	283	0	26	208
Lakewood	67,865	91	37	63	139	330	0	22	426
Hamilton	66,195	119	57	93	345	614	0	32	1,615
Euclid	66,108	69	20	66	226	381	0	22	40
Warren	62,118	46	12	25	14	97	0	0	193
Mansfield	56,638	88	19	65	5	177	0	19	771
Cleveland Heights	56,071	82	18	40	1	141	0	21	286
Elyria	53,853	95	31	65	156	347	2	71	516
Lima	52,262	155	53	76	56	340	0	36	698
Cities 25,000-50,000 persons	1,012,674	1,525	592	1,357	2,436	5,910	14	404	9,096
Communities under 25,000 persons	6,179,535	6,809	3,096	5,512	12,326	27,743	150	1,801	91,698
UFIRS Cities (3):									
Total UFIRS Cities	2,513,956	6,594	3,108	4,938	14,238	28,878	58	1,125	$ 29,004[3]
Jacksonville, FL	579,669 (76)	1,408	335	702	3,808	6,253	11	117	11,225
Denver, CO[2]	523,700 (76)	1,367	865	1,137	3,250	6,619	15	145	4,468
Kansas City, MO	486,500 (75)	1,524	926	1,051	2,831	6,332	10	335	4,951
Tucson, AZ	305,200 (76)	698	318	730	1,656	3,402	4	131	4,323
Wichita, KS	265,455 (76)	556	284	755	1,478	3,073	10	180	1,322
Syracuse, NY	185,000 (76)	813	241	378	671	2,103	8	167	—[3]
Madison, WI	168,432 (75)	228	139	185	544	1,096	0	50	2,715

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11). For the cities shown the degree of completeness varies from one population group to another, with the larger cities tending to have greater completeness. Care should be taken, therefore, in comparing these cities.

[2] The Denver Fire Department has jurisdiction over Denver city and county.

[3] The total dollar loss for the UFIRS cities excludes Syracuse, which does not record that information.

SOURCE: (1) 1975 CFIRS, (2) 1976 NFIRS, (3) 1976 UFIRS, except Kansas City which was May 1975-April 1976.

Table 47. RATE OF REPORTED FIRES AND FIRE LOSSES BY COMMUNITY AND TYPE OF OCCUPANCY

Community (Source of Data)	Population Estimate (Year)	Residential Fires	Non-Residential Structure Fires	Mobile Property Fires	Outside Property Fires	Total Fires	Total Deaths	Total Injuries	Dollar Loss
		Rate[1]							
NFIRS States:									
California (1)	21,185,000 (75)	220	103	140	558	1,020	20	233	$ 9.87
Ohio (2)	10,759,000 (75)	158	69	125	278	630	25	372	$13.41
Ohio Communities (2):	(73)								
Cities over 200,000 persons	2,499,113	284	127	221	531	1,164	38	547	$13.38
Cleveland	678,615	256	156	253	724	1,389	41	320	14.02
Columbus	540,933	269	79	223	522	1,093	43	669	9.38
Cincinnati	426,245	334	112	222	456	1,124	38	516	13.56
Toledo	377,423	271	174	178	521	1,144	26	519	14.18
Akron	261,520	265	91	148	139	643	38	409	12.81
Dayton	214,377	359	152	281	595	1,387	37	1,231	20.44
Cities 50,000-200,000 persons	1,052,049	136	50	90	165	440	10	394	8.14
Youngstown	133,452	127	39	55	15	236	22	322	10.42
Canton	106,897	119	45	14	33	210	28	430	8.26
Parma	101,482	58	24	60	10	152	10	138	4.82
Lorain	79,025	144	59	128	419	750	25	380	11.00
Springfield	78,032	197	119	192	308	816	0	423	2.27
Kettering	72,051	79	17	72	225	393	0	361	2.89
Lakewood	67,865	134	55	93	205	486	0	324	6.28
Hamilton	66,195	180	86	140	521	928	0	483	24.40
Euclid	66,108	104	30	100	342	576	0	333	0.61
Warren	62,118	74	19	40	23	156	0	0	3.11
Mansfield	56,638	155	34	115	9	313	0	335	13.61
Cleveland Heights	56,071	146	32	71	2	249	0	375	5.10
Elyria	53,853	176	58	121	290	644	37	1,318	9.58
Lima	52,262	297	101	145	107	651	0	689	13.36
Cities 25,000-50,000 persons	1,012,674	151	58	134	241	584	14	399	8.98
Communities under 25,000 persons	6,179,535	110	50	89	199	449	24	291	14.84
UFIRS Cities (3):									
Total UFIRS Cities	2,513,956	262	124	196	566	1,149	23	448	$12.45[3]
Jacksonville, FL	579,669 (76)	243	58	121	657	1,079	19	202	19.36
Denver, CO[2]	523,700 (76)	261	165	217	621	1,264	29	277	8.53
Kansas City, MO	486,500 (75)	313	190	216	582	1,302	21	689	10.18
Tucson, AZ	305,200 (76)	229	104	239	543	1,115	13	429	14.16
Wichita, KS	265,455 (76)	209	107	284	557	1,158	38	678	4.98
Syracuse, NY	185,000 (76)	439	130	204	363	1,137	43	903	—[3]
Madison, WI	168,432 (75)	135	83	110	323	651	0	297	16.12

[1] Fires/100,000 persons, deaths/million persons, injuries/million persons, dollar per capita. The reported fire incidents on which these rates are based do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11). For the cities shown the degree of completeness varies from one population group to another, with the larger cities tending to have greater completeness. Care should be taken in comparing these cities.

[2] The Denver Fire Department has jurisdiction over Denver city and county.

[3] The total dollar loss per capita for the UFIRS cities excludes Syracuse, which does not record that information, and is based on a population of 2,328,956.

SOURCE: (1) 1975 CFIRS, (2) 1976 NFIRS, (3) 1976 UFIRS, except Kansas City which was May 1975-April 1976.

NOTE: Highest rates in each city group are circled; the lowest are enclosed in rectangles.

50,000 population and less than 25,000.[56] Also included in the table are data for seven cities in other States. These have populations ranging between 168,000 and 580,000 persons and appear to be comparable in many respects to the six largest Ohio cities.

Overall rates for California and Ohio are also shown in Table 24. The California data file did not identify individual communities and hence was used only in the aggregate.

There is considerable variation among individual cities in Ohio within each group. Some cities are often simultaneously highest in one respect, such as fire rates, and lowest in another, such as injury rates. (The highest rates within each city group have been circled in Table 47, and low rates are enclosed by a rectangle.) Since we do not know how accurate the data are, these comparisons must be taken only as a starting point for understanding problems and identifying sources of solutions. Perhaps the first question for understanding reasons for differences should be, "Is it a data collection artifact or a real world difference?"

Variation of Fire Losses with Community Size

Figure 20 shows a plot of the average fire and fire loss rates for the four different Ohio population groups and also the average for the UFIRS cities. The patterns are strikingly similar to the analogous plots from the NFPA 1974 survey, Figure 3 and Figure 4. The curves for injury and dollar loss rates agree well in both magnitude and shape. The death rate curve has the same U-shape as in the 1974 survey, but with lower values; this is because Ohio's average death rate is well below the national average (see Appendix IV). The principal difference is in the total fire rate. The large Ohio cities and the UFIRS cities have about the same value as in the NFPA survey, but the rates for the remaining Ohio groups are about 40 percent to 50 percent smaller. This is probably due to under-reporting of fires by local communities to the State in NFIRS for the first year.

[56] Values for the under 25,000 group were obtained by removing cities with greater than 25,000 population from the Ohio data tape. The figures were *not* obtained by averaging the values obtained from all cities with less than 25,000 population.

Comparison by City of Residential Fire Causes

Table 48 shows the percent of residential fires within eight major cause categories for each Ohio and UFIRS city. To the extent that the data are valid, they suggest problems (and the priorities) local fire prevention programs might address. They also indicate how well cities have been doing relative to various problems, and what areas may not require additional programs.

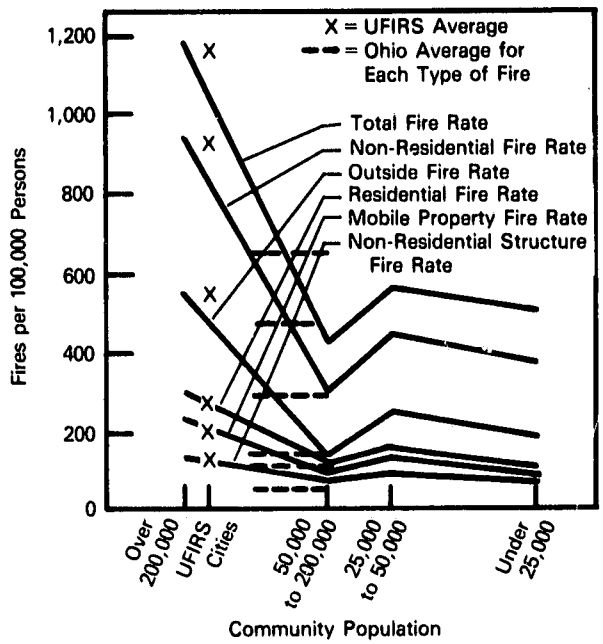
Table 48 also shows that the top two or three problems (i.e. most frequent causes) vary from city to city. For example, in Cleveland, incendiary, smoking, and "children playing" fires account for over half of all residential fires. In Columbus, as in Cleveland, incendiary and smoking related fires are important, but cooking-related fires are more important than "children playing." In Cincinnati, cooking and smoking dominate with "children playing" a distant third.

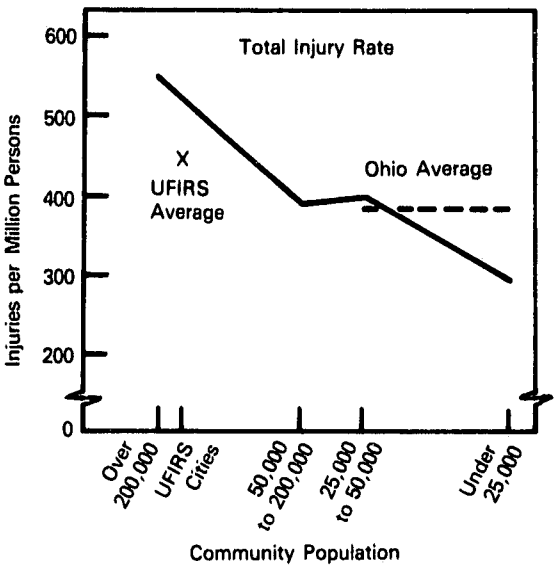
In contrast with the larger cities, as the community size becomes smaller, heating fires apparently become progressively more important. For communities under 25,000 population, it is the principal cause of residential fires; cooking is second and electrical distribution third most frequent.

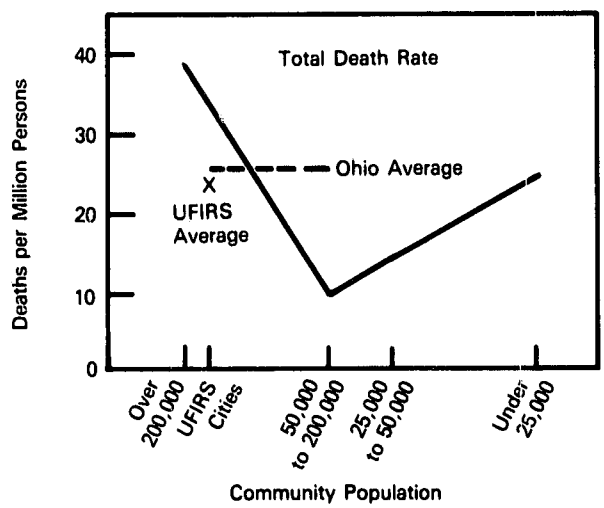
As was done in the previous table, one can also compare the fire *rates* among the cities. Table 49 indicates those cities, within each population group, having the highest and lowest fire rate for each cause category. Although some cities are consistently higher than others, the leaders in each category tend to vary. It would be useful to see if the cities with low rates for certain causes have prevention programs aimed at those causes; or if they have community characteristics tending to have fewer fires of that type; or if they have reporting practices that would reduce reporting of those fires or report them in another category; or if, in fact, the laws of chance were kind to them that year.

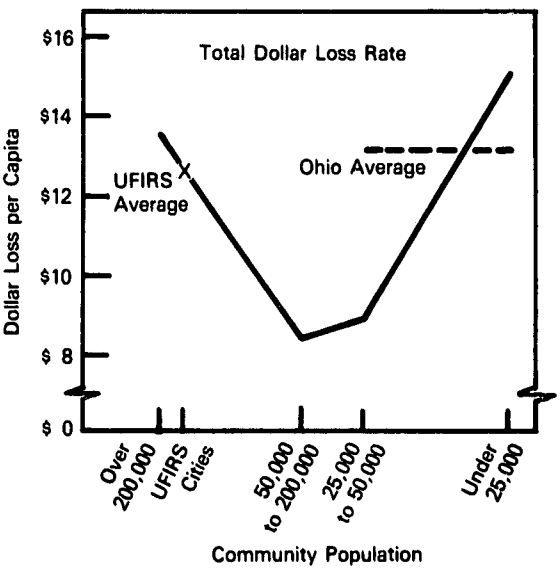
The average fire rates for each cause category versus average community size were previously plotted in Figure 14, page . Except for heating fires, the largest cities on the average have the highest rates. The largest differences occurred in those categories which the analysis in Section IX showed was dominated by behavior problems such as equipment misuse, rather than categories where equipment malfunction dominated.

Figure 20. FIRE LOSS RATES vs. COMMUNITY SIZE — Ohio (NFIRS 1976) and UFIRS Cities









Population Range (1973 estimate)	Over 200,000 Persons	50,000-200,000 Persons	25,000-50,000 Persons	Less Than 25,000 Persons
Number of Ohio Fire Departments (1976)	6	14	31	1,170 (Approx.)
Percent of Ohio Population (1973 estimate)	23%	10%	9%	58%

Table 48. PERCENT OF RESIDENTIAL FIRES BY COMMUNITY AND CAUSE

Community (Source of Data)	Population Estimate (Year)	Cause of Fire: Cooking	Smoking	Heating	Incendiary/ Suspicious	Electrical Distribution	Appliances	Children Playing	Open Flame, Spark	Other	Unknown	Total Fires
		Percent [1]										
NFIRS States:												
California (1)	21,185,000 (75)	19%	13%	13%	10%	7%	7%	4%	6%	9%	11%	99%
Ohio (2)	10,759,600 (75)	16	14	13	12	8	7	8	3	10	8	99
Ohio Communities (2):	(73)											
Cities over 200,000 persons	2,499,113	16	19	7	18	5	5	11	3	10	6	100
Cleveland	678,615	4	22	4	23	3	2	13	3	15	11	100
Columbus	540,933	17	16	9	19	6	7	9	3	7	7	100
Cincinnati	426,245	27	22	4	10	5	4	14	5	8	1	100
Toledo	377,423	16	15	12	13	8	8	9	2	11	5	99
Akron	261,520	19	15	9	13	7	10	9	4	10	6	102
Dayton	214,377	14	20	6	27	5	3	10	2	8	4	99
Cities 50,000-200,000 persons	1,052,049	16	16	10	13	7	8	10	4	8	8	100
Youngstown	133,452	5	12	8	29	9	4	15	4	8	6	100
Canton	106,897	11	9	6	13	8	8	16	2	3	24	100
Parma	101,482	17	17	10	3	7	5	12	2	10	17	100
Lorain	79,025	16	21	7	15	3	5	14	6	7	6	100
Springfield	78,032	18	13	12	10	5	14	10	5	10	2	99
Kettering	72 051	28	11	12	14	11	4	7	2	5	7	101
Lakewood	67,865	30	22	12	2	5	4	4	8	10	2	99
Hamilton	66,195	18	18	6	13	9	12	7	6	5	7	101
Euclid	66,108	25	13	10	10	4	19	1	6	9	3	100
Warren	62,118	4	30	4	13	4	7	15	7	4	11	99
Mansfield	56,638	11	20	8	19	3	6	15	5	6	7	100
Cleveland Heights	56,071	17	21	11	5	6	10	9	5	16	1	101
Elyria	53,853	19	16	17	9	6	9	3	1	9	9	98
Lima	52,262	19	15	12	8	10	10	6	3	10	9	102
Cities 25,000-50,000 persons	1,012,674	21	14	11	10	8	10	7	4	8	8	101
Communities under 25,000 persons.	6,179,535	16	8	20	8	11	8	5	3	11	10	100
UFIRS Cities (3):												
Total UFIRS Cities	2,513,956	21	15	10	15	5	5	6	3	10	10	100
Jacksonville, FL	579,669 (75)	23	13	11	10	5	5	6	2	11	14	100
Denver, CO[2]	523,700 (76)	26	18	10	15	6	5	5	3	6	6	100
Kansas City, MO	486,500 (75)	10	14	6	23	3	3	4	3	11	24	101
Tucson, AZ	305,200 (76)	23	11	13	14	8	6	4	4	16	1	100
Wichita, KS	265,455 (76)	16	23	17	5	10	5	9	4	10	0	99
Syracuse, NY	185 000 (76)	27	11	10	19	5	7	7	2	9	2	99
Madison, WI	168,432 (75)	29	17	7	11	4	7	7	6	9	3	100

[1] The reported fire incidents on which these percentages are based do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11). For the cities shown the degree of completeness may vary from one population group to another. Care should be taken in comparing these cities.

[2] The Denver Fire Department has jurisdiction over Denver city and county.

SOURCE: (1) 1975 CFIRS, (2) 1976 NFIRS, (3) 1976 UFIRS, except Kansas City which was May 1975-April 1976.

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error.

Table 49. RATE OF RESIDENTIAL FIRES BY COMMUNITY AND CAUSE

Community (Source of Data)	Population Estimate (Year)	Cause of Fire: Cooking	Smoking	Heating	Incendiary/ Suspicious	Electrical Distribution	Appliances	Children Playing	Open Flame, Spark	Other	Unknown	Total Fires	Total Deaths	Total Injuries	Dollar Loss
		Rate[1]													
NFIRS States:															
California (1)	21,185,000 (75)	42	29	29	23	16	15	9	13	20	25	220	13	130	$4.45
Ohio (2)	10,759,000 (75)	26	21	20	20	13	11	13	5	16	13	158	19	218	$5.70
Ohio Communities (2):	(73)														
Cities over 200,000 persons	2,499,113	45	53	19	50	15	15	32	9	29	17	284	33	336	$5.95
Cleveland	678,615	11	55	9	60	7	5	33	8	39	28	256	34	214	7.32
Columbus	540,933	46	44	24	50	16	19	25	8	20	18	269	39	475	4.52
Cincinnati	426,245	89	72	15	35	16	15	47	15	26	3	334	30	354	5.39
Toledo	377,423	45	40	31	36	23	21	25	6	30	15	271	26	268	4.76
Akron	261,520	50	39	23	33	19	26	24	10	27	16	265	38	298	6.33
Dayton	214,377	51	72	22	98	18	10	35	9	29	14	359	23	793	8.01
Cities 50,000-200,000 persons	1,052,049	22	22	13	17	9	11	13	6	11	11	136	10	261	3.51
Youngstown	133,452	7	16	10	37	11	4	19	4	10	8	127	22	232	5.19
Canton	106,897	13	11	7	15	9	9	19	3	4	29	119	28	290	3.94
Parma	101,482	10	10	6	2	4	3	7	1	6	10	58	10	79	2.36
Lorain	79,025	23	30	10	22	4	8	20	9	10	8	144	25	266	5.20
Springfield	78,032	36	26	24	21	9	28	21	9	21	4	197	0	333	1.61
Kettering	72,051	22	8	10	11	8	3	6	1	4	6	79	0	278	2.33
Lakewood	67,865	40	29	16	3	7	6	6	10	13	3	134	0	221	2.05
Hamilton	66,195	33	32	11	23	17	21	12	11	9	12	180	0	317	1.37
Euclid	66 108	26	14	11	11	5	20	2	6	9	3	104	0	227	0.39
Warren	62,118	3	23	3	10	3	5	11	5	3	8	74	0	0	2.04
Mansfield	56,638	18	32	12	30	5	9	23	7	9	11	155	0	282	5.88
Cleveland Heights	56,071	25	30	16	7	9	14	12	7	23	2	146	0	285	3.35
Elyria	53,853	33	28	30	17	11	17	6	2	17	17	176	19	557	5.70
Lima	52,262	55	44	34	23	29	29	17	10	29	27	297	0	478	8.02
Cities 25,000-50,000 persons	1,012,674	31	22	17	15	12	15	11	5	12	12	151	11	265	4.25
Communities under 25,000 persons	6,179,535	17	8	22	8	12	9	6	3	12	11	110	16	138	6.07
UFIRS Cities (3):															
Total UFIRS Cities	2,513,956	54	39	26	40	14	13	15	8	26	27	262	17	259	$3.81
Jacksonville, FL	579,669 (75)	55	32	26	24	12	12	14	5	27	35	243	16	116	5.91
Denver, CO[2]	523,700 (76)	68	46	25	40	16	14	14	8	15	15	261	13	170	1.27
Kansas City, MO	486,500 (75)	30	43	20	71	10	9	14	9	34	75	313	21	386	5.01
Tucson, AZ	306,200 (76)	52	26	29	32	18	14	10	9	37	3	229	7	246	4.27
Wichita, KS	265,455 (76)	34	48	37	10	22	10	19	8	22	0	209	26	324	1.89
Syracuse, NY	185 000 (76)	120	49	42	84	22	31	32	10	41	8	439	43	649	—[3]
Madison, WI	168,432 (75)	40	23	10	15	5	9	10	8	12	4	135	9	148	3.13

[1] Fires/100,000 persons, death/million persons, injuries/million persons, dollar loss per capita. Reported fire incidents do not include all fires attended by fire departments. For the cities and States shown the degree of comepleteness varies.

[2] The Denver Fire Department has jurisdiction over Denver city and county.

[3] The total residential dollar loss per capita for the UFIRS cities excludes Syracuse, which does not record that information, and is based on a population of 2,328,956.

SOURCE: (1) 1975 CFIRS, (2) 1976 NFIRS, (3) 1976 UFIRS, except Kansas City which was May 1975-April 1976.

NOTE: For each cause, the highest rates in each city group are circled; the lowest are enclosed in rectangles.

Section XI

Causes of Non-Residential Fires

This section discusses the causes of non-residential fires and fire losses for Ohio and California. The first subsection summarizes the results for eight major non-residential structure occupancy classes. This is followed by a detailed breakdown into the more detailed types of properties within each occupancy class.

As is the case for residential fires, it is necessary to identify for each State the property types that have the most fire losses, and their causes, since they vary somewhat from State to State and occupancy to occupancy. Although fire losses for each property type are presented, comparison of relative risk for each was not possible because that would require knowledge of the number of structures or of total property value, which for the most part was not available.

The leading properties and causes are generally the ones where most fire prevention efforts should be placed to achieve further reduction in losses. There are, however, exceptions. The general cost-effectiveness principle is that one should consider investing in programs likely to give the greatest loss reduction per dollar spent.

In interpreting the tables, it should be recalled that many industrial fires attended by industrial fire brigades are not reported to fire departments. Thus, the data here only represent the part of the problem addressed by public agencies.

SUMMARY OF CAUSES OF NON-RESIDENTIAL FIRES

Table 50 summarizes the causes of California and Ohio fires for the eight major 901 non-residential occupancies. Highlights of the table are discussed below.

In both States, incendiary or suspicious fires are by far the principal cause of non-residential fires, injuries, and dollar loss. Electrical distribution ranks second as the cause of fires and dollar loss.

There are few non-residential fire deaths relative to residential fire deaths in both States. The ones which occurred are distributed across several categories of causes.

The leading cause categories for fires for each major non-residential occupancy type are listed below. The list applies amazingly well both to California and Ohio, adding to the face validity of the results. More than one cause is listed when one alone did not dominate.

Public Assembly	—Cooking (mostly in restaurants); Incendiary or Suspicious
Education	—Incendiary or Suspicious in day schools
Institutions	—Smoking; Incendiary or Suspicious
Stores and Offices	—Incendiary or Suspicious; Electrical Distribution
Basic Industry	—Electrical Distribution (mostly from fires in the power industry)
Manufacturing	—Many assorted causes
Storage	—Incendiary or Suspicious
Vacant, Construction	—Incendiary or Suspicious

Prevention programs should be targeted especially against these causes. It is clear that different problems must be focused on in different types of properties.

DETAILED CHARACTERISTICS OF NON-RESIDENTIAL FIRES

More details on the causes of California and Ohio non-residential occupancy fires are presented in this section. For each occupancy category, some prevention thoughts are presented in

Table 50. FIRES IN NON-RESIDENTIAL STRUCTURES BY PROPERTY TYPE AND CAUSE—California (CFIRS 1975), Ohio (NFIRS 1976)—Continued

Occupancy Type / Cause	Public Assembly		Education		Institutions		Storage, Offices		Basic Industry	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Percent of Fires Within Each Occupancy Type									
Incendiary/Suspicious	21%	23%	58%	55%	27%	24%	18%	19%	6%	17%
Electrical Distribution	10	13	5	6	7	5	20	15	47	19
Open Flame, Spark	5	3	9	1	11	9	6	4	4	11
Smoking	8	8	8	13	26	33	8	9	2	3
Exposure	2	2	1	0.7	4	0.2	4	5	6	1
Cooking	26	24	2	2	0.4	4	2	2	0.9	1
Appliances	3	3	2	2	4	9	10	8	2	5
Heating	6	6	2	4	8	3	6	8	4	15
Flammable Liquids	1	0.6	1	0.7	0.2	0.2	4	3	4	4
Children Playing	0.8	1	4	3	0.2	1	0.8	2	0.9	0
Natural	0.4	2	0.7	2	0.6	1	1	1	3	3
Air Conditioning, Refrigeration	3	3	0.9	1	1	2	3	2	0.7	2
Gas	0.4	0.1	0.2	0	0.1	0.2	0.6	1	2	2
Explosives, Fireworks	0.3	0.4	0.1	0	0	0	0.3	0	0.5	0
Other Equipment	1	1	1	3	2	2	2	4	7	9
Other Heat	1	3	0.5	2	0.7	1	2	4	2	3
Unknown	12	7	9	6	7	4	13	12	9	4
Total Fires	101%	100%	99%	101%	99%	99%	101%	101%	101%	99%
	Number Reported[1]									
Total Fires	3,057	783	1,693	271	2,239	474	4,381	1,056	1,278	96
Total Deaths	1	0	0	0	5	3	7	7	1	0
Total Injuries	140	100	57	24	84	85	142	338	41	15
Total Dollar Loss (in thousands)	$15,339	$6,976	$6,332	$2,217	$1,973	$1,199	$20,756	$16,068	$2,848	$880

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 50 cont'd. FIRES IN NON-RESIDENTIAL STRUCTURES BY PROPERTY TYPE AND CAUSE—California (CFIRS 1975), Ohio (NFIRS 1976)

Occupancy Type	Manufacturing		Storage		Vacant, Construction		Other		All Non-Residential Occupancies	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio	California	Ohio
Cause	Percent of Fires Within Each Occupancy Type									
Incendiary/Suspicious	11%	7%	22%	28%	46%	71%	11%	29%	23%	29%
Electrical Distribution	9	7	5	7	2	0.5	4	5	12	8
Open Flame, Spark	6	9	18	7	15	5	30	11	9	6
Smoking	5	6	6	5	8	2	9	5	8	8
Exposure	5	3	12	7	4	2	22	8	5	4
Cooking	3	2	1	0.6	0.7	0.3	0.6	0.9	5	4
Appliances	8	6	2	1	0.4	0	0.3	0.5	5	3
Heating	5	7	3	6	1	1	4	11	4	6
Flammable Liquids	7	8	3	4	2	0.2	1	0.5	3	3
Children Playing	1	0.6	5	10	4	6	3	11	2	5
Natural	5	8	2	4	0.4	0.3	0.3	2	2	3
Air Conditioning, Refrigeration	1	0.6	0.2	0	0.1	0.1	0.2	0.5	1	0.9
Gas	2	3	0.4	0.6	0.2	0	0.2	0	0.7	0.8
Explosives, Fireworks	0.2	0	1	0.4	0.3	0	0.3	0.5	0.4	0.2
Other Equipment	12	20	2	2	1	0.5	0.6	0.5	3	4
Other Heat	3	5	3	4	3	3	2	2	2	4
Unknown	18	3	18	16	12	7	13	15	13	11
Total Fires	101%	100%	99%	103%	100%	99%	102%	100%	98%	100%
	Number Reported[1]									
Total Fires	2,925	909	4,546	2,771	1,079	866	634	217	21,832	7,443
Total Deaths	12	0	6	5	0	1	0	0	32	16
Total Injuries	367	211	197	386	41	93	5	3	1,074	1,255
Total Dollar Loss (in thousands)	$19,324	$16,003	$15,527	$22,380	$1,329	$1,300	$224	$209	$83,651	$67,233

Table 50 cont'd. FIRES IN NON-RESIDENTIAL STRUCTURES BY PROPERTY TYPE AND CAUSE—California (CFIRS 1975), Ohio (NFIRS 1976)

Cause	Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Number Reported[1]							
Incendiary/Suspicious	4,957	2,166	4	6	192	257	$24,589	$16,087
Electrical Distribution	2,568	572	1	1	55	130	7,922	8,674
Open Flame, Spark	1,946	475	2	1	39	44	3,263	3,331
Smoking	1,837	574	3	1	75	37	3,594	634
Exposure	1,167	513	5	0	28	43	4,490	1,358
Cooking	1,160	280	0	0	34	46	1,587	1,045
Appliances	1,115	253	0	0	31	29	2,247	749
Heating	903	426	3	0	54	55	3,419	2,722
Flammable Liquids	658	221	9	0	63	31	3,569	2,324
Children Playing	477	389	0	2	32	22	1,078	684
Natural	380	237	0	0	26	174	872	4,109
Air Conditioning, Refrigeration	302	65	0	0	5	7	611	134
Gas	148	56	1	3	14	14	3,022	1,540
Explosives, Fireworks	84	16	0	0	1	3	124	25
Other Equipment	751	311	0	0	34	56	4,567	2,390
Other Heat	451	266	0	0	16	49	644	835
Unknown	2,928	823	4	2	375	258	18,055	20,595
				Number Reported[1]				
Total Fires	21,832	7,443	—	—	—	—	—	—
Total Deaths	—	—	32	16	—	—	—	—
Total Injuries	—	—	—	—	1,074	1,255	—	—
Total Dollar Loss (in thousands)	—	—	—	—	—	—	$83,651	$67,233

the California sections. Since the profiles for Ohio are generally similar, many of the same comments would apply there.

California Fires in Public Assembly Properties

Table 51 shows that eating and drinking establishments (restaurants, taverns, etc.) have over half of the fires and dollar losses among fires in public assembly places. The most common cause of fire in these eating and drinking places is cooking (40 percent), followed by incendiary or suspicious (12 percent), and electrical distribution (10 percent). However, the major dollar losses in public assembly fires are not from the most frequent cause (cooking), but are from incendiary or suspicious fires in eating and drinking places. "Unknown" cause is second for dollar loss, again mainly for eating and drinking places. Electrical distribution fires are third in dollar loss, mainly from fires in theaters.

Further analysis of reasons for cooking fires and types of places having incendiary fires would be desirable. In the meantime, inspectors might emphasize reducing hazards in eatery kitchens and encouraging sprinkler systems. Specifically, it is recommended that emphasis be given to promoting use of grease flues (built to code standards) and encouraging the installation of venthood extinguishers.

Ohio Fires in Public Assembly Properties

As in California, eating and drinking establishments have the most fires in this category, with the leading causes being cooking and incendiary or suspicious. (See Table 52). Dollar loss causes are also similar to California, except that churches sustained a large dollar loss, but theaters did not. Fires of unknown cause have the greatest dollar loss.

California Fires in Educational Properties

Table 53 shows that day schools have most of the fires and dollar loss in educational properties. The principal cause of fires in day schools is incendiary or suspicious (64 percent). Open flame and spark (9 percent) and children playing (4 percent) are next most important.

Substantial dollar loss also results from incendiary or suspicious fires in trade or business schools. Colleges and boarding schools account for very small parts of the problem.

The net implication is a need to concentrate on —perhaps even shift resources to—educating and apprehending juvenile firesetters. Pinpointing the communities and levels of schools, preferably even the particular schools which account for the bulk of the fires, might be the next steps at the local and State level. Analysis of this detailed data for several years should indicate whether there are isolated "hot spots" or a general problem.

Ohio Fires in Educational Properties

As in California, the leading cause combination for fires and losses is incendiary or suspicious fires in day schools. (See Table 54.) However, electrical distribution fires are important for dollar loss, while children playing and open flame and spark are not. Note that one fire in a boarding school, involving flammable liquids, led to a large dollar loss.

California Fires in Institutional Properties

The two most frequent types of institutional fires are hospital fires of smoking-related origin and prison fires of incendiary origin. (See Table 55.) In fact, smoking and incendiarism account for more than 50 percent of all fires in institutional property. In prisons, these two causes account for 91 percent of the property loss from fires. Homes for the aged are by no means a minor fire problem, but probably are receiving a disproportionate share of publicity relative to where the center of the institutional problem now seems to be.

Increased enforcement of smoking regulations and better fire protection education of staff and residents in institutions may be warranted. Intentionally set fires in prisons can be attacked by using care in selecting materials used in furnishings, by employee vigilance, and by use of automatic detectors.

Ohio Fires in Institutional Properties

As in California, the type of institution with the most fires is hospitals. (See Table 56.) The most frequent cause in hospitals is smoking. Other significant problems in institutions are smoking in homes for the mentally handicapped and incendiary fires in prisons.

Table 51. CALIFORNIA FIRES IN PUBLIC ASSEMBLY PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliance	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Amusement I [2]	129	28	20	29	4	21	8	33	5
Amusement II [3]	68	13	8	13	3	4	1	7	4
Churches, Funeral	93	21	27	9	7	9	8	31	3
Clubs	34	16	3	13	14	13	6	17	2
Library, Museum, Court	34	14	1	10	2	0	1	4	1
Eating, Drinking	225	180	50	143	25	738	56	82	13
Passenger Terminal	5	2	3	3	0	0	2	0	1
Theaters	44	26	12	20	2	7	11	4	1
Other	5	1	17	4	2	1	1	1	0
Total	637	301	141	244	59	793	94	179	30
	Percent								
Amusement I [2]	37	8	6	8	1	6	2	10	1
Amusement II [3]	44	8	5	8	2	3	0.6	5	3
Churches, Funeral	37	8	11	4	3	4	3	12	1
Clubs	24	11	2	9	10	9	4	12	1
Library, Museum, Court	43	18	1	13	3	0	1	5	1
Eating, Drinking	12	10	3	8	1	40	3	4	0.7
Passenger Terminal	24	10	14	14	0	0	10	0	5
Theaters	25	15	7	11	1	4	6	2	0.6
Other	11	2	36	9	4	2	2	2	0
Percent of Public Assembly Fires	21%	10%	5%	8%	2%	26%	3%	6%	1%
	Dollar Loss in Thousands								
Amusement I [2]	188	31	732	34	2	9	4	117	0
Amusement II [3]	300	0	2	2	210	0	0	8	10
Churches, Funeral	743	28	16	91	24	2	10	137	0
Clubs	86	13	1	2	94	100	2	30	2
Library, Museum, Court	29	1	0	1	0	0	0	12	0
Eating, Drinking	2,251	340	131	1,014	439	1,282	131	214	18
Passenger Terminal	0	0	0	0	0	0	0	0	0
Theaters	284	2,008	1	1	10	3	4	2	0
Other	1	0	18	2	10	0	0	5	0
Total	$3,882	$2,421	$901	$1,147	$789	$1,391	$151	$525	$30

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.
[2] Fixed use properties. Included are bowling and billiard centers, amusement-centers, ice and roller rinks, swimming facilities.
[3] Variable use properties. Included are ballrooms, gymnasiums, exhibition halls, arenas, stadiums, playgrounds.
NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 51 cont'd. CALIFORNIA FIRES IN PUBLIC ASSEMBLY PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Cause								
	Reported Number of Fires[1]								
Amusement I[1]	7	0	6	1	2	8	3	43	347
Amusement II[3]	4	0	0	2	2	1	1	24	155
Churches, Funeral	6	2	3	1	0	2	4	27	253
Clubs	3	0	5	0	0	1	1	15	143
Library, Museum, Court	0	0	1	0	1	5	1	5	80
Eating, Drinking	3	11	70	9	3	12	21	196	1,837
Passenger Terminal	0	0	0	0	0	0	3	2	21
Theaters	1	0	3	0	0	2	2	39	174
Other	0	0	1	0	0	0	2	12	47
Total	24	13	89	13	8	31	38	363	3,057
	Percent								
Amusement I[2]	2	0	2	0.3	0.6	2	0.9	12	99
Amusement II[3]	3	0	0	1	1	0.6	0.6	15	100
Churches, Funeral	2	0.8	1	0.4	0	0.8	2	11	101
Clubs	2	0	3	0	0	0.7	0.7	10	98
Library, Museum, Court	0	0	1	0	1	6	1	6	100
Eating, Drinking	0.2	0.6	4	0.5	0.2	0.7	1	11	100
Passenger Terminal	0	0	0	0	0	0	14	10	101
Theaters	0.6	0	2	0	0	1	1	22	98
Other	0	0	2	0	0	0	4	26	100
Percent of Public Assembly Fires	0.8%	0.4%	3%	0.4%	0.3%	1%	1%	12%	101%
	Dollar Loss in Thousands								
Amusement I[2]	13	0	1	1	0	0	0	79	1,217
Amusement II[3]	0	0	0	0	0	0	0	157	693
Churches, Funeral	0	1	0	0	0	0	20	55	1,132
Clubs	0	0	11	0	0	0	0	20	366
Library, Museum, Court	0	0	0	0	0	0	0	0	44
Eating, Drinking	0	9	353	0	0	1	74	2,200	8,407
Passenger Terminal	0	0	0	0	0	0	0	0	0
Theaters	0	0	2	0	0	0	0	981	3,300
Other	0	0	0	0	0	0	10	67	115
Total	$13	$10	$367	$1	$0	$1	$104	$3,559	$15,339

Table 52. OHIO FIRES IN PUBLIC ASSEMBLY PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliance	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Amusement I[2]	16	4	4	1	3	2	3	2	0
Amusement II[3]	11	4	2	2	1	0	1	0	0
Churches, Funeral	21	13	2	6	4	4	3	11	2
Clubs	23	10	4	7	1	10	7	3	0
Library, Museum, Court	7	2	1	1	0	1	0	1	0
Eating, Drinking	96	59	9	45	10	172	12	31	0
Passenger Terminal	0	0	0	0	0	0	0	0	2
Theaters	3	6	0	2	0	0	0	1	1
Other	0	0	0	0	0	0	0	0	0
Total	177	98	22	64	19	189	26	49	5
	Percent								
Amusement I[2]	36	9	9	2	7	5	7	5	0
Amusement II[3]	50	18	9	9	5	0	5	0	0
Churches, Funeral	24	15	2	7	5	5	3	13	2
Clubs	28	12	5	9	1	12	9	4	0
Library, Museum, Court	50	14	7	7	0	7	0	7	0
Eating, Drinking	19	11	2	9	2	33	2	6	0
Passenger Terminal	0	0	0	0	0	0	0	0	67
Theaters	17	33	0	11	0	0	0	6	6
Other	0	0	0	0	0	0	0	0	0
Percent of Public Assembly Fires	23%	13%	3%	8%	2%	24%	3%	6%	0.6%
	Dollar Loss in Thousands								
Amusement I[2]	33	25	75	0	2	2	0	0	0
Amusement II[3]	13	3	0	0	0	0	0	0	0
Churches, Funeral	164	51	0	1	99	5	9	25	5
Clubs	145	106	0	52	0	1	20	3	0
Library, Museum, Court	41	150	0	0	0	0	0	0	0
Eating, Drinking	1,420	620	13	52	50	854	22	253	0
Passenger Terminal	0	0	0	0	0	0	0	0	0
Theaters	10	20	0	1	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Total	$1,826	$975	$88	$106	$151	$962	$51	$281	$5

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).
[2] Fixed use properties. Included are bowling and billard centers, amusement centers, ice and roller rinks, swimming facilities.
[3] Variable use properties. Included are ballrooms, gymnasiums, exhibition halls, arenas, stadiums, playgrounds.
NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 52 cont'd. OHIO FIRES IN PUBLIC ASSEMBLY PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equip.	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Amusement I[2]	1	0	1	0	1	1	2	3	44
Amusement II[3]	0	0	0	0	0	0	1	0	22
Churches, Funeral	3	3	1	0	1	2	4	7	87
Clubs	5	3	0	1	0	1	1	5	81
Library, Museum, Court	0	0	0	0	0	1	0	0	14
Eating, Drinking	2	5	18	0	0	5	37	37	514
Passenger Terminal	0	1	0	0	0	0	0	0	3
Theaters	0	0	1	0	1	0	1	2	18
Other	0	0	0	0	0	0	0	0	0
Total	11	12	21	1	3	10	22	54	783
	Percent								
Amusement I[2]	2	0	2	0	2	2	5	7	100
Amusement II[3]	0	0	0	0	0	0	5	0	101
Churches, Funeral	3	3	1	0	1	2	5	8	99
Clubs	6	4	0	1	0	1	1	6	99
Library, Museum, Court	0	0	0	0	0	7	0	0	99
Eating, Drinking	0.4	1	4	0	0	1	3	7	100
Passenger Terminal	0	33	0	0	0	0	0	0	100
Theaters	0	0	6	0	6	0	6	11	102
Other	0	0	0	0	0	0	0	0	0
Percent of Public Assembly Fires	1%	2%	3%	0.1%	0.4%	1%	3%	7%	100%
	Dollar Loss in Thousands								
Amusement I[2]	0	0	0	0	1	0	9	156	306
Amusement II[3]	0	0	0	0	0	0	0	0	17
Churches, Funeral	0	4	0	0	1	10	50	615	1,044
Clubs	2	10	0	8	0	2	0	217	570
Library, Museum, Court	0	0	0	0	0	0	0	0	191
Eating, Drinking	0	13	28	0	0	19	31	859	4,237
Passenger Terminal	0	0	0	0	0	0	0	0	0
Theaters	0	0	25	0	0	0	300	250	607
Other	0	0	0	0	0	0	0	0	0
Total	$2	$27	$53	$8	$2	$31	$389	$2,097	$6,976

Table 53. CALIFORNIA FIRES IN EDUCATIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Day Schools	928	51	130	33	17	15	18	26	16
Boarding Schools	4	2	2	0	0	0	2	1	0
Trade, Business Schools[2]	36	18	4	13	1	3	1	4	1
Colleges	19	11	14	11	2	9	8	2	2
Other	3	1	1	0	0	0	0	1	0
Total	990	83	151	57	20	27	29	34	19
	Percent								
Day Schools	64	4	9	2	1	1	1	2	1
Boarding Schools	20	10	10	0	0	0	10	5	0
Trade, Business Schools[2]	36	18	4	13	1	3	1	4	1
Colleges	18	10	13	10	2	8	7	2	2
Other	30	10	10	0	0	0	0	10	0
Percent of Educational Property Fires	58%	5%	9%	3%	1%	2%	2%	2%	1%
	Dollar Loss in Thousands								
Day Schools	4,722	55	187	128	104	4	15	18	15
Boarding Schools	0	0	0	0	0	0	0	3	0
Trade, Business Schools[2]	236	9	0	0	0	0	0	3	0
Colleges	37	3	17	38	0	0	0	0	0
Other	0	1	0	0	0	0	0	0	0
Total	$4,995	$68	$204	$166	$104	$4	$15	$21	$17

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.
[2] Other than high school or college.
NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 53 cont'd. CALIFORNIA FIRES IN EDUCATIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Day Schools	61	6	10	2	0	14	5	123	1,455
Boarding Schools	0	1	0	0	1	0	0	7	20
Trade, Business Schools[2]	1	1	3	0	0	0	1	14	101
Colleges	0	4	3	2	0	5	2	13	107
Other	0	0	0	0	0	1	1	2	10
Total	62	12	16	4	1	20	9	159	1,693
	Percent								
Day Schools	4	0.4	0.7	0.1	0	1	0.3	8	100
Boarding Schools	0	5	0	0	5	0	0	35	100
Trade, Business Schools[2]	1	1	3	0	0	0	1	14	101
Colleges	0	4	3	2	0	5	2	12	100
Other	0	0	0	0	0	10	10	20	100
Percent of Educational Property Fires	4%	0.7%	0.9%	0.2%	0.1%	1%	0.5%	9%	99%
	Dollar Loss in Thousands								
Day Schools	234	0	2	10	0	6	9	420	5,935
Boarding Schools	0	0	0	0	0	0	0	1	2
Trade, Business Schools[2]	0	0	0	0	0	0	0	20	214
Colleges	0	0	0	0	0	1	10	1	116
Other	0	0	0	0	0	0	0	0	1
Total	$234	$0	$2	$10	$0	$7	$19	$442	$6,332

Table 54. OHIO FIRES IN EDUCATIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)—Continued

Property Type	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Cause								
	Reported Number of Fires[1]								
Day Schools	132	11	2	20	1	5	3	9	0
Boarding Schools	2	0	0	1	0	0	0	0	1
Trade, Business Schools[2]	4	1	1	4	0	0	0	1	0
Colleges	10	3	0	10	1	1	2	1	1
Other	0	0	0	0	0	0	0	0	0
Total	148	15	3	35	2	6	5	11	2
	Percent								
Day Schools	61	5	0.9	9	0.5	2	1	4	0
Boarding Schools	50	0	0	25	0	0	0	0	25
Trade, Business Schools[2]	29	7	7	29	0	0	0	7	0
Colleges	27	8	0	27	3	3	5	3	3
Other	0	0	0	0	0	0	0	0	0
Percent of Educational Property Fires	55%	6%	1%	13%	0.7%	2%	2%	4%	0.7%
	Dollar Loss in Thousands								
Day Schools	607	364	0	5	0	22	0	15	0
Boarding Schools	2	0	0	0	0	0	0	0	500
Trade, Business Schools[2]	471	0	0	0	0	0	0	0	0
Colleges	3	1	0	0	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Total	$1,083	$365	$0	$5	$7	$22	$0	$55	$504

[1]Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).
[2] Other than high school or college.
NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 54 cont'd. OHIO FIRES IN EDUCATIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Day Schools	6	3	3	0	0	4	2	15	216
Boarding Schools	0	0	0	0	0	0	0	0	4
Trade, Business Schools[2]	1	1	0	0	0	0	1	0	14
Colleges	1	1	0	0	0	3	2	1	37
Other	0	0	0	0	0	0	0	0	0
Total	8	5	3	0	0	7	5	16	271
	Percent								
Day Schools	3	1	1	0	0	2	0.9	7	98
Boarding Schools	0	0	0	0	0	0	0	0	100
Trade, Business Schools[2]	7	7	0	0	0	0	7	0	100
Colleges	3	3	0	0	0	8	5	3	101
Other	0	0	0	0	0	0	0	0	0
Percent of Educational Property Fires	3%	2%	1%	0%	0%	3%	2%	6%	101%
	Dollar Loss in Thousands								
Day Schools	1	20	6	0	0	0	2	115	1,162
Boarding Schools	0	0	0	0	0	0	0	0	502
Trade, Business Schools[2]	0	15	0	0	0	0	0	0	527
Colleges	0	1	0	0	0	5	0	0	25
Other	0	0	0	0	0	0	0	0	0
Total	$1	$36	$6	$0	$0	$5	$2	$115	$2,217

Table 55. CALIFORNIA FIRES IN INSTITUTIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)—Continued

Property Type	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Cause								
	Reported Number of Fires[1]								
Care of the Aged	30	39	19	113	6	19	89	33	0
Child Care [2]	100	7	7	4	1	9	3	3	0
Hospitals, Clinics, etc.	15	78	104	331	0	45	77	34	2
Prisons, etc.[3]	271	13	13	32	2	10	11	6	1
Physical Rehabilitation [4]	2	0	0	0	0	0	0	0	0
Mental Handicaps	177	21	101	107	0	4	9	6	1
Other	3	4	3	1	0	4	1	0	0
Total	598	162	247	588	9	91	190	82	4
	Percent								
Care of the Aged	7	9	5	27	1	5	21	8	0
Child Care [2]	27	13	13	7	2	16	5	5	0
Hospitals, Clinics, etc.	11	9	11	36	0	5	8	4	0.2
Prisons, etc.[3]	71	3	3	8	0.5	3	3	2	0.3
Physical Rehabilitation [4]	100	0	0	0	0	0	0	0	0
Mental Handicaps	40	5	23	24	0	0.9	2	1	0.2
Other	11	14	11	4	0	14	4	0	0
Percent of Institutional Fires	27%	7%	11%	26%	0.4%	4%	8%	4%	0.2%
	Dollar Loss in Thousands								
Care of the Aged	12	7	17	80	1	0	148	14	0
Child Care [2]	52	41	2	1	0	1	0	0	0
Hospitals, Clinics, etc.	54	19	14	133	0	6	10	7	0
Prisons, etc.[3]	429	31	0	531	0	0	9	0	0
Physical Rehabilitation [4]	10	0	0	0	0	0	0	0	0
Mental Handicaps	35	0	10	3	0	0	0	0	0
Other	2	0	0	4	0	0	0	0	0
Total	$594	$98	$43	$752	$1	$7	$167	$21	$0

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.
[2] Includes day care centers, children's homes or orphanages, foster homes.
[3] Includes prison cells, juvenile detention homes, police stations, vocational rehabilitation centers (attendance by direction).
[4] Includes institutions for the deaf, mute, or blind.
NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

CONTINUED

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Table 55 cont'd. CALIFORNIA FIRES IN INSTITUTIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Care of the Aged	1	3	10	1	0	11	6	35	415
Child Care[2]	2	0	0	0	1	0	0	4	56
Hospitals, Clinics, etc.	0	3	14	1	0	23	7	88	907
Prisons, etc.[3]	0	7	2	0	0	2	0	13	383
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	2
Mental Handicaps	1	1	1	0	0	3	2	14	448
Other	0	0	1	0	0	1	0	10	28
Total	4	14	28	2	1	40	15	164	2 239
	Percent								
Care of the Aged	0.2	0.7	2	0.2	0	3	1	8	98
Child Care[2]	4	0	0	0	2	0	0	7	101
Hospitals, Clinics, etc.	0	0.3	2	0.1	0	3	0.8	10	100
Prisons, etc.[3]	0	2	0.3	0	0	0.3	0	3	99
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	100
Mental Handicaps	0.2	0.2	0.2	0	0	0.7	0.4	3	101
Other	0	0	4	0	0	4	0	36	102
Percent of Institutional Fires	0.2%	0.6%	1%	0.1%	0.0%	2%	0.7%	7%	99%
	Dollar Loss in Thousands								
Care of the Aged	0	0	0	0	0	3	0	38	328
Child Care[2]	0	0	0	0	0	0	0	1	100
Hospitals, Clinics, etc.	0	0	8	0	0	14	0	4	274
Prisons, etc.[3]	0	1	1	0	0	0	0	49	1,053
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	10
Mental Handicaps	0	0	0	0	0	0	0	142	195
Other	0	0	0	0	0	0	0	0	8
Total	$0	$1	$9	$0	$0	$17	$0	$234	$1,973

Table 56. OHIO FIRES IN INSTITUTIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Care of the Aged	9	4	8	23	1	6	25	6	0
Child Care[2]	7	0	0	3	0	1	0	1	0
Hospitals, Clinics, etc.	29	16	21	90	0	10	16	4	0
Prisons, etc.[3]	39	1	2	10	0	0	0	0	0
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	0
Mental Handicaps	20	1	12	32	0	3	3	2	1
Other	0	0	0	0	0	0	0	0	0
Total	114	22	43	158	1	20	44	13	1
	Percent								
Care of the Aged	10	4	9	26	1	7	28	7	0
Child Care[2]	47	0	0	20	0	7	0	7	0
Hospitals, Clinics, etc.	13	7	10	41	0	5	7	2	0
Prisons, etc.[3]	77	2	3	16	0	0	0	0	0
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	0
Mental Handicaps	24	1	14	38	0	4	4	2	1
Other	0	0	0	0	0	0	0	0	0
Percent of Institutional Fires	24%	5%	9%	33%	0.2%	4%	9%	3%	0.2%
	Dollar Loss in Thousands								
Care of the Aged	9	0	3	1	0	1	2	0	0
Child Care[2]	4	0	0	2	0	0	0	0	0
Hospitals, Clinics, etc.	21	9	3	13	0	0	0	9	0
Prisons, etc.[3]	42	0	0	3	0	0	0	0	0
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	0
Mental Handicaps	24	0	0	1	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Total	$100	$9	$6	$20	$0	$1	$3	$9	$0

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).
[2] Includes day care centers, children's homes or orphanages, foster homes.
[3] Includes prison cells, juvenile detention homes, police stations, vocational rehabilitation centers (attendance by direction).
[4] Includes institutions for the deaf, mute, or blind.
NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 56 cont'd. OHIO FIRES IN INSTITUTIONAL PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)

Property Type	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Cause								
	Reported Number of Fires[1]								
Care of the Aged	1	2	0	0	0	0	0	5	90
Child Care[2]	1	1	0	0	0	1	0	0	15
Hospitals, Clinics, etc.	2	3	8	1	0	9	4	8	221
Prisons, etc.[3]	0	0	0	0	0	0	1	1	64
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	0
Mental Handicaps	2	1	0	0	0	0	1	6	84
Other	0	0	0	0	0	0	0	0	0
Total	6	7	8	1	0	10	6	20	474
	Percent								
Care of the Aged	1	2	0	0	0	0	0	6	101
Child Care[2]	7	7	0	0	0	7	0	0	102
Hospitals, Clinics, etc.	0.9	1	4	0.5	0	4	2	4	101
Prisons, etc.[3]	0	0	0	0	0	0	2	2	102
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	0
Mental Handicaps	2	0	0	0	0	0	1	7	99
Other	0	0	0	0	0	0	0	0	0
Percent of Institutional Fires	1%	1%	2%	0.2%	0%	2%	1%	4%	99%
	Dollar Loss in Thousands								
Care of the Aged	0	975	0	0	0	0	0	0	993
Child Care[2]	0	0	0	0	0	0	0	0	8
Hospitals, Clinics, etc.	0	1	5	0	0	0	0	2	68
Prisons, etc.[3]	0	0	0	0	0	0	0	0	46
Physical Rehabilitation[4]	0	0	0	0	0	0	0	0	0
Mental Handicaps	0	0	0	0	0	0	0	54	81
Other	0	0	0	0	0	0	0	0	0
Total	$0	$976	$5	$0	$0	$0	$0	$56	$1,199

California Fires in Store and Office Properties

The occupancies with the most fires in this category are offices, motor vehicle sales places, and food stores. (See Table 57.) For dollar loss, these properties plus household goods stores are important.

The leading cause of fires in stores and offices involved electrical distribution problems, especially in offices and food stores. This is followed closely by incendiary or suspicious fires in offices, food stores, and motor vehicle sales places. For dollar loss, the leading cause is incendiarism. A small number of exposure fires in motor vehicle sales places apparently also caused much loss.

Other frequent situations are appliance fires in professional supply stores and flammable liquids fires in motor vehicle sales property. A small number of heating-related fires in household goods stores are also important for dollar loss.

The prevention focus here needs to be on incendiary fires and electrical distribution fires; the latter might be emphasized during inspection visits.

Ohio Fires in Store and Office Properties

The Ohio properties with the most fires are motor vehicle sales places, followed by food stores and offices, the same top three as in California, though in different order. (See Table 58.) Motor vehicle sales property also ranked first for dollar loss.

The leading cause of fire is incendiary or suspicious (especially in offices, motor vehicle sales, food stores, and household goods stores). Electrical distribution is the second leading cause (especially in offices and motor vehicle sales), but accounts for most dollar loss (especially in hobby and home repair stores).

California Fires in Basic Industry, Utility, and Defense Properties

Half of the fires in this category are electrical distribution fires, primarily in utility and energy distribution properties and in laboratories. (See Table 59.) From the loss viewpoint, the picture is somewhat different. Large losses result from a small number of incendiary or suspicious fires and electrical distribution fires in agricultural occupancies, and from small numbers of equipment fires in laboratories and communications or defense industries.

Ohio Fires in Basic Industry, Utility, and Defense Properties

There are far fewer fires and much less dollar loss in this category in Ohio than in California. (See Table 60.) Only 96 fires were reported, compared with over 1,200 in California. Electrical distribution is the principal cause of fires in this property class, distributed across many industries. A large dollar loss resulted from incendiary or suspicious fires in mining companies.

California Fires in Manufacturing Properties

The manufacturing property class with the most fires in California is that involved with metals and woods, including furniture, paper, and printing. (See Table 61.) One in six manufacturing fires reported are of unknown cause, by far the largest single cause category. Of the known causes, most involved "other equipment." The cause second in importance is incendiary or suspicious (especially in wood-related manufacturing properties), followed by electrical distribution (from metals manufacturing properties). Dollar losses are concentrated in incendiary fires in food manufacturing, equipment and electrical distribution fires in metal manufacturing, and gas (explosions) in the chemical industry.

Ohio Fires In Manufacturing Properties

As in California, most of the Ohio fires occur in metal manufacturing properties. (See Table 62.) Chemical manufacturing properties, however, lead dollar loss. The principal causes of fire in metals manufacturing involve a variety of "other equipment" (23 percent), as in California, followed by flammable liquids (12 percent), and open flame or spark (9 percent). In wood manufacturing fires, "other equipment" is the most frequent cause, but incendiarism and unknown causes account for most dollar losses. Across all manufacturing property types, relatively few fires of unknown cause are reported, but these by far lead to the largest dollar losses.

California Fires in Storage Properties

Vehicle storage (mostly garages) are the most frequently cited type of storage fires (57 percent). (See Table 63.) Of these, 90 percent are residential garages.[57] Principal causes of vehicle storage fires are incendiary or suspicious (21 percent), unknown (17 percent), open flame and spark (14 percent), and exposure (14 percent). Of the latter, 85 percent were from residential fires. Incendiary or suspicious was the principal cause of all storage fires. This type of fire led to large losses in vehicle, chemical, and agricultural storages. Large losses also are sustained from fires of unknown causes in agricultural and vehicle storages, and from flammable liquid fires in chemical storage.

Ohio Fires in Storage Properties

As in California, Table 64 shows that vehicle storage is by far the most frequent type of Ohio storage fires (but ranks third in dollar loss). Incendiary/suspicious is the leading cause of vehicle storage fires (32 percent), with "children playing" next in importance (12 percent). Agricultural storage, though a distant second to vehicle storage in number of fires, is the leading category for dollar loss, accounting for 50 percent of storage losses. The principal known cause of these agricultural storage fires is incendiary or suspicious, followed by electrical distribution and natural cause. Dollar loss was highest for fires of unknown cause, both overall and for agricultural storage in particular.

[57] Residential garages, if detached from the house, are included in this catgory by NFPA 901 code. Exposure from residential fires accounted for fully 12 percent of *all* vehicle storage fires. Therefore, many vehicle storage fires are not really non-residential.

California Fires in Mobile Properties

In California (see Table 65), automobiles are by far the leading mobile property in terms of number of fires and fire losses. All other categories account for only one-quarter of mobile property fires. Trucks rank second in the number of fires, while mobile homes "for non-residential use" rank second in dollar loss[58]

The leading cause category by far for automobile fires and fire losses, as well as for overall mobile property, is "flammable liquids" (45 percent). Other frequent causes are unknown (14 percent), electrical distribution (11 percent), and incendiary or suspicious (9 percent). Incendiary fires, although a small fraction of auto fires, account for almost a quarter of the dollar loss from auto fires.

Ohio Fires in Mobile Properties

As in California, automobiles are the most frequent mobile property for fires and fire losses. "Flammable liquids" is the leading cause. (See Table 66.)[59] A very small number of rail transport fires involving flammable liquids resulted in very large dollar loss, half as much loss as from the more than 10,000 auto fires. This suggests the importance of increased attention to transportation of hazardous materials.

[58] We do not know how many residential mobile home fires were included accidentally here. That the vast majority of the dollar loss resulted from fires related to home appliances suggests that the category included at least some residential mobile home fires.

[59] Mobile homes are not included in this property type in this analysis.

Table 57. CALIFORNIA FIRES IN STORE AND OFFICE PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Food Sales	164	162	59	59	24	43	28	23	13
Wearing Apparel	32	85	14	25	11	3	9	10	2
Household Goods	54	58	13	26	14	5	19	19	4
Specialty Shops	47	66	15	33	6	6	12	15	1
Hobby, Home Repair	45	57	27	22	20	7	16	28	4
Professional Supplies	58	28	4	17	9	5	281	24	2
Motor Vehicle, Boat Sales	134	96	41	48	47	3	27	55	128
General Item Stores	72	43	15	25	7	6	3	5	4
Offices	171	255	56	107	19	19	37	74	9
Other	4	5	18	3	1	1	3	2	0
Total	781	855	262	365	158	98	435	255	167
	Percent								
Food Sales	21	21	8	8	3	6	4	3	2
Wearing Apparel	13	35	6	10	5	1	4	4	0.8
Household Goods	18	20	4	9	5	2	7	7	1
Specialty Shops	19	26	6	13	2	2	5	6	0.4
Hobby, Home Repair	15	20	9	8	7	2	5	10	1
Professional Supplies	12	6	0.8	3	2	1	56	5	0.4
Motor Vehicle, Boat Sales	17	12	5	6	6	0.4	3	7	16
General Item Stores	31	18	6	11	3	3	1	2	2
Offices	18	27	6	11	2	2	4	8	0.9
Other	7	8	31	5	2	2	5	3	0
Percent of Store/Office Fires	18%	20%	6%	8%	4%	2%	10%	6%	4%
	Dollar Loss in Thousands								
Food Sales	1,051	448	72	121	126	29	4	130	489
Wearing Apparel	60	66	73	102	106	20	18	78	68
Household Goods	792	150	8	95	239	5	68	926	0
Specialty Shops	371	370	13	29	44	0	2	52	0
Hobby, Home Repair	294	16	2	21	505	4	3	35	1
Professional Supplies	414	109	1	7	50	0	133	19	5
Motor Vehicle, Boat Sales	627	303	31	109	1,055	12	64	82	120
General Item Stores	656	30	6	56	136	8	1	0	0
Offices	920	324	29	196	72	1	66	66	13
Other	16	133	7	1	5	0	1	0	0
Total	$5,201	$1,949	$242	$737	$2,338	$79	$360	$1,388	$696

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 57 cont'd. CALIFORNIA FIRES IN STORE AND OFFICE PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Food Sales	9	6	39	5	2	7	24	101	768
Wearing Apparel	1	1	5	1	1	4	5	31	240
Household Goods	1	9	7	1	1	5	7	49	292
Specialty Shops	2	4	2	2	0	2	4	37	254
Hobby, Home Repair	0	3	5	1	2	11	4	39	291
Professional Supplies	3	1	1	1	1	5	6	58	504
Motor Vehicle, Boat Sales	7	20	4	12	0	18	21	118	779
General Item Stores	3	3	9	0	1	5	3	31	235
Offices	7	5	49	3	2	30	12	104	959
Other	0	1	0	0	1	2	0	18	59
Total	33	53	121	26	11	89	86	586	4,381
	Percent								
Food Sales	1	0.8	5	0.7	0.3	0.9	3	13	101
Wearing Apparel	0.4	0.4	2	0.4	0.4	2	2	13	99
Household Goods	0.3	3	2	0.3	0.3	2	2	17	100
Specialty Shops	0.8	2	0.8	0.8	0	0.8	2	15	102
Hobby, Home Repair	0	1	2	0.4	0.7	4	1	13	99
Professional Supplies	0.6	0.2	0.2	0.2	0.2	1	1	12	102
Motor Vehicle, Boat Sales	0.9	3	0.5	2	0	2	3	15	99
General Item Stores	1	1	4	0	0.4	2	1	13	99
Offices	0.7	0.5	5	0.3	0.2	3	1	11	101
Other	0	2	0	0	2	3	0	31	101
Percent of Store/Office Fires	0.8%	1%	3%	0.6%	0.2%	2%	2%	13%	101%
	Dollar Loss in Thousands								
Food Sales	0	7	51	0	0	0	34	275	2,843
Wearing Apparel	0	0	5	0	0	2	1	127	731
Household Goods	0	60	0	0	0	0	0	1,669	4,020
Specialty Shops	0	0	0	54	0	250	0	986	2,175
Hobby, Home Repair	0	0	100	0	9	85	0	343	1,424
Professional Supplies	0	0	0	0	0	0	0	348	1,088
Motor Vehicle, Boat Sales	20	40	0	501	0	132	11	1,353	4,466
General Item Stores	2	0	1	0	0	10	0	66	977
Offices	1	77	33	0	0	325	6	587	2 725
Other	0	0	0	0	0	5	0	133	303
Total	$23	$184	$190	$555	$9	$809	$52	$5,887	$20,756

Table 58. OHIO FIRES IN STORE AND OFFICE PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Food Sales	33	25	2	20	13	14	6	14	1
Wearing Apparel	6	21	0	7	2	1	1	1	1
Household Goods	26	14	5	11	8	0	4	6	2
Specialty Shops	14	12	2	4	4	0	3	6	1
Hobby, Home Repair	11	16	4	7	4	1	7	9	0
Professional Supplies	14	7	2	4	3	0	50	2	1
Motor Vehicle, Boat Sales	36	26	20	15	10	2	4	37	27
General Item Stores	18	7	4	6	2	2	3	1	0
Offices	39	28	8	26	2	3	5	10	2
Other	0	0	0	0	0	0	0	0	0
Total	197	156	47	100	48	23	83	86	35
	Percent								
Food Sales	18	14	1	11	7	8	3	8	0.5
Wearing Apparel	11	38	0	13	4	2	2	2	2
Household Goods	25	13	5	11	8	0	4	6	2
Specialty Shops	21	18	3	6	6	0	4	9	1
Hobby, Home Repair	15	23	6	10	6	1	10	13	0
Professional Supplies	15	7	2	4	3	0	52	2	1
Motor Vehicle, Boat Sales	15	11	8	6	4	0.8	2	15	11
General Item Stores	30	12	7	10	3	3	5	2	0
Offices	22	16	5	15	1	2	3	6	1
Other	0	0	0	0	0	0	0	0	0
Percent of Store/Office Fires	19%	15%	4%	9%	5%	2%	8%	8%	3%
	Dollar Loss in Thousands								
Food Sales	607	92	0	3	104	24	15	235	1
Wearing Apparel	2	107	0	8	24	0	3	0	2
Household Goods	377	211	1,000	42	121	0	0	5	2
Specialty Shops	177	54	0	0	7	0	0	39	0
Hobby, Home Repair	529	1,711	195	6	13	0	6	133	0
Professional Supplies	140	1	13	0	7	0	66	2	8
Motor Vehicle, Boat Sales	594	1,247	560	52	27	40	1	117	646
General Item Stores	60	115	0	1	9	0	0	0	0
Offices	133	127	10	23	3	0	16	10	0
Other	0	0	0	0	0	0	0	0	0
Total	$2,619	$3,665	$1,778	$135	$315	$64	$106	$541	$659

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 58 cont'd. OHIO FIRES IN STORE AND OFFICE PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Food Sales	2	2	14	1	0	11	11	16	185
Wearing Apparel	1	1	0	0	0	1	4	9	56
Household Goods	2	3	1	1	0	4	1	16	104
Specialty Shops	1	1	2	1	0	3	2	11	67
Hobby, Home Repair	0	1	0	0	0	2	0	9	71
Professional Supplies	1	1	0	1	0	3	2	5	96
Motor Vehicle, Boat Sales	5	2	1	7	0	9	11	31	243
General Item Stores	3	0	0	0	0	4	3	7	60
Offices	1	2	4	1	0	8	13	22	174
Other	0	0	0	0	0	0	0	0	0
Total	16	13	22	12	0	45	47	126	1,065
	Percent								
Food Sales	1	1	8	0.5	0	6	6	9	102
Wearing Apparel	2	2	0	0	0	2	7	16	103
Household Goods	2	3	1	1	0	4	1	15	101
Specialty Shops	1	1	3	1	0	4	3	16	97
Hobby, Home Repair	0	1	0	0	0	3	0	13	101
Professional Supplies	1	1	0	1	0	3	2	5	99
Motor Vehicle, Boat Sales	2	0.8	0.4	3	0	4	5	13	102
General Item Stores	5	0	0	0	0	7	5	12	101
Offices	0.6	1	2	0.6	0	5	7	13	100
Other	0	0	0	0	0	0	0	0	0
Percent of Store/Office Fires	2%	1%	2%	1%	0%	4%	4%	12%	99%
	Dollar Loss in Thousands								
Food Sales	0	0	28	0	0	44	6	271	1,439
Wearing Apparel	0	1	0	0	0	0	2	804	955
Household Goods	0	12	14	13	0	25	0	464	3,292
Specialty Shops	0	30	2	0	0	22	0	1,221	1,556
Hobby, Home Repair	0	0	0	0	0	0	0	386	2,982
Professional Supplies	0	0	0	2	0	0	0	39	281
Motor Vehicle, Boat Sales	0	0	7	316	0	4	25	1,293	4,936
General Item Stores	0	0	0	0	0	11	4	239	442
Offices	1	0	5	0	0	5	80	763	1,180
Other	0	0	0	0	0	0	0	0	0
Total	$1	$43	$55	$331	$0	$111	$117	$5,480	$16,068

Table 59. CALIFORNIA FIRES IN BASIC INDUSTRY, UTILITY, AND DEFENSE PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Nucleonics, Energy Production	0	11	1	1	0	0	0	0	3
Laboratories	2	168	3	6	0	6	11	9	16
Communications, Defense	11	16	2	3	2	2	1	1	2
Utility, Energy Distribution	40	396	26	9	60	1	5	25	14
Agriculture[2]	9	7	7	2	8	0	4	2	3
Mining, Quarrying	2	1	2	2	0	2	1	1	4
Mineral Products Mfg.	8	6	3	0	3	1	5	10	8
Other	1	0	1	0	1	0	0	0	0
Total	73	605	45	23	74	12	27	48	50
	Percent								
Nucleonics, Energy Production	0	44	4	4	0	0	0	0	12
Laboratories	0.7	58	1	2	0	2	4	3	6
Communications, Defense	18	27	3	5	3	3	2	2	3
Utility, Energy Distribution	6	55	4	1	8	0.1	0.7	3	2
Agriculture[2]	12	9	9	3	11	0	5	3	4
Mining, Quarrying	8	4	8	8	0	8	4	4	16
Mineral Products Mfg.	9	7	3	0	3	1	6	12	9
Other	33	0	33	0	33	0	0	0	0
Percent of Basic Industry, etc. Fires	6%	47%	4%	2%	6%	0.9%	2%	4%	4%
	Dollar Loss in Thousands								
Nucleonics, Energy Production	0	13	0	0	0	0	0	0	1
Laboratories	0	137	0	3	0	0	60	16	0
Communications, Defense	15	2	0	60	0	0	0	0	0
Utility, Energy Distribution	5	150	5	9	38	0	0	40	2
Agriculture[2]	418	363	5	0	1	0	3	21	0
Mining, Quarrying	0	8	0	0	0	0	0	0	1
Mineral Products Mfg.	53	2	0	0	4	0	112	15	1
Other	0	0	0	0	0	0	0	0	0
Total	$491	$675	$10	$72	$43	$0	$175	$92	$5

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.

[2] "Agriculture" does not include "crops and orchards"; these are included, along with "forests, hunting, fishing" in Outside Fires.

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 59 cont'd. CALIFORNIA FIRES IN BASIC INDUSTRY, UTILITY, AND DEFENSE PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Nucleonics, Energy Production	0	1	1	0	0	4	1	2	25
Laboratories	0	8	4	4	0	36	2	13	288
Communications, Defense	0	1	1	1	2	9	1	5	60
Utility, Energy Distribution	7	15	2	18	3	12	14	68	715
Agriculture[2]	4	5	1	1	0	5	4	14	76
Mining, Quarrying	0	1	0	3	1	1	0	4	25
Mineral Products Mfg.	0	2	0	4	0	17	5	14	86
Other	0	0	0	0	0	0	0	0	3
Total	11	33	9	31	6	84	27	120	1,278
	Percent								
Nucleonics, Energy Production	0	4	4	0	0	16	4	9	100
Laboratories	0	3	1	1	0	13	0.7	5	100
Communications, Defense	0	2	2	2	3	15	2	8	100
Utility, Energy Distribution	1	2	0.3	3	0.4	2	2	10	101
Agriculture[2]	5	7	1	1	0	7	5	18	100
Mining, Quarrying	0	4	0	12	4	4	0	16	100
Mineral Products Mfg.	0	2	0	5	0	20	6	16	99
Other	0	0	0	0	0	0	0	0	99
Percent of Basic Industry, etc. Fires	0.9%	3%	0.7%	2%	0.5%	7%	2%	9%	101%
	Dollar Loss in Thousands								
Nucleonics, Energy Production	0	0	0	0	0	50	0	0	64
Laboratories	0	100	0	0	0	252	0	261	832
Communications, Defense	0	0	0	0	0	216	0	0	296
Utility, Energy Distribution	0	1	0	173	0	5	1	20	455
Agriculture[2]	0	9	0	0	0	5	0	5	836
Mining, Quarrying	0	10	0	0	0	0	0	0	19
Mineral Products Mfg.	0	2	0	5	0	81	0	63	342
Other	0	0	0	0	0	0	0	0	0
Total	$0	$122	$0	$178	$0	$609	$1	$349	$2,848

Table 60. OHIO FIRES IN BASIC INDUSTRY, UTILITY, AND DEFENSE PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Nucleonics, Energy Production	1	0	0	0	0	0	0	2	0
Laboratories	2	1	0	0	0	1	1	2	2
Communications, Defense	1	3	0	0	0	0	1	0	0
Utility, Energy Distribution	3	8	3	0	0	0	0	1	2
Agriculture[2]	4	5	3	1	1	0	2	5	0
Mining, Quarrying	0	1	1	0	0	0	0	1	0
Mineral Products Mfg.	5	0	4	2	0	0	1	3	0
Other	0	0	0	0	0	0	0	0	0
Total	16	18	11	3	1	1	5	14	4
	Percent								
Nucleonics, Energy Production	25	0	0	0	0	0	0	50	0
Laboratories	17	8	0	0	0	8	8	17	17
Communications, Defense	17	50	0	0	0	0	17	0	0
Utility, Energy Distribution	14	38	14	0	0	0	0	5	10
Agriculture[2]	16	20	12	4	4	0	8	20	0
Mining, Quarrying	0	25	25	0	0	0	0	25	0
Mineral Products Mfg.	21	0	17	8	0	0	4	13	0
Other	0	0	0	0	0	0	0	0	0
Percent of Basic Industry, etc. Fires	17%	19%	11%	3%	1%	1%	5%	15%	4%
	Dollar Loss in Thousands								
Nucleonics, Energy Production	0	0	0	0	0	0	0	0	0
Laboratories	24	0	0	0	0	1	0	26	60
Communications, Defense	0	11	0	0	0	0	0	0	0
Utility, Energy Distribution	29	31	0	0	0	0	0	0	32
Agriculture[2]	4	100	28	0	10	0	135	37	0
Mining, Quarrying	0	15	0	0	0	0	0	20	0
Mineral Products Mfg.	189	0	10	1	0	0	0	0	0
Other	0	0	0	0	0	0	0	0	0
Total	$246	$157	$38	$1	$10	$1	$135	$83	$92

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).

[2] "Agriculture" does not include "crops and orchards"; these are included, along with "forests, hunting, fishing" in Outside Fires.

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 60 cont'd. OHIO FIRES IN BASIC INDUSTRY, UTILITY, AND DEFENSE PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Nucleonics, Energy Production	0	0	0	0	0	0	0	1	4
Laboratories	0	0	0	0	0	3	0	0	12
Communications, Defense	0	0	0	0	0	1	0	0	6
Utility, Energy Distribution	0	1	1	0	0	0	1	1	21
Agriculture[2]	0	2	0	0	0	0	0	2	25
Mining, Quarrying	0	0	0	1	0	0	0	0	4
Mineral Products Mfg.	0	0	1	1	0	5	2	0	24
Other	0	0	0	0	0	0	0	0	0
Total	0	3	2	2	0	9	3	4	96
	Percent								
Nucleonics, Energy Production	0	0	0	0	0	0	0	25	100
Laboratories	0	0	0	0	0	25	0	0	100
Communications, Defense	0	0	0	0	0	17	0	0	101
Utility, Energy Distribution	0	5	5	0	0	0	5	5	101
Agriculture[2]	0	8	0	0	0	0	0	8	100
Mining, Quarrying	0	0	0	25	0	0	0	0	100
Mineral Products Mfg.	0	0	4	4	0	21	8	0	100
Other	0	0	0	0	0	0	0	0	0
Percent of Basic Industry, etc. Fires	0%	3%	2%	2%	0%	9%	3%	4%	99%
	Dollar Loss in Thousands								
Nucleonics, Energy Production	0	0	0	0	0	0	0	0	0
Laboratories	0	0	0	0	0	0	0	0	112
Communications, Defense	0	0	0	0	0	0	0	0	11
Utility, Energy Distribution	0	0	0	0	0	0	0	3	97
Agriculture[2]	0	30	0	0	0	0	0	0	346
Mining, Quarrying	0	0	0	15	0	0	0	0	50
Mineral Products Mfg.	0	0	0	55	0	4	0	0	261
Other	0	0	0	0	0	0	0	0	0
Total	$0	$30	$0	$70	$0	$4	$0	$2	$880

Table 61. CALIFORNIA FIRES IN MANUFACTURING PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Food	27	23	15	8	12	29	16	13	1
Beverages, Tobacco	1	4	5	4	0	4	7	1	1
Textiles	12	5	10	7	0	2	11	4	3
Wearing Apparel	14	16	8	9	5	2	5	9	6
Wood, Furniture, Paper, Printing	79	53	43	40	37	0	44	30	15
Chemical, Plastic, Petroleum	12	17	16	7	5	3	9	10	27
Metals	35	74	28	20	12	32	48	38	66
Vehicle Assembly	24	24	15	13	3	1	9	4	63
Other	107	60	35	28	59	8	82	28	17
Total	311	276	175	136	133	81	231	137	199
	Percent								
Food	11	10	6	3	5	12	7	5	0.4
Beverages, Tobacco	2	10	12	10	0	10	17	2	2
Textiles	11	5	9	7	0	2	10	4	3
Wearing Apparel	10	12	6	7	4	1	4	7	4
Wood, Furniture, Paper, Printing	13	9	7	7	6	0	7	5	3
Chemical, Plastic, Petroleum	5	6	6	3	2	1	3	4	10
Metals	6	12	5	3	2	5	8	6	11
Vehicle Assembly	9	9	5	6	1	0.4	3	1	22
Other	17	9	5	4	9	1	13	4	3
Percent of Manufacturing Fires	11%	9%	6%	5%	5%	3%	8%	5%	7%
	Dollar Loss in Thousands								
Food	3,135	133	160	5	16	6	13	46	0
Beverages, Tobacco	0	5	0	4	0	16	3	75	0
Textiles	335	0	0	18	0	0	0	23	16
Wearing Apparel	210	16	6	46	1	1	0	23	0
Wood, Furniture, Paper, Printing	321	254	34	165	74	0	520	265	102
Chemical, Plastic, Petroleum	27	485	4	7	1	3	6	76	436
Metals	495	1,013	21	20	27	13	610	363	296
Vehicle Assembly	12	11	27	13	2	0	0	1	9
Other	136	157	66	51	43	5	22	79	71
Total	$4,671	$2,077	$318	$329	$164	$44	$1,174	$951	$936

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 61 cont'd. CALIFORNIA FIRES IN MANUFACTURING PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Food	4	13	4	2	0	32	12	27	238
Beverages, Tobacco	1	1	0	1	0	4	0	8	42
Textiles	1	0	0	1	0	20	9	21	106
Wearing Apparel	0	7	0	2	0	24	2	25	134
Wood, Furniture, Paper, Printing	11	29	3	2	5	76	20	106	593
Chemical, Plastic, Petroleum	0	37	1	12	0	52	8	49	265
Metals	2	16	11	18	0	95	18	108	621
Vehicle Assembly	1	10	3	10	0	25	18	57	280
Other	20	27	6	5	1	33	9	121	646
Total	40	140	28	53	6	361	96	522	2,925
	Percent								
Food	2	5	2	0.8	0	13	5	11	98
Beverages, Tobacco	2	2	0	2	0	10	0	19	100
Textiles	0.9	0	0	0.9	0	19	8	20	100
Wearing Apparel	0	5	0	1	0	18	1	19	99
Wood, Furniture, Paper, Printing	2	5	0.5	0.3	0.8	13	3	18	199
Chemical, Plastic, Petroleum	0	14	0.4	5	0	9	6	20	101
Metals	0.3	3	2	3	0	9	6	20	101
Vehicle Assembly	0.4	4	1	4	0	9	6	20	101
Other	3	4	0.9	0.8	0.2	5	1	19	99
Percent of Manufacturing Fires	1%	5%	1%	2%	0.2%	12%	3%	18%	101%
	Dollar Loss in Thousands								
Food	0	6	20	1	0	12	13	580	4,152
Beverages, Tobacco	0	0	0	0	0	0	0	3	114
Textiles	0	0	0	1	0	6	3	424	832
Wearing Apparel	0	16	0	0	0	110	5	66	506
Wood, Furniture, Paper, Printing	0	42	0	0	14	70	3	627	2,496
Chemical, Plastic, Petroleum	0	15	0	2,086	0	153	0	279	3,584
Metals	0	46	0	65	0	2,421	1	550	5,949
Vehicle Assembly	0	41	0	1	0	7	10	40	178
Other	2	30	0	85	0	24	19	705	1,506
Total	$2	$196	$20	$2,239	$14	$2,803	$54	$3,274	$19,324

Table 61 cont'd. CALIFORNIA FIRES IN MANUFACTURING PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Food	4	13	4	2	0	32	12	27	238
Beverages, Tobacco	1	1	0	1	0	4	0	8	42
Textiles	1	0	0	1	0	20	9	21	106
Wearing Apparel	0	7	0	2	0	24	2	25	134
Wood, Furniture, Paper, Printing	11	29	3	2	5	76	20	106	593
Chemical, Plastic, Petroleum	0	37	1	12	0	52	8	49	265
Metals	2	16	11	18	0	95	18	108	621
Vehicle Assembly	1	10	3	10	0	25	18	57	280
Other	20	27	6	5	1	33	9	121	646
Total	40	140	28	53	6	361	96	522	2,925
	Percent								
Food	2	5	2	0.8	0	13	5	11	98
Beverages, Tobacco	2	2	0	2	0	10	0	19	100
Textiles	0.9	0	0	0.9	0	19	8	20	100
Wearing Apparel	0	5	0	1	0	18	1	19	99
Wood, Furniture, Paper, Printing	2	5	0.5	0.3	0.8	13	3	18	199
Chemical, Plastic, Petroleum	0	14	0.4	5	0	9	6	20	101
Metals	0.3	3	2	3	0	9	6	20	101
Vehicle Assembly	0.4	4	1	4	0	9	6	20	101
Other	3	4	0.9	0.8	0.2	5	1	19	99
Percent of Manufacturing Fires	1%	5%	1%	2%	0.2%	12%	3%	18%	101%
	Dollar Loss in Thousands								
Food	0	6	20	1	0	12	13	580	4,152
Beverages, Tobacco	0	0	0	0	0	0	0	3	114
Textiles	0	0	0	1	0	6	3	424	832
Wearing Apparel	0	16	0	0	0	110	5	66	506
Wood, Furniture, Paper, Printing	0	42	0	0	14	70	3	627	2,496
Chemical, Plastic, Petroleum	0	15	0	2,086	0	153	0	279	3,584
Metals	0	46	0	65	0	2,421	1	550	5,949
Vehicle Assembly	0	41	0	1	0	7	10	40	178
Other	2	30	0	85	0	24	19	705	1,506
Total	$2	$196	$20	$2,239	$14	$2,803	$54	$3,274	$19,324

Table 62. OHIO FIRES IN MANUFACTURING PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Food	6	6	9	1	1	10	3	2	1
Beverages, Tobacco	1	0	1	1	0	0	0	1	1
Textiles	0	1	0	1	0	0	0	0	0
Wearing Apparel	5	6	4	6	1	1	4	1	3
Wood, Furniture, Paper, Printing	13	15	20	10	4	3	8	19	4
Chemical, Plastic, Petroleum	7	9	7	3	4	2	3	10	12
Metals	13	25	30	18	9	1	18	27	43
Vehicle Assembly	4	1	2	3	0	1	1	4	6
Other	17	4	7	9	4	1	21	2	2
Total	66	67	80	52	23	19	58	66	72
	Percent								
Food	11	11	16	2	2	18	5	4	2
Beverages, Tobacco	7	0	7	7	0	0	0	7	7
Textiles	0	13	0	13	0	0	0	0	0
Wearing Apparel	9	11	7	11	2	2	7	2	5
Wood, Furniture, Paper, Printing	7	9	11	6	2	2	5	11	2
Chemical, Plastic, Petroleum	6	7	6	2	3	2	2	8	10
Metals	4	7	9	5	3	0.3	5	8	12
Vehicle Assembly	11	3	6	8	0	3	3	11	17
Other	18	4	7	9	4	1	22	2	2
Percent of Manufacturing Fires	7%	7%	9%	6%	3%	2%	6%	7%	8%
	Dollar Loss in Thousands								
Food	15	1	229	0	100	4	2	2	22
Beverages, Tobacco	1,600	0	0	20	0	0	0	0	C
Textiles	0	0	0	0	0	0	0	0	0
Wearing Apparel	528	6	3	59	0	0	60	2	0
Wood, Furniture, Paper, Printing	258	93	390	17	415	50	7	294	0
Chemical, Plastic, Petroleum	555	642	56	5	5	15	4	31	58
Metals	71	48	83	56	7	0	119	319	516
Vehicle Assembly	205	85	0	24	0	0	4	1	109
Other	3	4	5	25	0	0	12	0	0
Total	$3,235	$879	$766	$206	$527	$69	$208	$649	$705

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 62 cont'd. OHIO FIRES IN MANUFACTURING PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Food	0	0	0	2	0	6	3	5	55
Beverages, Tobacco	1	2	0	0	0	4	0	2	14
Textiles	0	0	0	0	0	3	2	1	8
Wearing Apparel	0	4	0	0	0	17	1	4	57
Wood, Furniture, Paper, Printing	3	14	2	0	0	37	10	14	176
Chemical, Plastic, Petroleum	0	17	1	4	0	25	7	11	122
Metals	0	26	2	14	0	81	19	19	345
Vehicle Assembly	0	2	0	1	0	7	1	3	36
Other	1	11	0	3	0	2	2	10	96
Total	5	76	5	24	0	182	45	69	909
	Percent								
Food	0	0	0	4	0	1%	5	9	100
Beverages, Tobacco	7	14	0	0	0	29	0	14	99
Textiles	0	0	0	0	0	38	25	13	102
Wearing Apparel	0	7	0	0	0	30	2	7	102
Wood, Furniture, Paper, Printing	2	8	1	0	0	21	6	8	101
Chemical, Plastic, Petroleum	0	14	1	3	0	20	6	9	99
Metals	0	8	0.6	4	0	23	6	6	101
Vehicle Assembly	0	6	0	3	0	19	3	8	101
Other	1	11	0	3	0	2	2	10	98
Percent of Manufacturing Fires	0.6%	8%	0.6%	3%	0%	20%	5%	8%	100%
	Dollar Loss in Thousands								
Food	0	0	0	107	0	12	0	304	803
Beverages, Tobacco	0	11	0	0	0	350	0	352	2,334
Textiles	0	0	0	0	0	1	1	25	27
Wearing Apparel	0	8	0	0	0	13	12	17	712
Wood, Furniture, Paper, Printing	0	57	0	0	0	101	24	606	2,318
Chemical, Plastic, Petroleum	0	84	0	861	0	55	35	1,827	4,239
Metals	0	70	6	89	0	1,326	30	1,347	4,093
Vehicle Assembly	0	0	0	0	0	124	0	140	695
Other	0	7	0	45	0	0	0	668	778
Total	$0	$239	$6	$1,102	$0	$1,982	$102	$5,286	$16,003

Table 63. CALIFORNIA FIRES IN STORAGE PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Agricultural Products	147	34	59	36	60	6	8	13	18
Textiles	8	0	5	6	1	0	2	1	6
Processed Food, Tobacco	11	5	5	0	2	11	5	2	1
Petroleum Products, Alcoholic Beverage	7	3	6	1	3	5	3	1	15
Wood, Paper Products	33	5	8	7	8	0	1	1	1
Chemicals, Plastics	15	7	6	2	3	1	0	1	2
Metals	25	11	58	11	5	0	5	5	17
Vehicle[2]	553	138	372	157	375	16	65	91	91
General Item	195	38	48	51	69	7	12	18	6
Other	13	1	6	2	9	0	2	0	0
Total	1,007	242	573	283	535	46	103	133	157
	Percent								
Agricultural Products	22	5	9	5	9	0.9	1	2	3
Textiles	8	0	5	6	1	0	2	1	6
Processed Food, Tobacco	18	8	8	0	3	18	8	3	2
Petroleum Products, Alcoholic Beverage	12	5	10	2	5	8	5	2	25
Wood, Paper Products	36	5	9	8	9	0	1	1	1
Chemicals, Plastics	24	11	10	3	5	2	0	2	3
Metals	13	6	31	6	3	0	3	3	9
Vehicle[2]	21	5	14	6	14	0.6	2	3	3
General Item	30	6	7	8	11	1	2	3	0.9
Other	22	2	10	3	16	0	3	0	0
Percent of Storage Fires	22%	5%	13%	6%	12%	1%	2%	3%	3%
	Dollar Loss in Thousands								
Agricultural Products	799	52	90	106	24	0	26	10	96
Textiles	267	0	5	1	0	0	0	2	0
Processed Food, Tobacco	389	0	0	0	19	0	3	0	0
Petroleum Products, Alcoholic Beverage	0	0	1	0	26	0	0	0	152
Wood, Paper Products	31	16	40	2	109	0	0	0	0
Chemicals, Plastics	845	6	37	8	104	0	0	4	1,320
Metals	14	116	2	1	5	0	12	8	19
Vehicle[2]	1,218	296	471	171	379	24	111	244	104
General Item	502	46	680	27	302	6	22	43	135
Other	6	11	12	2	13	0	10	0	0
Total	$4,071	$543	$1,338	$318	$981	$30	$184	$311	$1,826

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.

[2] Includes parking garages (residential and other), storage for buses, trucks, automobile dealers, heavy equipment, boats, ships, railways, aircraft hangers, fire stations.

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 63 cont'd. CALIFORNIA FIRES IN STORAGE PROPERTIES BY CAUSE AND PROPERTY TYPE (CFIRS 1975)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Agricultural Products	36	56	0	0	4	31	43	117	668
Textiles	1	4	0	0	0	32	13	17	96
Processed Food, Tobacco	2	3	2	0	0	4	2	5	60
Petroleum Products, Alcoholic Beverage	2	0	0	3	0	1	0	10	60
Wood, Paper Products	4	0	0	0	0	1	2	20	91
Chemicals, Plastics	0	5	1	0	0	3	6	11	63
Metals	2	0	0	2	1	5	6	37	190
Vehicle[2]	145	31	5	9	37	22	49	446	2,612
General Item	42	9	1	2	3	8	21	118	648
Other	3	1	0	0	1	2	1	17	58
Total	237	109	9	16	46	109	143	798	4,546
	Percent								
Agricultural Products	5	8	0	0	0.6	5	6	18	100
Textiles	1	4	0	0	0	33	14	18	99
Processed Food, Tobacco	3	5	3	0	0	7	3	8	97
Petroleum Products, Alcoholic Beverage	3	0	0	5	0	2	0	17	101
Wood, Paper Products	4	0	0	0	0	1	2	22	99
Chemicals, Plastics	0	8	2	0	0	5	10	17	102
Metals	1	0	0	1	0.5	3	3	19	102
Vehicle[2]	6	1	0.2	0.3	1	0.8	2	17	97
General Item	6	1	0.2	0.3	0.5	1	3	18	99
Other	5	2	0	0	2	3	2	29	99
Percent of Storage Fires	5%	2%	0.2%	0.4%	1%	2%	3%	18%	99%
	Dollar Loss in Thousands								
Agricultural Products	36	260	0	0	4	14	94	1,190	2,807
Textiles	0	1	0	0	0	191	177	30	676
Processed Food, Tobacco	0	5	0	0	0	1	0	16	438
Petroleum Products, Alcoholic Beverage	0	0	0	0	0	0	0	11	192
Wood, Paper Products	0	0	0	0	0	0	6	176	383
Chemicals, Plastics	0	1	0	0	0	16	0	8	2,351
Metals	250	0	0	6	0	2	4	33	477
Vehicle[2]	174	66	11	19	91	52	67	1,306	4,812
General Item	322	9	0	0	1	1	12	715	2,830
Other	0	1	0	0	1	1	0	497	557
Total	$782	$343	$11	$25	$97	$278	$360	$3,982	$15,527

Table 64. OHIO FIRES IN STORAGE PROPERTIES BY CAUSE AND PROPERTY TYPE (NFIRS 1976)—Continued

Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Reported Number of Fires[1]								
Agricultural Products	175	79	75	26	29	2	12	38	9
Textiles	2	0	0	0	0	0	0	1	0
Processed Food, Tobacco	1	0	1	2	0	0	0	0	0
Petroleum Products, Alcoholic Beverage	2	0	0	0	0	0	0	1	3
Wood, Paper Products	0	0	1	0	0	0	0	0	0
Chemicals, Plastics	3	0	0	2	0	0	0	0	0
Metals	12	9	11	3	4	1	4	6	5
Vehicle[2]	505	77	83	89	140	13	15	94	76
General Item	70	17	27	13	12	1	0	12	6
Other	2	0	0	1	0	0	0	1	0
Total	772	182	198	136	185	17	31	153	99
	Percent								
Agricultural Products	21	10	9	3	4	0.2	1	5	1
Textiles	67	0	0	0	0	0	0	33	0
Processed Food, Tobacco	14	0	14	29	0	0	0	0	0
Petroleum Products, Alcoholic Beverage	20	0	0	0	0	0	0	10	30
Wood, Paper Products	0	0	25	0	0	0	0	0	0
Chemicals, Plastics	27	0	0	18	0	0	0	0	0
Metals	14	11	13	4	5	1	5	7	6
Vehicle[2]	32	5	5	6	9	0.8	0.9	6	5
General Item	32	8	12	6	5	0.5	0	5	3
Other	29	0	0	14	0	0	0	14	0
Percent of Storage Fires	28%	7%	7%	5%	7%	0.6%	1%	6%	4%
	Dollar Loss in Thousands								
Agricultural Products	2,205	1,777	390	53	48	7	122	713	5
Textiles	0	0	0	0	0	0	0	3	0
Processed Food, Tobacco	400	0	0	0	0	0	0	0	0
Petroleum Products, Alcoholic Beverage	12	0	0	0	0	0	0	0	16
Wood, Paper Products	0	0	0	0	0	0	0	0	0
Chemicals, Plastics	370	0	0	0	0	0	0	0	0
Metals	47	18	7	0	11	0	79	73	21
Vehicle[2]	577	381	110	67	128	8	33	235	287
General Item	2,402	398	44	15	105	1	0	37	17
Other	0	0	0	0	0	0	0	0	0
Total	$6,013	$2,574	$551	$135	$292	$16	$234	$1,061	$346

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).
[2] Includes parking garages (residential and other), storage for buses, trucks, automobile dealers, heavy equipment, boats, ships, railways, aircraft hangers, fire stations.
NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 64 cont'd. OHIO FIRES IN STORAGE PROPERTIES BY CAUSE PROPERTY TYPE (NFIRS 1976)

Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Reported Number of Fires[1]								
Agricultural Products	62	78	0	1	3	18	17	203	827
Textiles	0	0	0	0	0	0	0	0	3
Processed Food, Tobacco	0	0	0	0	0	2	0	1	7
Petroleum Products, Alcoholic Beverage	0	2	0	2	0	0	0	0	10
Wood, Paper Products	0	0	0	0	0	0	0	3	4
Chemicals, Plastics	3	1	0	0	0	1	1	0	11
Metals	3	3	0	2	0	3	6	12	84
Vehicle[2]	186	23	2	9	9	11	74	192	1,598
General Item	10	6	0	2	0	8	10	26	220
Other	1	0	0	0	0	0	0	2	7
Total	265	113	2	16	12	43	108	439	2,771
	Percent								
Agricultural Products	7	9	0	0.1	0.4	2	2	25	100
Textiles	0	0	0	0	0	0	0	0	100
Processed Food, Tobacco	0	0	0	0	0	29	0	14	100
Petroleum Products, Alcoholic Beverage	0	20	0	20	0	0	0	0	100
Wood, Paper Products	0	0	0	0	0	0	0	75	100
Chemicals, Plastics	27	9	0	0	0	9	9	0	99
Metals	4	4	0	2	0	4	7	14	101
Vehicle[2]	12	1	0.1	0.6	0.6	0.7	5	12	102
General Item	5	3	0	0.9	0	4	5	12	101
Other	14	0	0	0	0	0	0	29	100
Percent of Storage Fires	10%	4%	0.1%	0.6%	0.4%	2%	4%	16%	103%
	Dollar Loss in Thousands								
Agricultural Products	289	1,040	0	0	20	187	35	3,836	10,733
Textiles	0	0	0	0	0	0	0	0	3
Processed Food, Tobacco	0	0	0	0	0	0	0	0	400
Petroleum Products, Alcoholic Beverage	0	16	0	0	0	0	0	0	44
Wood, Paper Products	0	0	0	0	0	0	0	200	200
Chemicals, Plastics	175	1,500	0	0	0	2	0	0	2,047
Metals	4	18	0	0	0	19	37	61	399
Vehicle[2]	133	31	0	11	1	38	96	1,152	2,298
General Item	44	136	0	11	0	2	12	2,013	5,243
Other	0	0	0	0	0	0	0	8	9
Total	$645	$2,741	$0	$22	$21	$248	$180	$7,270	$22,380

Table 65. CALIFORNIA FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (CFIRS 1975)—Continued

Mobile Property Type	Cause										
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids	Children Playing	Natural
	Percent										
Auto, Taxi, Race Car, Ambulance	9%	11%	1%	5%	1%	0.1%	0.5%	0.2%	45%	0.4%	0.2%
Bus, Trolley	8	17	1	4	1	0.2	0.3	0.1	46	0.2	0.2
Terrain Vehicles[1]	8	6	0.6	0.4	0.6	0	0.8	0.6	64	0.2	0
Motor Homes and Trailers[2]	13	11	3	3	6	3	3	5	17	2	0
Mobile Home (non-residential use)	13	9	4	7	8	0.5	1	1	4	2	0.3
Other Passenger Transport	12	8	1	2	0.6	0.3	0.6	0.6	40	1	0
Trucks over one ton	9	11	2	6	3	0.2	0.4	0.4	32	0.4	0.7
Trucks under one ton	11	10	2	9	3	0.3	0.6	0.5	36	0.4	0.4
Tank Truck	11	11	2	6	4	0	0.4	1	30	0	1
Trash Truck	9	4	6	7	2	0	1	0	19	0.5	2
Other Freight Transport	3	13	3	5	0.7	0	2	0.3	22	0.1	0.4
All Rail Transport	12	8	11	2	5	0.6	0	1	7	0	0.6
All Water Transport	17	13	3	3	9	3	2	2	22	0	0.6
All Air Transport	2	7	0	0	0	0	5	0	53	0	2
Tractors	3	14	4	0.6	3	0.3	0.9	0.3	26	0	0.3
Other Heavy Equipment	9	8	0.6	2	2	0.6	1	0	32	0.6	0
Special and Other Vehicles	6	6	3	1	3	1	3	2	45	2	0
Total Percent of Mobile Property Fires	9%	11%	2%	5%	2%	0.2%	0.6%	0.3%	41%	0.4%	0.3%
Total Number Mobile Fires[3]	2,725	3,183	516	1,478	512	46	173	102	12,237	117	80
Total Number Mobile Deaths	3	4	1	0	2	1	0	0	73	2	5
Total Number Mobile Injuries	12	33	20	6	17	13	1	13	242	1	9
Total Mobile Dollar Loss in Thousands	$2,007	$1,191	$393	$427	$386	$49	$1,366	$96	$4,628	$22	$184

[1] Includes motorcycles, golf carts, snowmobiles, and dune buggies.

[2] Includes pickup trucks, mounted campers, bookmobiles, and both travel and camping trailers.

[3] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 90 percent for California.

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 65 cont'd. CALIFORNIA FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (CFIRS 1975)

Mobile Property Type	Cause										
	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total	Total Fires	Total Deaths	Total Injuries	Dollar Loss (Thousands)
	Percent							Number Reported			
Auto, Taxi, Race Car, Ambulance	0.1%	0.8%	0.1%	3%	8%	14%	99%	21,391	36	242	$6,818
Bus, Trolley	0.4	0.5	0.3	5	6	9	99	1,024	1	4	235
Terrain Vehicles[1]	0.2	1	0.2	1	4	11	99	479	12	21	134
Motor Homes and Trailers[2]	4	3	0	4	10	12	99	298	1	22	569
Mobile Home (non-residential use)	0.5	1	0	23	18	9	101	388	0	4	1,547
Other Passenger Transport	0.3	0.6	0.3	2	8	22	99	363	0	5	100
Trucks over one ton	0.1	1	0.2	7	14	13	100	1,600	4	34	1,105
Trucks under one ton	0.1	1	0.1	4	11	11	100	1,469	12	60	645
Tank Truck	0	1	0	6	15	13	101	250	3	11	210
Trash Truck	0	0	0.5	5	24	22	102	200	0	0	65
Other Freight Transport	0.2	1	0.3	4	7	39	101	1,142	0	11	624
All Rail Transport	0.6	0.6	0	21	14	16	99	177	0	7	212
All Water Transport	0	0	0.6	1	6	18	100	180	1	10	356
All Air Transport	2	4	0	5	5	15	100	55	26	9	873
Tractors	0	3	0	18	20	7	100	317	2	6	822
Other Heavy Equipment	0	7	0	15	12	11	101	168	0	4	188
Special and Other Vehicles	0	5	0	9	3	9	98	87	0	5	26
Total Percent of Mobile Property Fires	0.2%	0.9%	0.1%	4%	9%	14%	101%	—	—	—	—
Total Number Mobile Fires[3]	57	279	44	1,145	2,608	4,286	—	29,588	—	—	—
Total Number Mobile Deaths	0	2	0	2	0	3	—	—	98	—	—
Total Number Mobile Injuries	6	17	0	9	29	27	—	—	—	455	—
Total Mobile Dollar Loss in Thousands	$94	$589	$10	$579	$956	$1,563	—	—	—	—	$14,549

Table 66. OHIO FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (NFIRS 1976)—Continued

Mobile Property Type	Cause										
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids	Children Playing	Natural
	Percent of Fires										
Auto, Taxi, Race Car, Ambulance	13%	2%	2%	7%	1%	0.1%	0.2%	0.1%	42%	0.4%	0.3%
Bus, Trolley	13	1	0	4	1	0	1	0	21	1	1
Terrain Vehicles[1]	7	0.9	0.9	4	2	0	0	0.4	69	0.4	0
Motor Homes and Trailers[2]	16	9	3	6	4	3	2	7	20	1	0.7
Mobile Home (non-residential use)	27	0	5	9	5	5	0	23	9	0	0
Other Passenger Transport	10	0	5	5	0	10	0	0	43	5	0
Trucks over one ton	8	5	4	8	3	0	0	2	32	0.5	0.7
Trucks under one ton	12	3	3	9	1	0.2	0.2	0.5	42	0.5	0.2
Tank Truck	3	8	3	0	3	0	0	5	30	0	0
Trash Truck	3	1	5	10	1	0	0	0	36	0	5
Other Freight Transport	11	5	2	5	4	0.3	0.7	3	13	2	0.7
All Rail Transport	23	2	12	6	0.8	0.8	2	5	8	5	4
All Water Transport	13	10	3	10	6	0	6	0	13	10	3
All Air Transport	0	0	0	0	0	0	0	0	57	0	0
Tractors	2	2	2	1	1	0.6	0.6	0	40	0	2
Other Heavy Equipment	9	3	9	1	3	0	2	2	39	0	0
Special and Other Vehicles	4	0.7	4	0.7	0	3	0	0	69	1	0
Total Percent of Mobile Property Fires	13%	2%	3%	7%	1%	0.2%	0.2%	0.4%	41%	0.6%	0.4%
Total Number Mobile Fires[3]	1,724	327	357	935	162	25	33	55	5,501	77	53
Total Number Mobile Deaths	2	0	0	0	1	0	0	0	40	0	1
Total Number Mobile Injuries	11	8	7	10	8	2	1	2	162	1	4
Total Mobile Dollar Loss in Thousands	$2,137	$288	$114	$266	$157	$21	$122	$109	$3,870	$34	$35

[1] Includes motorcycles, golf carts, snowmobiles, and dune buggies.

[2] Includes pickup trucks, mounted campers, bookmobiles, and both travel and camping trailers.

[3] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is roughly 50 percent for Ohio (Reference 11).

NOTE: Some totals may not equal 100 percent or the sum of their elements due to round-off error. Percentages less than one were rounded to the nearest tenth of a percent.

Table 66 cont'd. OHIO FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (NFIRS 1976)

Mobile Property Type	Cause										
	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total	Total Fires	Total Deaths	Total Injuries	Dollar Loss (Thousands)
	Percent of Fires							Number Reported			
Auto, Taxi, Race Car, Ambulance	0%	0.2%	0.2%	0.6%	18%	11%	98%	10,938	32	187	$5,218
Bus, Trolley	0	0	0	0	45	10	98	71	0	1	180
Terrain Vehicles[1]	0.4	0.9	0.9	0.4	7	7	101	231	1	32	85
Motor Homes and Trailers[2]	7	0.7	0.7	0.7	10	9	100	138	0	4	261
Mobile Home (non-residential use)	0	0	5	0	9	5	102	22	0	2	46
Other Passenger Transport	0	0	0	0	10	14	102	21	0	1	25
Trucks over one ton	0.2	0.7	0	3	20	13	100	424	4	21	555
Trucks under one ton	0	0.5	0.2	0.5	15	12	100	609	2	23	358
Tank Truck	0	3	0	11	30	5	101	37	0	6	102
Trash Truck	0	0	0	2	19	17	99	88	0	0	137
Other Freight Transport	0	0.3	0	6	35	11	99	294	3	11	661
All Rail Transport	0.8	0	0	5	14	12	100	128	4	3	1,588
All Water Transport	3	6	0	0	6	10	99	31	1	8	70
All Air Transport	0	0	0	0	29	14	100	7	3	0	42
Tractors	0	0.6	0.6	2	29	16	99	176	0	6	427
Other Heavy Equipment	0	0	1	7	12	11	99	91	0	4	323
Special and Other Vehicles	0	0	0	2	5	9	98	143	0	3	46
Total Percent of Mobile Property Fires	0.1%	0.3%	0.2%	1%	18%	11%	99%	—	—	—	—
Total Number Mobile Fires[3]	16	41	26	128	2,466	1,523	—	13,449	—	—	—
Total Number Mobile Deaths	0	0	0	0	6	0	—	—	50	—	—
Total Number Mobile Injuries	0	6	0	2	30	58	—	—	—	312	—
Total Mobile Dollar Loss in Thousands	$47	$52	$24	$71	$1,271	$1,556	—	—	—	—	$10,183

PART III

Appendices

Appendix I

Fire-Related Activities of the Federal Government

This appendix describes the fire prevention activities of those Federal agencies most actively involved with the fire problem. First, the activities of the Department of Commerce are discussed; then, those of selected other agencies are identified and briefly described. This appendix is not meant to include all fire-related activities of the Federal Government, but rather is meant to illustrate various ongoing fire-related programs.

U.S. DEPARTMENT OF COMMERCE

Two components of the Department of Commerce have a major role in fire safety. They are the National Fire Prevention and Control Administration and the Center for Fire Research in the National Bureau of Standards. Other parts of the Department of Commerce also have specialized fire-related programs. The Maritime Administration is concerned with fire protection of ships and ports. The Economic Development Administration has special concern with the effects of arson on cities.

National Fire Prevention and Control Administration

The National Fire Prevention and Control Administration (NFPCA) was established by Public Law 93-498, the Federal Fire Prevention and Control Act of 1974. That Act followed from a study of the U.S. fire problem by the National Commission on Fire Prevention and Control.[60] The Commission reported that fire caused an unconscionable loss in lives and property and set a goal of reducing fire losses by 50 percent in the next generation.

[60] *America Burning: Report of the National Commission on Fire Prevention and Control*, Richard E. Bland, Chairman (Washington, DC: Government Printing Office, 1973).

NFPCA was set up to assist, supplement, expand, and improve the Nation's fire prevention and control efforts. The Fire Administration has no regulatory or enforcement responsibilities. Most of NFPCA's programs fall under its four major operating areas.

Public Education Office. The PEO is determining the most effective public education programs to improve fire safety and reduce losses. Effectiveness is established by research and identification of success cases. The most effective public education programs are propagated at the State and local levels with assistance from the PEO.

National Academy for Fire Prevention and Control. The National Fire Academy is developing courses to advance professional development in the fire service and fire safety understanding by others engaged in fire protection, such as architects. The Academy emphasizes "training the trainers" who will then return home to train local fire personnel in fire service management, master planning for fire safety, fire investigation, and other areas. The Academy also assists State and local training programs, as well as those colleges and universities offering fire service training.

National Fire Data Center. The Data Center collects, analyzes, and publishes information on the occurrence of fires, deaths, injuries, and losses. The Data Center also provides assistance to State and local governments in setting up their own data systems to be compatible with the National Fire Incident Reporting System. Twenty-two States are now at varying stages of participation in NFIRS, and it is planned to expand the program to include most of the fifty States in the next several years. A reference service is available to answer queries from the fire community and to compile bibliographic materials and abstracts.

National Fire Safety and Research Office. The NFSRO coordinates the application of current technology to the fire problem. Some current projects include improving protective equipment for firefighters, evaluating the effectiveness of smoke detectors in residences, and developing master plans for community fire safety.

Center for Fire Research

The Center performs and supports research in all aspects of fire, with the aim of providing scientific and technical knowledge applicable to the prevention and control of fires. This includes efforts in areas such as (1) the fundamental process underlying fires, including physics and chemistry of combustion processes and products, early stages of fires, structural influences in fire behavior, fire-safe design concepts for buildings, and specific fire hazards; (2) biological, physiological, and psychological factors affecting human victims of fire, the performance of individual members of fire services, and the psychological factors leading to arson; and (3) operational tests, demonstration projects, and fire investigations in support of such activities. It also coordinates all activities carried out by the National Bureau of Standards on behalf of the National Fire Prevention and Control Administration.

OTHER FEDERAL AGENCIES INVOLVED IN FIRE SAFETY

Many other agencies of the Federal Government are engaged in fire safety activities related to their sphere of responsibility. They include the Consumer Product Safety Commission; the Department of Housing and Urban Development (e.g. residential building standards); the Department of Health, Education and Welfare (e.g. the National Center for Health Statistics and the Emergency Medical Service Program); the Department of Transportation (e.g. vehicle fires); the Department of Agriculture (e.g. U.S. Forest Service for wildfires and the Rural Development Service for rural fires); and the Department of Justice (e.g. the Law Enforcement Assistance Administration for arson fires).

Tables I-1 thru I-3 give an indication of some additional involvement of the Federal Government with the fire problem. A more complete and detailed listing of Federal agencies involved in fire safety will be found in the publication, *Federal Fire Strategies: An Intergovernmental Analysis of NFPCA Program Directions.*[61]

OTHER FEDERAL AGENCIES WITH FIRE SAFETY PROGRAMS

U.S. Department of Agriculture

Cooperative State Research Service—Research on protection of forest land resources against fire. Research on the role of fire in normal usage of farmland. Technical assistance and cost-sharing funds for preventing and suppressing wildfires on State and private lands.

Forest Service Cooperative Fire Protection—Research on all aspects of forest fire protection and control.

Farmer's Home Administration—Provides insured loans to rural communities for essential community improvements, including fire stations, apparatus, and equipment.

Rural Development Service—Provides loans to benefit local communities, including fire protection.

U.S. Department of Health, Education and Welfare

Center for Disease Control, Public Health Service—Provides grants for research about hazards in the work environment harmful to the health and safety of workers including fire-related dangers and injuries. Provides grants for training professional personnel in occupational safety and health, including study of potential fire hazards and injuries.

Health Services Administration, Public Health Service—Provides grants for planning and development of comprehensive emergency medical services.

U.S. Department of Housing and Urban Development

Community Planning and Development—Provides grants to develop viable urban communities, including funds for construction or improvement of fire protection services and facilities.

Federal Disaster Assistance Administration—Provides grants for post-disaster repair, restoration, relief, and recovery.

Federal Insurance Administration—Provides reinsurance to private insurers participating in Fair Plans.

U.S. Department of Interior

Bureau of Land Management—Provides for the protection of 450 million acres of natural lands and

[61] *Federal Fire Strategies: An Intergovernmental Analysis of NFPCA Program Directions,* B. Michael Kahl, Project Director (Yorba Linda, CA: Kahl Associates, Inc. Research Consultant for the National Fire Prevention and Control Administration, June 1977).

their resources and operates the Boise Interagency Fire Center.

U.S. Department of Labor

Occupational Safety and Health Administration—Provides grants to assure safe working conditions, including fire-related hazards.

Manpower Administration—Provides grants to assist in employment and training of public service employees, including the fire service.

U.S. Department of Transportation

National Highway Traffic Safety Administration—Provides grants and other financial assistance for the purchase of ambulances, rescue trucks, approved equipment, and training for personnel. Administers programs relating to vehicle fires.

Federal Railroad Administration—Provides grants for promotion of safety in railroad operations, including transportation of hazardous materials.

Federal Aviation Administration—Development of adequate public airports, including firefighting and crash rescue equipment. Development of standards for fire-safe and crash-worthy construction and operation of aircraft.

Office of Pipeline Safety—Provides grants to develop and maintain pipeline safety programs. Collects data on pipeline accidents.

National Transportation Safety Board—Investigation of transportation accidents, recommendations for improving transportation safety.

U.S. Department of Treasury

Office of Revenue Sharing—Provides Federal financial aid, which may be allocated to fire protection, to states, countries, cities, and townships.

Small Business Administration—Provides loans and guaranteed/insured loans to assist small businesses likely to suffer substantial loss and injury through compliance with OSHA standards.

Appendix II

Annual Investment in Fire Safety

The magnitude of the annual investment in fire safety is not currently known with any degree of certainty. Table II-1 provides a rough indication of the general magnitude of annual investments in fire safety. Although we do not place high confidence in the total investment cost plus loss estimate as an absolute number, we are confident that the $13.6 billion figure represents a lower bound and that the true figure, if it were known, probably is considerably higher.

Table II-1. ROUGH APPROXIMATION OF ANNUAL INVESTMENT IN FIRE SAFETY

Federal fire-related expenditures, including grants and loans	$ 260,000,000+?
Insurance premiums for fire coverage	4,500,000,000+?
Individual expenses for fire protection equipment	350,000,000+?
Public fire protection	4,200,000,000
Private fire protection organizations	100,000,000
Total investment cost	$ 9,400,000,000+?
Estimated fire losses	4,200,000,000+?
TOTAL INVESTMENT COST PLUS LOSS	$13,600,000,000+?

NOTE: Figures represent lower bounds of the actual values. Those with the "+?" are likely to be more uncertain and represent the general magnitude of the value.

Despite the uncertainty concerning the $13.6 billion figure, some components of that figure have a more solid basis than others. These include the figures for estimated fire losses and for expenditures by public fire departments and private fire protection organizations.

Insurance premiums paid directly for fire protection are not published by the insurance industry. However, data on premiums for coverage for multiple risks are available. The proportion of that total figure that was attributable to fire protection was estimated subjectively. Consequently, the $4.5 billion figure should be considered as an indicator of the approximate magnitude and a satisfactory estimate of that cost component.

The figure given for the expenses incurred by individuals for fire protection is the least solidly based. It includes only expenditures for smoke detectors and does not include other cost components. The other missing components (which would include the marginal costs of constructing and maintaining structures in compliance with fire and building codes, for example) most likely are the major portion of this component. The true amount of this cost component and even its order of magnitude is not currently known.

In view of the tentative nature of the above estimates, no attempt was made to treat investment costs in a precise economic manner: for example, to amortize each category of investment according to its expected useful duration.

Appendix III

NFPA 1974 Survey

The analysis of the NFPA 1974 survey data in this section was based upon preliminary tabulations provided by NFPA as part of a 1977 study.[62] The main feature of the NFPCA analysis of the NFPA data is the formation of overall national estimates based upon stratifying the data according to urban and rural population and, more specifically, according to size of community. The nature of the data and how they were edited and analyzed is described below.

CHARACTERISTICS OF THE DATA

For a number of years, NFPA has conducted an annual survey of local fire departments for information on fires and fire losses. In 1974 over 2,000 questionnaires were mailed to a sample of departments. About 50 percent responded. As is the case for most mail surveys, it is not known whether the self-selection of the respondents introduced any significant bias.[63] Some of the original survey data were of questionable validity. To improve the quality of the data used in making the national estimates, NFPA devised an "edit" process to identify and discard inconsistent or otherwise questionable survey responses. Of the approximately 1,000 fire departments responding, the data from about 955 were retained for estimating number of fire incidents, 900 for deaths, 727 for injuries, and 534 for dollar loss. The validity of the results reported here depends in large measure on the degree of success of the data "cleaning" for its new application.

[62] Derry, Louis, Principal Investigator, *Analysis of NFPA Data for National Fire Loss Estimates* (Boston, MA: National Fire Protection Association 1977), Fire Administration Contract No. 7-34753.

[63] This can be tested by a follow-up survey of a sample of non-respondents to the first wave, but obviously costs more and takes more time, and was not done for this report.

DATA SUMMARY

Table III-1 summarizes the fire losses for each of nine groupings of comunities by population. Fire and death rates are shown separately for residential and non-residential occupancies. Injuries and dollar loss were presented in total only. Since not all communities gave the occupancy breakdown, the total of the residential and non-residential rates differs slightly from the total when results from communities are added.

The numbers shown in parentheses indicate the statistical uncertainty (or precision) associated with each quantity in the table. The fact that the precision is lowest for the smallest communities is discussed in more detail later.[64]

Column 2 of the table gives the number of community reports in the sample that, after editing, contained satisfactory data on the total number of fires. The sample number of communities usable for other loss categories was almost always much smaller.

Column 4 shows the percent of the U.S. population (for 1970) contained in each population interval. These values were also the weights assigned to each interval in calculating the national estimates. The percentages shown are rough estimates. The Census figures are not exactly applicable since the geographic area covered by a fire department does not always coincide with the political boundaries of "places" used by the Census Bureau. For communities above 10,000 population, the differences are probably not significant. (Exceptions are fire departments which serve counties rather than cities.) The Census Bureau does not provide population size esti-

[64] As a rough check on the NFPA survey data for the largest cities, data from 1976 was collected directly from New York City, Los Angeles County, Detroit, and Philadelphia; and was found to compare satisfactorily with the 1974 survey.

Table III-1. FIRE LOSS RATES VERSUS COMMUNITY POPULATION— NFPA 1974 Survey

(1) Population Interval	No. F.D.'s In Sample (for total Fires)	Estimated F.D.'s in U.S.	Estimated % of 1970 Popula-tion	RESIDENTIAL Fires (per 10,000)	RESIDENTIAL Deaths (per million)	NON-RESIDENTIAL Fires (per 10,000)	NON-RESIDENTIAL Deaths (per million)	TOTAL[2] Fires (per 10,000)	TOTAL[2] Deaths (per million)	TOTAL[2] Injuries (per million)	TOTAL[2] Dollar Loss (per person)
METROPOLIS											
Over 1 Million	3	6	9.2%	36.9(±3.3)	36.7(±10.5)	104.6(±10.0)	3.3(± .1)	142.4(±12.0)	40.4(± 5.3)[3]	587(± 8)	——
LARGE CITIES											
500,000 to 1 Million	25	25	6.4%	28.9(± .7)	28.2(± 1.7)	90.7(± 3.3)	3.5(± .3)	117.1(± .0)	33.2(± .0)	554(±63)	$11.60(± .60)
250,000 to 500,000	29	30	5.1%	33.1(± .4)	26.7(± 1.7)	88.0(± 2.2)	3.9(± .5)	124.3(± 1.9)	33.1(± .7)	426(±23)	13.90(±1.10)
MEDIUM CITIES											
100,000 to 250,000	80	95	7.0%	30.0(±1.0)	24.8(± 1.6)	81.5(± 2.8)	2.0(± .4)	113.9(± 2.6)	27.1(± .6)	503(±37)	10.00(± .60)
50,000 to 100,000	176	227	8.2%	26.8(± .6)	17.2(± 1.0)	77.4(± 1.9)	3.0(± .4)	107.3(± 1.9)	21.4(± 1.1)	424(±20)	9.90(± .70)
SMALL CITIES											
25,000 to 50,000	298	476	8.8%	31.3(± .7)	22.0(± .8)	78.1(± 2.0)	6.7(± 1.9)	108.5(± 2.0)	29.5(± 2.1)	413(±17)	10.70(± .80)
10,000 to 25,000	190	1,157	10.5%	32.3(±1.1)	33.3(± 5.0)	72.1(± 2.5)	6.3(± 2.1)	103.1(± 3.0)	37.7(± 5.2)	391(±33)	10.60(±1.30)
SMALL TOWNS											
5,000 to 10,000	83	5,199	18.3%	32.1(±2.5)	27.9(± 8.7)	67.7(± 4.9)	3.7(± 2.3)	98.4(± 5.7)	34.9(± 9.2)	218(±50)	17.50(±3.50)
RURAL											
Under 5,000	71	18,140	26.5%	33.2(±3.7)	29.3(±12.9)	85.1(± 8.8)	10.2(±11.2)	119.0(±11.0)	47.8(±19.6)	202(±59)	17.10(±3.30)
TOTAL	955	23,355	100.0%	32.1	28.0	81.4	5.7	113.6	36.7	352	$14.10

[1] Editing and tabulation of data provided by NFPA; responsibility for synthesis is NFPCA's.
[2] Residential plus non-residential fire and death rates do not sum exactly to "total," because some fire departments did not report both.
[3] Los Angeles County excluded; if included, the rate would be 36.5 per million.
[4] Rough estimate.

NOTE: Numbers in parentheses represent the precision of each estimated rate, for 68% confidence; doubling these numbers gives 95% confidence.

mates for unincorporated urban areas or for most rural areas. As an approximation, since there is apparently no accurate estimate of the total population encompassed by fire departments serving fewer than 5,000 persons, the total percent of rural population (26.5 percent) was assigned to the 0-5,000 population interval. The remaining unaccounted urban population (18.3 percent), mostly unincorporated areas, was assigned to the 5,000-10,000 interval.

The number of fire departments in each interval, shown in column 3, is not used directly in the computations. These numbers do not reflect the fact that many fire departments protect the area of other jurisdictions in addition to their own area. The number of departments in each interval was obtained from NFPCA's mailing list and corresponds reasonably well with Census's count of "places" in each of the population intervals greater than 10,000. The number of departments in each of the last two population intervals represents rough estimates.

ANALYSIS

Plots of total fires, deaths, injuries, and dollar loss versus population of community appear in Figure 3, page 17. Figure III-1 is a plot of fire incident and death rates for residential and non-residential occupancies. The vertical lines show the statistical precision (or confidence interval) associated with each of the plotted values. The patterns exhibited by each of the curves in Figure III-1 differ considerably. The main features are summarized below.

Residential Fire Death Rates

The residential fire death rate pattern of Figure III-1 is roughly U-shaped. The highest residential death rate (37 per million) occurs for the very large cities. The lowest (17 per million) occurs for medium sized cities (population 50,000-100,000). The three smallest population intervals (those below 25,000 population) also have high death rates (28-33 per million). However, the small town/rural estimates have low precision, being based upon a total of only 100, 15, and 6 deaths, respectively, in each interval.

Some insights as to why the residential fire death rate pattern is U-shaped are given by Figure III-2. The pattern in the death rate for all fires closely follows the pattern in the death rate for fires in one and two family dwellings. The trough of both curves occurs in communities of medium population size.

As would be expected, large cities have a higher rate of deaths from apartment fires than the less populous areas do, whereas the smaller and rural areas have a higher rate of death from fires in mobile homes.

The death rate of fires in hotels and motels is relatively constant over all population intervals.

Non-Residential Fire Death Rates

The non-residential death rate of Figure III-1 is much less than the residential fire death rate for each population interval. The pattern is also different. The rates are approximately constant, or increase slightly as population decreases in communities of more than 5,000 population. But for rural communities, the non-residential fire death rate increases considerably. This estimate has extremely low precision, being based only on 2 deaths from a single nursing home fire. Until more extensive rural data become available, one cannot really assert that the observed difference is real rather than being merely a random effect.[65]

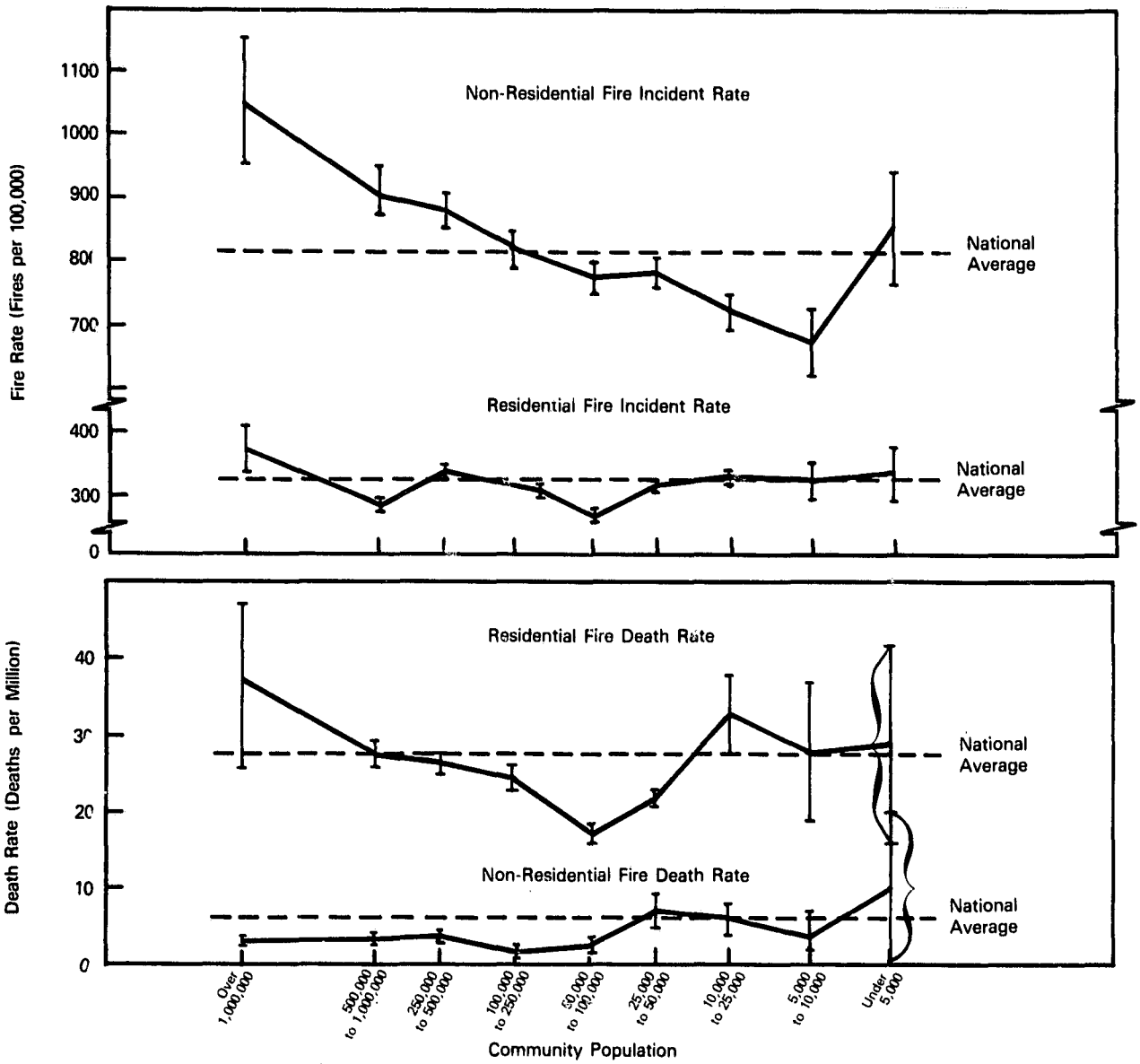
Death Rate for All Fires

The fire death rates (shown in Figure 6, page 22) for residential and non-residential fires combined are similar to the curve for residential alone. The precision of the estimate of the total death rate for each population interval is given in Table III-2. Note that because of the low precision of the rural estimate (±41 percent), the value is not statistically significantly greater than the values given for the two next larger population intervals.

The incident rates for residential fires show only moderate variation. They are highest for the very large cities and lowest for cities between 50,000 and 100,000 population. Below 50,000 the rate is approximately constant. This behavior is quite different from that found in the NFIRS data for Ohio communities (Figure 20, page 107), which show a sharp fall-off for communities below

[65] Statistically, the observed rural death rate is not significantly larger, since the confidence limits overlap so much with those from the preceding population interval.

Figure III-1. FIRE AND DEATH RATES vs. COMMUNITY POPULATION — 1974 NFPA Survey



	Metro-polis	Large Cities			Medium Cities	Small Cities		Small Towns	Rural
Population Range	Over 1 Million	500,000-Million	250,000-500,000	100,000-250,000	50,000-100,000	25,000-50,000	10,000-25,000	5,000-10,000	Under 5,000
Approximate Number of Fire Departments	6	25	30	95	227	476	1,157	5,200	18,140
Approximate Percent of U.S. Population	9.2%	6.4%	5.1%	7%	8.2%	8.8%	10.5%	18.3%	26.5%

[1] Rough estimate.

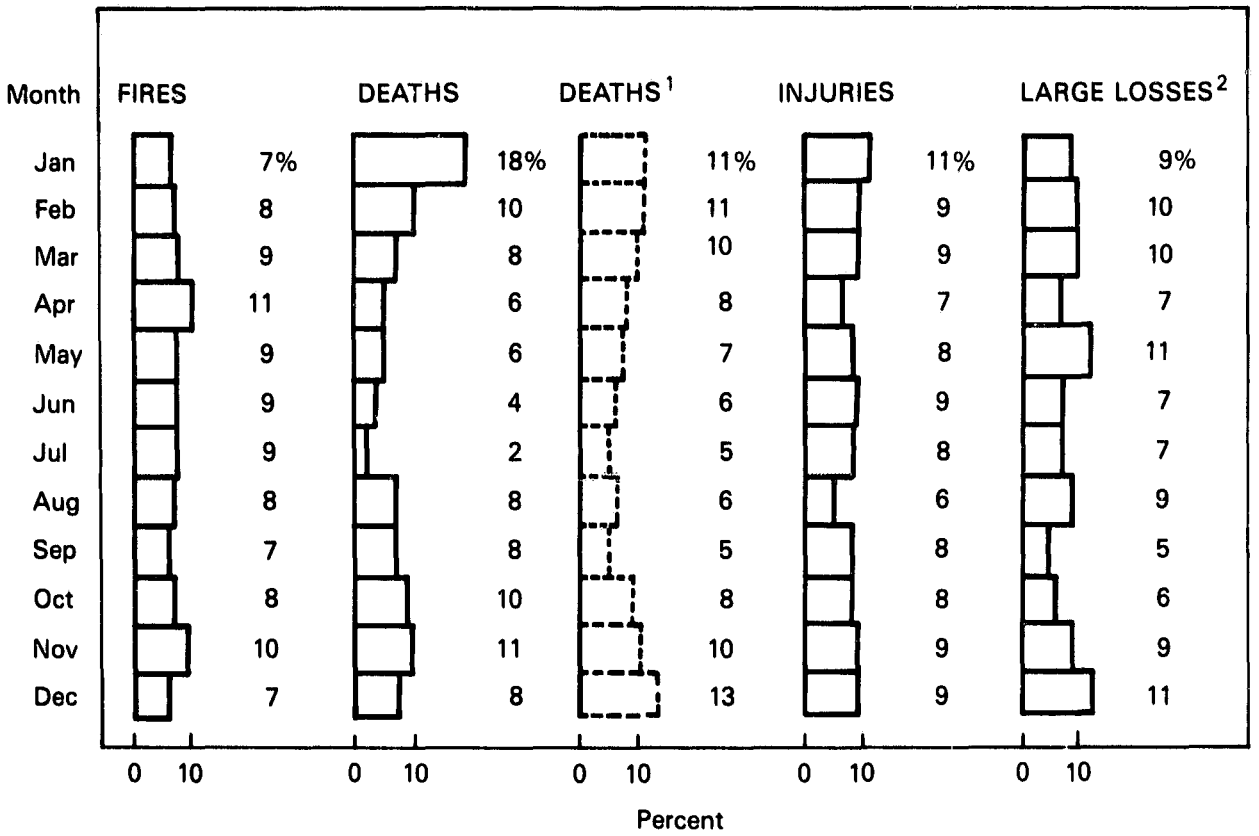
NOTE: Vertical lines denote precision of estimate (the distance from the midpoint to the end of the line is one standard deviation). The National Averages plotted are those developed from the NFPA Survey results.

Table III-2. ESTIMATES OF URBAN/RURAL FIRE LOSS RATES—NFPA 1974 Survey

	RESIDENTIAL		NON-RESIDENTIAL		TOTAL			
	Fires (per 10,000)	Deaths (per million)	Fires (per 10,000)	Deaths (per million)	Fires (per 10,000)	Deaths (per million)	Injuries (per million)	Dollar Loss[2] (per capita)
URBAN (Cities > 10,000)	31.5 (± .6)	27.4 (± 2.0)	84.1 (±1.9)	4.3 (± .5)	116.1 (± 2.2)	32.0 (± 1.4)	469 (±12)	$10.90 (± .40)
URBAN (Cities > 5,000)	31.7 (± .8)	27.5 (± 2.7)	80.0 (±1.9)	4.1 (± .7)	111.7 (± 2.2)	32.7 (± 2.5)	406 (±15)	$12.80 (±1.00)
RURAL (Communities < 5,000)	33.2 (±3.7)	29.3 (±12.9)	85.1 (±8.8)	10.3 (±11.2)	119.0 (±11.0)	47.8 (±19.6)	202 (±59)	$17.10 (±3.30)
All Communities	32.1 (±1.1)	28.0 (± 4.0)	81.4 (±2.7)	5.7 (± 3.0)	113.6 (± 3.3)	36.7 (± 3.5)	352 (±19)	$14.10 (±1.20)
	RELATIVE PRECISION[1] (%)							
URBAN (Cities > 10,000)	2.0%	7.3%	2.3%	11.6%	1.9%	4.4%	2.6%	3.7%
URBAN (Cities > 5,000)	2.5%	9.8%	2.4%	17.1%	2.0%	7.6%	3.7%	8.1%
RURAL (Communities < 5,000)	11.0%	44.0%	10.3%	100.0%	9.2%	41.0%	29.2%	19.3%
All Communities	3.5%	14.1%	3.3%	52.5%	2.9%	9.4%	5.5%	8.6%

[1] Limits shown in parentheses are for 68% confidence; doubling the limits gives 95% confidence.
[2] No satisfactory data from cities greater than one million population was available.
NOTE: Numbers in parentheses represent the precision of each estimated rate for 68% confidence; doubling these numbers gives 95% confidence.

Figure 19. FIRES BY MONTH OF YEAR, ALL OCCUPANCY TYPES — Ohio (NFIRS 1976)



[1]Nationwide fatality data from the National Center for Health Statistics in dotted lines show a similar pattern, though not as extreme. Based on 1974 fire and burn deaths as reported in *Accident Facts, 1976,* National Safety Council, p. 15.
[2]Losses of $1,000 or more.

SOURCE: Ohio 1976 NFIRS data, except as noted.

200,000 population. Ohio's rate for its largest cities (200,000-700,000 population) was 28 per 10,000 persons, only slightly less than the values in Figure III-1. But for communities below 200,000 population, the Ohio rates (11-15) are only one-third to one-half of the survey values. The most likely explanation is that the Ohio NFIRS reporting from small communities was more incomplete than that from larger communities in this first year of NFIRS. We will explore this inconsistency further.

Non-Residential Fire Incident Rate

The incident rates of non-residential fires are extremely high for very large cities and sharply decrease with population size at approximately a constant rate, except for the rural population category where the rate (which again is imprecisely estimated) increases sharply. The reasons for this behavior of the urban and rural communities will also be explored in the future.

Total Fire Incident Rate

Because residential fires constitute a relatively small proportion of total fires, the total fire incident rate (Figure 20, page 107) is similar to the curve for non-residential fires alone.

Total Injury and Loss Rates

As noted previously, the NFPA 1974 survey data on injuries were not broken down by occupancy.

The data are probably not too reliable because of widely differing practices among communities. The reasons for the observed patterns for total injury rate and total dollar loss rate (Figure 4 of Part I) are not known. Future analysis of the dollar loss broken down by occupancy could give insight to this aspect of the problem.

EXTRAPOLATION TO NATIONAL ESTIMATES

Assuming that the data in Table III-1 represent a random sample stratified according to population size, the overall national estimates (or stratified means) are simply the weighted average of the rates for each population interval. The weights correspond to the percent of total U.S. population shown in Table III-1. The precision of the estimates is readily computed using formulas in the theory of random stratified sampling.[66] Because of the large uncertainties associated with the rural data, separate urban and rural estimates have been developed. The urban estimate has also been computed with small towns omitted, that is with cities greater than 10,000 in population.

The results of the statistical calculations are summarized in Table III-2. The lower portion of the table shows the relative precision (in percent) of each estimate. A brief summary of the principal estimates based on the NFPA survey data is given below.

[66] The overall precision equals the square root of the sum of weighted squares of the individual precisions for each interval (shown in parentheses in Table III-1). A 68 percent confidence level is associated with the resulting value. For 95 percent confidence the precision value should be doubled.

Fires

The estimate of the U.S. total fire rate based on the survey is 113.6 ±3.3 per 10,000 persons. The urban rate is 111.7 ±2.2, the rural rate 119.0 ±11.0. Residential fires account for 28 percent of all fires, both urban and rural.

Deaths

The estimate of the U.S. total fire death rate based on the survey is 36.7 ±3.5 per million persons. The urban rate is 32.7 ±2.5, the rural rate 47.8 ±19.6. Urban residential deaths account for 87 percent of total urban fire deaths; rural residential deaths account for 74 percent of total rural fire deaths.

Injuries

The estimate of the U.S. total fire injury rate based on the survey is 352 ±19 per million. The urban rate is 406 ±15, the rural rate 202 ±59.

Dollar Loss

The estimate of the U.S. total dollar loss from fire per capita based on the survey is $14.10 ±1.20. The urban rate is $12.80 ±1.00, the rural rate $17.10 ±3.30.

It is apparent from Table III-2 that a larger rural survey sample would greatly improve the overall precision of the national estimate. Special problems could be anticipated in such a survey, since almost all rural departments are manned by volunteers not likely to be intimately familiar with 901 codes, partly because the vast majority of such departments experience no deaths and relatively few fires and injuries each year and therefore are not experienced in filling out forms.

Appendix IV

State Fire Marshal Data

The analysis of the State Fire Marshal data in this section assesses its suitability for developing estimates of the national fire loss. This appendix discusses the data limitations, provides a summary of this information, extrapolates from it to produce national estimates, and compares the death rates derived from State Fire Marshal data with those derived from NCHS death certificate data.[67]

As a result of this assessment, it was concluded that the uncertainty regarding the completeness of reporting is sufficiently large that this data source cannot be used by itself in making national estimates of the fire incident rate. This data source must also be supplemented for estimates of other aspects of the fire problem because of differences in the basic definitions and techniques used.

DATA LIMITATIONS

Fire losses contained in State Fire Marshal reports from 34 States plus the District of Columbia are analyzed below. The remaining 16 States either issued no reports or copies were not available.

Data collection systems for the States differ considerably. Some are quite sophisticated and are organized on a statewide basis (e.g. an NFIRS-type system). Most States simply compile the data reported by local fire departments, which are free to adopt whatever system they wish. Both the criteria for reporting a fire and the definitions of different classes of fires differ among States, and sometimes among communities within the same State. A few States report only those fires having detailed investigations or only those fires exceeding a certain dollar loss or involving an injury or death. Also, many States do not summarize fires according to residential or non-residential occupancy categories.

Almost all States have some degree of under-reporting of incidents by local departments to the State, even when reporting by local fire departments is mandatory and when there is a payment made for each report received. This under-reporting is believed to be substantial in regard to total number of fires, but much less so for deaths.

Reporting of injuries and property loss is also not consistent among States. Minor injuries, which comprise a substantial proportion of the total, often are unreported. Likewise, the quality of dollar estimates of property loss depends strongly on the knowledge and experience of the estimator. In addition, local conventions differ in regard to what costing criteria to use—replacement, market, or book value.

As was the case for local communities, even after allowing for reporting differences, there is still considerable variation in fire and death rates among the States. This variation probably reflects, in part, the differences in climatic and socio-economic conditions among the States and, in part, differences in fire safety performance. The rationale for treating population size as a stratifying variable is not as relevant as it was for local communities. However, the smaller the State the larger will be the random fluctuation in fire losses from year to year.

DATA SUMMARY

The State Fire Marshal data on fire incident and death rates are summarized in Table IV-1; injuries and dollar loss in Table IV-2. The data for about one-third of the States are for 1976 and

[67] After the analysis of the State Fire Marshal data had been completed, tapes of NCHS death data for 1974 and 1975 became available. A summary of the NCHS data and comparison with the State data is given on page . Preliminary tabulations of these NCHS data indicate that several States, primarily those with low death rates, may have underestimated their fire deaths.

Table IV-1. SUMMARY OF STATE FIRE AND DEATH RATES —State Fire Marshal Reports[1]

State (According to Increasing Total Death Rate)	Year	Residential		Non-Residential		Total	
		Fires (per 10,000)	Deaths (per million)	Fires (per 10,000)	Deaths (per million)	Fires (per 10,000)	Deaths (per million)
Arizona	74						7.9
Nevada	75	38.0(+4.1)		346.0(+145)		384.0(+149)	11.8(−16.1)
Missouri	75	10.1(−0.4)	9.4(+ 0.2)*	8.7(− 0.8)	3.0(−2.3)	18.8(−1.2)	12.4(− 2.5)
Idaho	76	13.2		39.2		52.4	14.6
Florida	75	12.2		36.1		48.3(+ 4.2)	14.8(+ 6.0)
Connecticut	75	15.8(+9.1)	7.5	55.3(+40.0)	7.7	71.1(+49.1)	15.2(− 4.2)
California	75	21.9(−4.9)	12.7(+ 1.5)	80.1(+ 3.5)	7.2(+1.7)	102.0(− 1.4)	19.9(+ 3.2)
Vermont	75					12.0	21.2(− 8.7)*
Minnesota	75	7.4	19.9	9.6	2.0	17.0(+ 2.6)	21.9(− 2.2)
Utah	75	13.6(−0.5)	12.4(+ 3.9)*	65.3(−10.7)	10.0(+4.9)	78.9(−11.2)	22.4(+ 8.8)
North Dakota	75	5.8(+0.7)		8.7(+ 1.0)		14.5(+ 1.7)	29.9(− 4.7)
Ohio	76	15.6(−1.0)	18.3	47.4(+24.1)	7.0	63.0(+23.1)	24.8(+ 1.0)
South Dakota	76	13.2(+1.6)		49.7(− 6.0)		62.9(− 4.4)	26.4
Montana	76	13.7(+0.8)	20.0(−17.4)	35.3(+ 8.0)	6.7(−6.7)	49.0(+ 8.8)	26.7(−24.1)
Delaware	76	28.4(−5.8)		88.5(+ 2.7)		116.9(− 3.1)	27.4(− 5.4)*
New Mexico	76	29.1(+2.3)	13.9(− 9.6)	118.9(+33.7)	15.9(+5.1)	148.0(+36.0)	27.8(− 4.5)*
Kansas	76	9.2(+2.2)		9.4(+ 3.1)		18.6(+ 5.3)	29.6(+15.1)
Pennsylvania	75						30.2(− 2.1)*
Iowa	76	7.2(+0.3)	21.3(+1.1)*	8.8(+ 1.6)	9.4(−2.5)*	16.0(+ 1.6)	32.1(+ 3.4)*
Kentucky	75	11.9	30.0	3.2	1.5	15.1	31.8
Nebraska	75	8.4(+0.1)		11.4(− 0.4)		19.8(− 0.3)	31.7(+ 7.7)
Virginia	75		30.4(+ 0.1)*		2.4(+0.3)*		32.8(+ 0.4)*
West Virginia	76	8.0(+0.2)		7.1(+ 2.4)		15.1(+ 2.6)	34.4(+ 2.8)*
Michigan	75	18.8(−9.0)	22.6(−10.7)	63.1(−23.2)	12.1(+8.8)	81.9(−32.2)	34.7(− 1.9)*
Illinois[2]	75	18.9(−2.6)		22.1(+ 1.5)		41.0(− 4.1)	36.8(+ 1.0)*
Oregon	75	27.4(+0.9)	30.6(+ 0.9)*	55.3(−10.5)	6.6(−0.9)*	82.7(− 9.6)	37.2(− 0.1)*
Oklahoma	75	30.7(−3.8)		89.3(−30.2)		120.0(−34.0)	39.8(+ 4.0)
Washington, DC	76	21.2		155.2		176.4(+15.0)	40.5
North Carolina	75		28.3		13.1		41.1
Louisiana	75	16.7(+0.3)		10.2(+ 1.0)		26.9((+ 1.3)	42.2(− 0.9)*
Maryland	75						43.4(+ 8.4)
Wyoming	74	21.9		106.1		128.0	49.7
South Carolina	75					95.8(+20.2)	53.9(+20.8)
Alabama	76						55.3(+15.7)
Alaska	75	24.0(+2.5)		32.6(+ 7.8)		56.6(+10.3)	88.1(−48.3)

[1] Numbers in parentheses show increase or decrease from previous year. * denotes that the change is not statistically significant at the 68 percent confidence level.
[2] Illinois deaths include Chicago; Illinois fires exclude Chicago.

NOTE: Circled death rates denote those values that are significantly lower than the NCHS rates for the year given (1974 or 1975 only, see Table IV-4).

Table IV-2. SUMMARY OF STATE INJURY AND DOLLAR LOSS RATES —State Fire Marshal Reports[1]

State (According to Increasing Total Death Rate)	Year	Residential		Non-Residential		Total	
		Injuries (per million)	Dollar Loss (per capita)	Injuries (per million)	Dollar Loss (per capita)	Injuries (per million)	Dollar Loss (per capita)
Arizona[2]							
Nevada	75					495.0(+81.0)	$20.90(+ 5.0)
Missouri	75	50.0(−13.3)	$ 4.90(+0.9)	34.8(+2.1)	$ 4.10(−1.5)	84.8(−11.2)	9.00(− 0.6)
Idaho	76		4.50		20.70	109.0	25.20
Florida	75					209.0(+66.0)	
Connecticut	75		7.40(+4.9)		10.40(+7.3)	302.0	17.80(+12.2)
California	75	130.0	4.50(+0.3)	103.0	5.40(−0.6)	233.0	9.90(− 0.3)
Vermont	75						18.80(+ 7.5)
Minnesota	75	62.2	5.60	43.8	8.00	106.0	13.60(− 0.8)
Utah	75		4.20(+1.6)		4.50(−6.4)		8.70(− 4.8)
North Dakota	75		2.80(+0.5)		9.50(+2.9)		12.30(+ 3.4)
Ohio	76	218.0	5.70(+1.0)	154.0	7.70(+2.3)	372.0(+173.0)	13.40(+ 3.3)
South Dakota	76		4.40(+1.5)		17.00(+5.4)		21.40(+ 6.9)
Montana	76	100.0		97.0		197.0	20.00(0)
Delaware	76						2.00(− 1.0)
New Mexico	76						9.00(+ 1.9)
Kansas	76		4.30(+1.3)		4.40(+1.8)		8.70(+ 3.1)
Pennsylvania[2]							
Iowa	76		5.00(+1.4)		7.40(+0.9)		12.40(+ 0.5)
Kentucky	75		6.00		4.50		10.50
Nebraska	75		4.10(+0.3)		8.20(+1.7)	180.0(−19.0)	12.30(+ 2.0)
Virginia[2]							
West Virginia	76		6.20(+0.3)		8.40(−1.6)		14.60(− 1.3)
Michigan	75	158.0		121.0		279.0	15.90(0)
Illinois[3]	75		11.40(+0.6)		17.00(−8.1)		28.40(− 7.5)
Oregon	75		5.00(−0.2)		15.50(+3.1)	475.0(−21.0)	20.50(+ 2.9)
Oklahoma	75		5.60(−1.2)		7.70(−2.2)		13.30(− 3.4)
Washington, DC	76		2.50		8.10	1060.0	10.60
North Carolina	75						5.70
Louisiana	75		7.10(−.01)		5.90(−2.4)		13.00(− 2.5)
Maryland[2]							
Wyoming	74		4.40		6.20	127.0	10.60
South Carolina	75					329.0(+86.0)	9.90(+ 5.2)
Alabama[2]							
Alaska	75		$17.10(−0.3)		$62.40(−4.9)	290.0	$79.50(− 5.2)

[1] Numbers in parentheses show increase or decrease from previous year.
[2] These States did not report injuries or dollar losses. They are included here to preserve the relative ranking by death rate.
[3] Illinois data excludes Chicago.

about two-thirds for 1975; Arizona and Wyoming are for 1974. The States are listed according to increasing total death rate. The numbers in parentheses represent the change from the previous year, with an asterisk denoting when the change is not statistically significant; that is, it is probably due to chance.

The frequency distributions for fire incident and death rates are plotted in Figures IV-1 and IV-2. For fire incident rates, almost one-third of the States are seen to have exceptionally low values. Of these, Missouri and Iowa reporting is apparently quite complete; Vermont and North Dakota report only fires with loss exceeding $200 and $25, respectively; and in Kansas 25 of 103 counties do not report. The situation in Minnesota, Kentucky, Nebraska, and West Virginia has not been determined. The remaining portion of the frequency distribution (except for Nevada) shows statistical regularity; however, the fire rates are on the average only about two-thirds of the rates in the NFPA survey.

In Figure IV-1 we have sketched, using subjective judgment based on the NFPA survey estimates in the previous section as a guide, the frequency distribution one might expect to find if there had been 100 percent reporting of all fires by all States. It seems clear that the uncertainty regarding completeness of reporting is so great that the State fire incident rate data are not suitable for making national estimates at present.

The frequency distribution for fire death rates in Figure IV-2 is much more regular. Fewer States have low death rates, indicating that underreporting of deaths probably is less of a problem than for fires.

Data on fire injuries were available only for 16 States. On the average one would expect injuries to correlate with deaths, with injuries being roughly 10-15 times greater. However, the rank-

Figure IV-1. FREQUENCY DISTRIBUTION OF STATE FIRE INCIDENT RATES — State Fire Marshal Reports

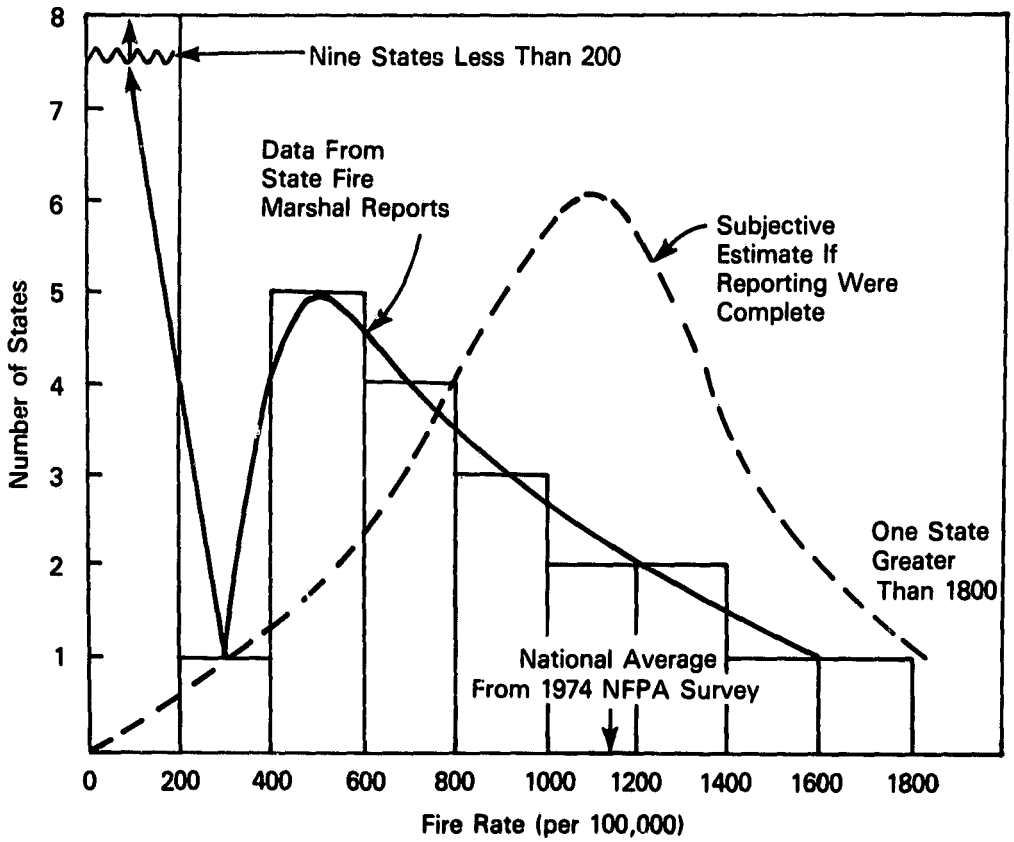
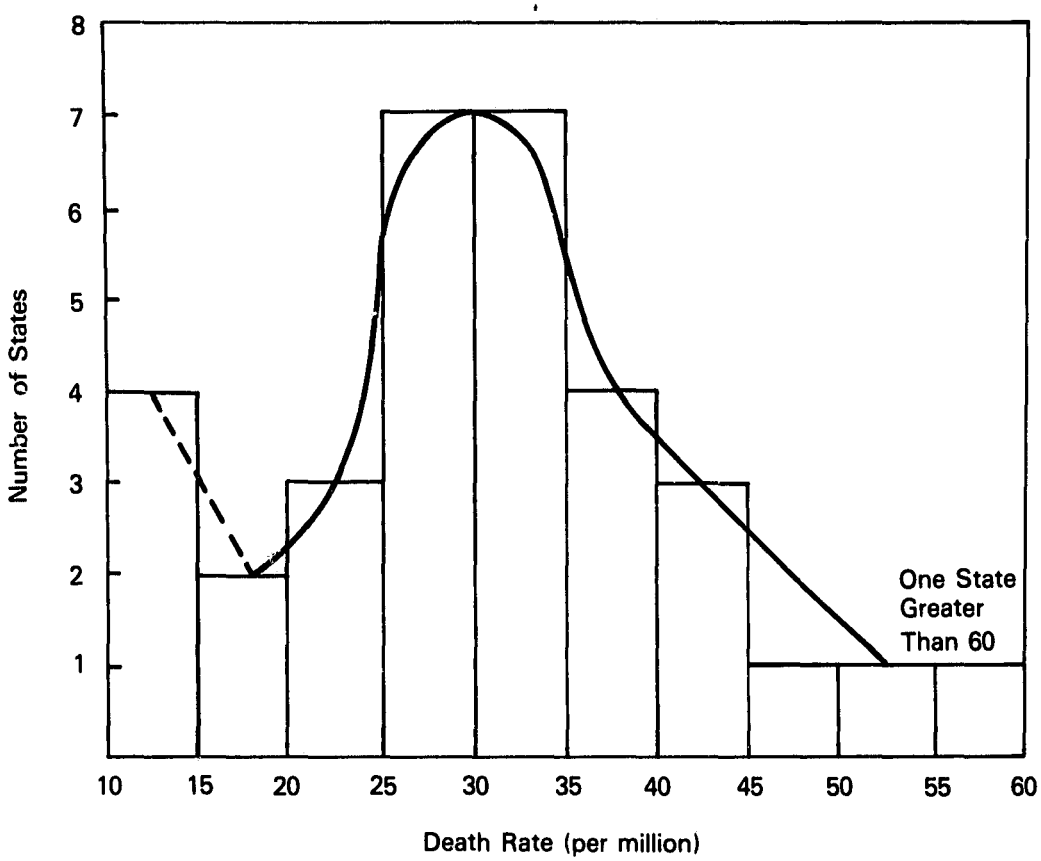


Figure IV-2. FREQUENCY DISTRIBUTION OF STATE FIRE DEATH RATES – State Fire Marshal Reports



ing of injury rates in Table IV-2 is seen to depart considerably from the ranking of death rates. The highest injury rate, for the District of Columbia, exceeded 1,000 per million persons, yielding an injury-to-death ratio of 26. Nevada had the second highest injury rate (and the second lowest death rate) with an injury-to-death ratio exceeding 40. The next largest injury rate was Oregon with an injury-to-death ratio of 12.8. Oregon is often considered by many to have one of the most complete fire reporting systems in the country, which may account for its relatively high reported injury rate.

Dollar loss also shows considerable variability, ranging from $2 per capita for Delaware and $5.70 for North Carolina, to $79.50 for Alaska and $28.40 for Illinois (excluding Chicago).

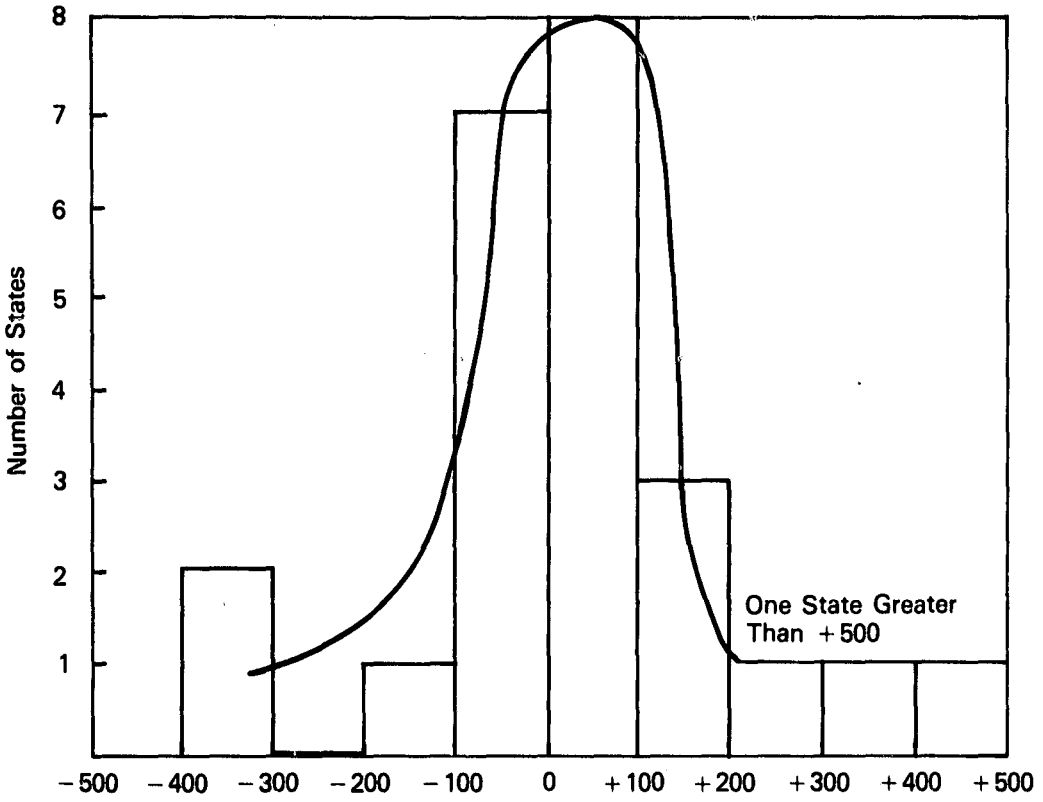
Because much of the injury and property loss data seem to be of low quality, statistical plots have not been made for them.

The frequency distributions of the magnitude and direction of the change in fire and death rates for each State (the value shown in parentheses in Table IV-1) are plotted in Figures IV-3 and IV-4. These distributions appear to be fairly well behaved statistically and, as expected, have less variability than the absolute distributions in the previous Figures IV-1 and IV-2.

EXTRAPOLATION TO NATIONAL ESTIMATES

Using the State Fire Marshal data, we developed national estimates by calculating the mean, weighted by population, of the values for individual States. In extrapolating this result to the entire country, the assumption was made that the 35 States (or less, depending on the category) constitute a random (or representative) sample of all States, which may or may not be true.

Figure IV-3. FREQUENCY DISTRIBUTION OF YEAR-TO-YEAR CHANGE IN FIRE INCIDENT RATE — State Fire Marshal Reports



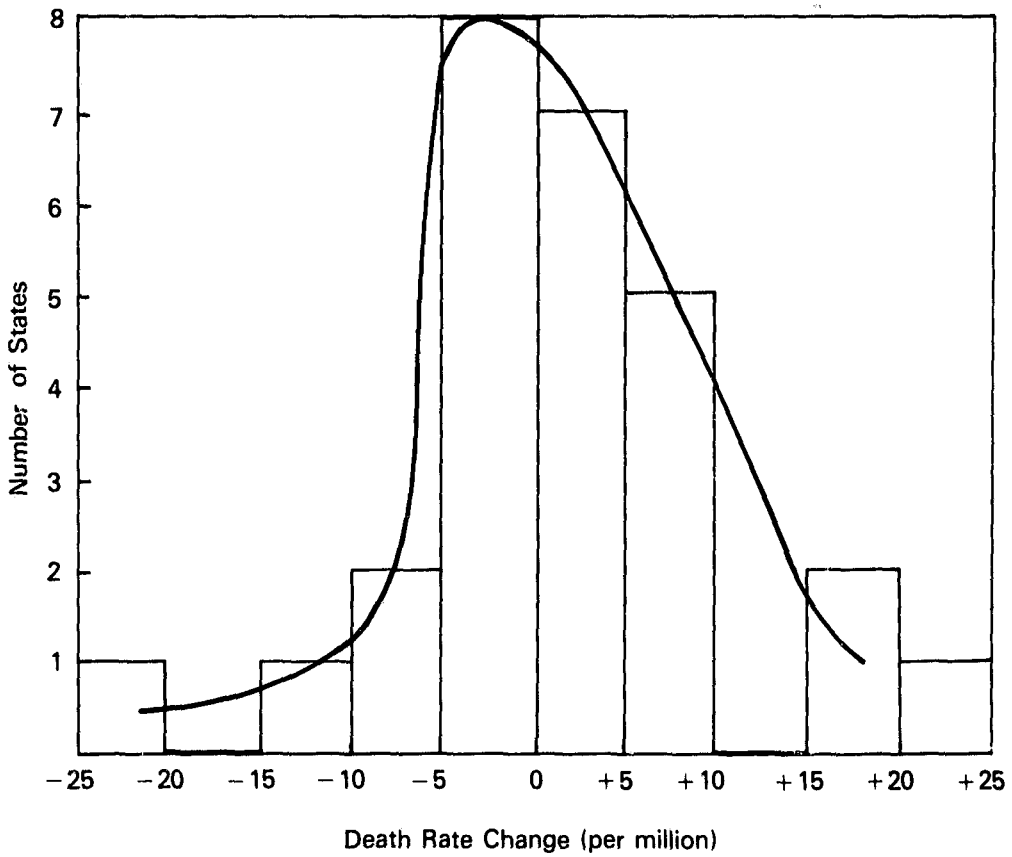
The results of the statistical calculations are summarized in Table IV-3. The upper half of that table pertains to the magnitude of fire loss while the lower half pertains to change from the previous year. The first column indicates the number of States for which data were available. In some instances the extreme values were not used, either because of suspected significantly large under-reporting or some other special circumstances; the States omitted are noted in the last column.

The second column shows the weighted mean, which corresponds to the national estimate. Since not all States provided a breakdown into residential and non-residential occupancies, the sum of the separate estimates for these occupancies may not always equal the total estimate.

The third column presents the standard deviation, a statistical measure for degree of spread among the individual values. Differences in population size among States were not taken into account so that the variability reflects both the random fluctuation (principally of the smaller States) as well as differences in State characteristics and fire protection. The last column presents the statistical error attached to the estimate of the mean. This quantity does not take account of any bias resulting from under-reporting.

The mean death rate of 29.5 from these State Fire Marshal reports is somewhat less than the rate of 37 previously obtained from the 1974 NFPA survey or the value of 35 obtained from the HEW National Center for Health Statistics data, which is discussed in the next section. Possible reasons for this low estimate are currently under investigation. The sampling error (or statistical precision, with confidence 68 percent) of the death rate is 4 percent. The error arises from the

Figure IV-4. FREQUENCY DISTRIBUTION OF YEAR-TO-YEAR CHANGE IN FIRE DEATH RATE — State Fire Marshal Reports



fact that only a (random) sample, 35 out of 50 States and the District of Columbia, is used.

For the 14 States giving residential death data, the mean residential death rate is 18.7 per million persons and the mean non-residential death rate is 7.3 per million persons. The percentage of deaths that are residential is 72 percent, somewhat less than the 83 percent obtained from the NFPA survey. As noted previously, because not all States reported residential deaths separately, the sum of the residential and non-residential rates does not equal the total calculated rate.

As indicated in Figure IV-1, in determining the mean fire rate, we have excluded the 9 States having a total fire rate of less than 20 per 10,000 persons, for which the under-reporting is in most cases likely to be substantial, and Nevada. For the remaining 20 States, the mean fire rate is 79. Of this, 25 percent is residential, which is again less than the estimate from the NFPA survey (28 percent). The precision of the total fire rate estimate, again ignoring under-reporting bias, is 9 percent. Note that only 6 of the 29 reporting States have total fire rates exceeding 114, the mean from the NFPA survey.

The injury rate, with the District of Columbia excluded, is estimated at 253 per million persons (much below the 1974 NFPA survey estimates), with a precision of 11 percent. The average dollar loss rate, calculated from 16 States (with 13 States omitted) is $14 per person, the same as for the 1974 survey.

The estimates of annual change shown in the lower half of Table IV-3 show an increase in all categories of fire loss. But taking into account the (absolute) precision in the last column, only the death rate increase is statistically significant. This result for death rates contradicts that obtained

Table IV-3. SUMMARY OF STATISTICAL MEASURES FOR STATE FIRE LOSS ESTIMATES—State Fire Marshal Reports

		States With Data	States Used in Calculation	Weighted Mean[1] (National Estimate)	Standard Deviation	Relative[2] Precision(%)	States Omitted from the Calculation
MAGNITUDE OF CHANGE							
Residential	Fires	27	18	19.0	6.1	6.1%	States with overall fire rate <20[3], Nevada
	Deaths	14	14	18.7	7.9	9.6	None
	Injuries	6	6	141.0	62.9	17.2	None
	Dollar Loss	21	12	5.7	2.3	10.0	States with overall fire rate <20[3], Alaska
Non-Residential	Fires	27	18	58.1	36.9	12.1	States with overall fire rate <20[3], Nevada
	Deaths	14	14	7.3	4.1	12.7	None
	Injuries	6	6	106.0	45.7	16.6	None
	Dollar Loss	21	12	8.2	5.5	16.9	States with overall fire rate <20[3], Alaska
Total	Fires	29	19	78.8	39.3	9.0	States with overall fire rate <20[3], Nevada
	Deaths	35	33	29.5	11.3	3.9	Alaska, Arizona
	Injuries	16	15	253.0	128.0	10.8	District of Columbia
	Dollar Loss	29	16	14.0	6.1	9.1	States with overall fire rate <20[3], Alaska, Delaware, Nevada, North Carolina
CHANGES FROM PREVIOUS YEAR							
						Absolute Precision[4]	
Residential	Fires	21	20	− 2.4	3.7	0.7	Nevada
	Deaths	9	8	− 1.4	5.6	1.8	Montana
	Injuries	—	—	—	—	—	None
	Dollar Loss	16	15	+ 0.5	0.8	0.2	Connecticut
Non-Residential	Fires	21	20	+ 2.5	16.3	2.9	Nevada
	Deaths	9	8	+ 2.3	4.0	1.3	Montana
	Injuries	—	—	—	—	—	None
	Dollar Loss	16	15	− 0.5	3.8	0.8	Connecticut
Total	Fires	25	24	+ 1.3	17.8	2.7	Nevada
	Deaths	27	25	+ 2.4	6.9	1.0	Montana, South Carolina
	Injuries	7	6	+36.0	52.4	20.1	Ohio
	Dollar Loss	24	23	+ 0.2	3.8	0.6	Connecticut

[1] Estimates are for rates: Fires per 10,000; deaths per million; injuries per million; dollar loss per person.

[2] $\left[\frac{\text{Standard deviation} \times \sqrt{\frac{1}{\text{number}} - \frac{1}{51}}}{\text{mean}}\right] \times 100$. Values correspond to 68 percent confidence level.

[3] Iowa, Kansas, Kentucky, Minnesota, Missouri, Nebraska, North Dakota, Vermont, West Virginia.

[4] Absolute precision here means $\text{Standard deviation} \times \sqrt{\frac{1}{\text{number}} - \frac{1}{51}}$. Values correspond to the 68 percent confidence level.

from the NCHS data in the next section. It is suspected that the increase may be a data artifact reflecting the fact that data reporting is becoming more complete.

COMPARISON OF STATE FIRE MARSHAL AND NATIONAL CENTER FOR HEALTH STATISTICS DEATH DATA

National Center for Health Statistics data tapes on U.S. deaths for 1974 and 1975 were obtained by NFPCA. The fire death rates for the two years for individual States are shown in Table IV-4. Also shown for comparison are the fire death rates for 1974 and 1975 obtained from State Fire Marshal (SFM) reports, if these figures were available.

The total death count from the preliminary tabulation of the NCHS data for all States, 6,746 for 1974 and 6,541 for 1975, is between 950 and 975 (or 13 percent) less than the *adjusted* NCHS total which includes transportation fire deaths. (See Table V-1 in the following Appendix.) Thus, those States which achieve a fairly complete count are likely to show more deaths than reported by NCHS. Table IV-4 shows that during 1975 death rates obtained from State Fire Marshal reports for 19 States were lower than the NCHS tabulation. For 11 States the SFM rates were higher than NCHS, as would be expected if motor vehicle fire deaths were counted in these reports.

Since neither the SFM data nor the NCHS data **are likely to *overestimate*** the number of deaths, it seems likely that the better estimation procedure is to choose the larger of the two death rates. That is, both sources are more likely to miss a fire death than to count as a fire death one that is not. One exception to this is that State Fire Marshal data may be counting fatalities as fire deaths in cases where vehicle accidents are accompanied by fire, but it is uncertain whether the original impact or the subsequent fire caused the death. The procedure of choosing the average of the maximum of the NCHS and SFM rates within each year was followed in drawing the map of State death rates and in identifying those States with highest and lowest death rates (Figure 1 and Table 4 of Part I).

Table IV-4. COMPARISON BETWEEN DEATH RATES FROM STATE FIRE MARSHAL REPORTS AND NCHS—Continued

States	1974			1975			Average of Maximum Rate Within Each Year[4]
	Population[1]	NCHS Rate[2]	SFM Rate[3]	Population[1]	NCHS Rate[3]	SFM Rate[3]	
Alabama	3,575,000	42.8	43.1	3,614,000	44.8	39.6	44.0
Alaska	330,000	124.2	136.4	352,000	73.9	88.1	112.3
Arizona	2,160,000	38.9	7.9	2,224,000	27.4		33.2
Arkansas	2,068,000	54.6		2,116,000	52.5		53.6
California	20,876,000	22.2	16.7	21,185,000	24.7	19.9	23.5
Colorado	2,515,000	18.7		2,534,000	19.3		19.0
Connecticut	3,086,000	22.4	19.4	3,095,000	17.4	15.2	19.9
Delaware	577,000	19.1		579,000	24.2	27.6[5]	23.4
District of Columbia	721,000	59.6		716,000	39.1		49.4
Florida	8,099,000	27.8	8.8	8,357,000	23.6	14.8	25.7
Georgia	4,877,000	43.1		4,926,000	44.5		43.8
Hawaii	841,000	7.1		865,000	15.0		11.1
Idaho	796,000	17.6		820,000	15.9		16.8
Illinois	11,160,000	30.6	36.8[5]	11,145,000	26.9	37.8[5]	37.3[5]
Indiana	5,313,000	25.0		5,311,000	31.8		28.4
Iowa	2,857,000	29.4	28.7	2,870,000	25.8	32.1	30.8
Kansas	2,266,000	24.7		2,267,000	20.3	14.6	22.5
Kentucky	3,354,000	38.8		3,369,000	36.8	31.8	37.8
Louisiana	3,762,000	45.2	43.1	3,791,000	42.5	42.2	43.9
Maine	1,049,000	62.9		1,059,000	42.5		52.7
Maryland	4,089,000	30.8	35.0	4,098,000	40.0	43.4	39.2
Massachusetts	5,799,000	35.5		5,828,000	33.8		34.7
Michigan	9,117,000	36.6	36.6	9,157,000	29.7	34.7	35.7
Minnesota	3,905,000	27.9	24.1	3,926,000	27.3	21.9	27.6
Mississippi	2,334,000	66.8		2,346,000	63.5		65.2
Missouri	4,772,000	36.9	14.9	4,763,000	26.5	12.4	31.7

Table IV-4 cont'd. COMPARISON BETWEEN DEATH RATES FROM STATE FIRE MARSHAL REPORTS AND NCHS

States	1974			1975			Average of Maximum Rate Within Each Year[4]
	Population[1]	NCHS Rate[2]	SFM Rate[3]	Population[1]	NCHS Rate[2]	SFM Rate[3]	
Montana	737,000	29.9		748,000	41.4	26.7	35.7
Nebraska	1,541,000	23.4	24.0	1,546,000	24.6	31.7	27.9
Nevada	574,000	34.8	27.9	592,000	22.0	11.8	28.4
New Hampshire	808,000	30.9		818,000	25.7		28.3
New Jersey	7,322,000	25.7		7,316,000	25.8		25.8
New Mexico	1,119,000	44.7	38.4	1,147,000	36.6	27.9	40.7
New York	18,101,000	21.8		18,120,000	21.5		21.7
North Carolina	5,375,000	44.7		5,451,000	41.5	41.1[5]	43.1
North Dakota	636,000	31.4	34.6	635,000	25.2	29.9	32.3
Ohio	10,745,000	26.9	23.8	10,759,000	25.7	24.8	26.3
Oklahoma	2,681,000	43.3	35.8	2,712,000	43.1	39.8	43.2
Oregon	2,255,000	31.9	37.3	2,288,000	32.3	37.2	37.3
Pennsylvania	11,841,000	32.1	32.3	11,827,000	35.1	30.2	33.7
Rhode Island	938,000	29.9		927,000	18.3		24.1
South Carolina	2,775,000	54.8	23.1	2,818,000	50.0	53.9	54.4
South Dakota	681,000	27.9		683,000	30.7		29.3
Tennessee	4,149,000	51.3		4,188,000	45.6		48.5
Texas	12,017,000	35.4		12,237,000	37.2		36.3
Utah	1,179,000	25.4	13.6	1,206,000	17.4	22.4	23.9
Vermont	468,000	19.2	29.9[5]	471,000	38.2	21.2[5]	34.1[6]
Virginia	4,910,000	34.6	32.4	4,967,000	34.4	32.8	34.5
Washington	3,494,000	36.1		3,544,000	26.0		31.1
West Virginia	1,784,000	38.7		1,803,000	44.4	31.6[5]	41.6
Wisconsin	4,566,000	23.4		4,607,000	24.3		23.9
Wyoming	362,000	47.0	49.7	374,000	18.7		34.2

[1] July 1, 1974, and July 1, 1975 Census population estimates as reported in *Statistical Abstract of the United States, 1976 (97th Ed.)* (Washington, DC: Government Printing Office, 1976), p. 11.

[2] Deaths per million. NCHS data includes the following ICDA (International Classification of Disease, Adapted for Use in the United States) codes: fires in railway accidents (E803), fires in water transport (E837), accidents caused by fires/flames (E890-899), accidents caused by gas cylinder explosions (E921.1), accidents caused by pressure vessel explosions (E921.8), accidents caused by explosive materials (E923), and late effect of accidents caused by fire (E944).

[3] Deaths per million.

[4] Computed as follows: [max (1974 NCHS, 1974 SFM) + max (1975 NCHS, 1975 SFM)] ÷ 2. These death rates were used in the map (Figure 1), except for New York State where the estimate of 36.7 deaths per million from the 1974 NFPA Survey was used.

[5] Rate is based on State Fire Marshal data reported by fiscal year.

[6] Actual average of the maximum rates, which may be less than this value, could not be computed because the State Fire Marshal data is reported by fiscal year. It does appear that the majority of Vermont fire deaths for FY 75 occurred in the first half of 1975.

Appendix V

National Center for Health Statistics Data: The Basis for the NFPCA National Fire Death Estimates

This appendix discusses the basis for arriving at the NFPCA national estimate of fire deaths. The estimate is derived primarily from fire death data published annually by the National Center for Health Statistics (NCHS) of HEW, after certain modifications are made to include a few categories of fire deaths not explicitly identified by NCHS as resulting from fire. The nature and magnitude of these adjustments are discussed in detail here.

The NCHS death data is obtained from death certificates submitted by the 50 States and is believed by NCHS to be over 99 percent complete. These certificates usually indicate whether the death was caused by fire. However, in the case of death from transportation accidents (except water transport), NCHS does not separate fire deaths from non-fire deaths. Thus, some adjustment in the NCHS data is required.

In addition, death certificates of fire victims who expired some time after the fire may not state fire as the underlying cause of death. An adjustment for these omissions is also needed.

The numerical adjustments that were made are based upon a detailed NFPCA study by Fristrom of national fire death data from various sources, including NCHS.[68] That study gave estimates in terms of minimum and maximum values. Here we suggest intermediate "best estimates," usually but not always the average of these extremes. These are shown in Table V-1.

The principal correction is for motor vehicle fire deaths. Numerous studies of such deaths have been made, yielding widely differing estimates. Table V-2, taken from the Fristrom report, lists the principal studies and their estimates of the percentage of vehicle accident deaths attributed to fire. The values range from 0.6 percent to 7.8 percent. The median of 1.5 percent yields the estimated number of motor vehicle fire deaths labeled as Method A in Table V-1.

Fristrom also examined State Fire Marshal reports and found that, "on the average, 10.8 percent of total fire deaths in the years 1970-1974 could be attributed to fire associated with motor vehicles."[69] This value results in a slightly larger estimated number of motor vehicle fire deaths, designated in Table V-1 as Method B.

The average of Methods A and B is used in forming the overall NCHS-adjusted national estimates for 1973-1975 shown in the bottom lines of the table. The death rate (35 per million for 1975) is, as noted previously, somewhat greater than was obtained from the State Fire Marshal data (29.5). This result is not surprising for the following reasons.

1. When death results from clothing ignition not accompanied by (uncontrolled) fire, the person affected often is taken directly to the hospital without the knowledge of the local fire department, and thus the death is not reported to the State Fire Marshal.
2. Seriously injured persons may subsequently die without notification to the fire department, and again the death will not be reported to the State.

[68] Fristrom, Geraldine, *Fire Deaths in the United States: Review of Data Sources and Range of Estimates* (Washington, DC: National Fire Prevention and Control Administration, September 1977).

[69] Fristrom, Geraldine, *Fire Deaths in the United States: Review of Data Sources and Range of Estimates* (Washington, DC: National Fire Prevention and Control Administration, September 1977).

Table V-1. CALCULATION OF NFPCA's BEST ESTIMATE OF FIRE DEATHS (Based on Corrections to HEW Fire Mortality Data)

	1973	1974	1975	Estimated Range[1] for Corrections Maximum/Minimum		Correction Rationale[2]
NCHS Total	7,090	6,746	6,541			
Estimated corrections for deaths involving:				(Percent of Fire Deaths)		
Rail	+5	+5	+4	1.2%	0 %	For both rail and air, maximum values correspond to DOT's 1973 rate estimates. We arbitrarily used one-half these rates since some detailed studies showed that, although all fatalities in some crashes were recorded as fire deaths, only a fraction were actually fire victims.
Air	+58	+59	+54	6.9%	0 %	
Motor vehicles						
Method A	+680	+563	+555	7.8%	0.6%	Estimate is 1.5% of vehicle-occupant accident deaths. This is the median of 17 studies (Table V-2). It is also the U. of Michigan HSRI recommendation, and the value calculated from *NFPA Fire Protection Handbook*.
Method B	+860	+818	+793	—	—	State Fire Marshal Reports classify 10.8% of annual fire deaths as motor vehicle fire deaths; this factor is used here.
Delayed reporting of death which is not properly attributed to fire	+231	+220	+213	4–9%	0 %	Estimate is 3.25% of deaths derived as follows: Half of the deaths occurring 2 or more weeks after fire are assumed not to show fire as underlying cause. The maximum number of such delayed deaths is estimated to be (4+9)/2=6.5% of *total annual fire deaths*, the minimum is estimated to be 0. The mean value between 6.5% and 0 is 3.25%, and was selected as the factor.
National Estimate[3]	8200	7720	7490			
Death rate per million	38.9	36.5	35.1			

[1] For discussion of these ranges see: Fristrom, Geraldine, *Fire Deaths in the United States: Review of Data Sources and Range of Estimates* (Washington, DC: National Fire Prevention and Control Administration, September 1977).

[2] Includes deaths by: fire and flames, explosion, fire or burning in water transport, accidents caused by explosive materials, and explosions of pressure vessels excluding boilers.

[3] Average of Method A and Method B used for motor vehicle fire deaths. Final values for National Estimates rounded to one significant digit.

3. Many motor vehicle fire deaths are believed to go unreported even when the fire was clearly the cause of death. (On the other hand, the cause of death may be wrongly attributed to an accompanying fire, which an autopsy later shows was not the true cause.)
4. Some aircraft fire deaths may not be reported by any local fire department because they occur in areas serviced by private or government fire brigades, or they occur in areas not serviced by any fire protection service.
5. State Fire Marshals do not always get reports of all fire deaths from all departments throughout the State.

Table V-2. SUMMARY OF TRAFFIC FIRE DEATH STUDIES

Studies	Scope	Estimated fire deaths as percent of yearly vehicle accident deaths	Estimated number of deaths per year (calculated using average of 45,000 vehicle accident deaths per year [1])
Lauriente and Wiggins, Fourth Intersociety Conference on Transportation, Los Angeles, California, July 18-24, 1976	1973 National estimate	6.7%	3,027
DOT, Federal Register, Vol. 39, No. 56, March 1974	National estimate	1.1—2.2	500—1,000
New York State Police reports 1968 Vehicles Research Report 1969-72, September 1969		<2.4	<1,080
Siegel and Nahum, 1970 International Automobile Safety Conference Compendium, Society Automobile Engineers 1970	Los Angeles City and County fire department records 1966-1969	2.7	1,215
University of Oklahoma Research Institute, Final Report for NHTSA under contract FH-11-7303, December 1970	Oklahoma accident records 1968	<7.8	<3,500
University of Oklahoma Research Institute, Final Report for NHTSA under contract FH-11-7512, July 1972	Oklahoma and Kansas accident file data and death certificates 1970-1971	3.3 2.5	1,485 1,125
Highway Safety Research Institute, University of Michigan, Special Report for NHTSA under contracts FH-11-6555 and FH-11-7129, June 1972	Wayne County Michigan morgue reports 1968-1971	1.3	585
Highway Safety Research Institute, University of Michigan, UM-HSRI-SA-74-3, April 1974	Michigan State Police reports 1968-1971	1.0	450
	Michigan fire statistics 1972	1.4	630
	Oregon fire statistics 1969-1973	1.3	585
	Iowa fire statistics 1971-1972	1.4	630
	Illinois fire statistics 1963-1972	1.7	765
NFPA *Fire Protection Handbook*, 13th edition and National Safety Council accident data	National: 10% sample motor vehicle fire deaths over 35 year period	1.5	675
Johns Hopkins University Applied Physics Laboratory Fire, Problems Programs, Fire Casualty Studies 1971-1976	State of Maryland 1971-1976	0.7	309
Flammability Research Center University of Utah, Progress Report "Fire Injuries-Case History Studies" under NSF Frant Ert 72-03406-1904, July 1975	Greater Salt Lake City, June 1972 to February 1975	0.6	280
Range from Studies		0.6—7.8%	280—3,500

[1] Averaged number of yearly *in-vehicle* traffic deaths during the years 1970-1973. *Source:* U.S. Bureau of the Census, *Statistical Abstract of the United States: 1975*, 96th Edition (Washington, DC: Government Printing Office, 1975).

Appendix VI

Estimating Precision of Fire Incidents and Fire Casualties

Fires rates, injuries, deaths, and dollar loss fluctuate from one year to the next. The smaller the community and the fewer the number of fires or deaths, the greater is this fluctuation. This randomness is inherent in fire data and should be explicitly taken into account in any interpretations.

The rule for determining the expected random fluctuation over time (or, in statistical jargon, the precision of the estimate) is as follows: The absolute *variability* (standard deviation) associated with the observed count of fires (or deaths, or injuries) equals the square root of the count. The *relative precision* (coefficient of variation) in percent equals 100 percent divided by the square root of the observed count.[70]

The relative precision is usually more pertinent than the absolute variability since it applies to per capita rates as well as to actual counts.

Some useful benchmarks are:

Count (e.g. number of deaths)	Relative Precision
4	50%
9	33
16	25
25	20
44	15
100	10
400	5

For example, if a community experienced 25 deaths during the year, the relative precision is 20 percent ($= 100\% \div \sqrt{25}$). This can be interpreted as follows: If over an extended period of time with stable (no trend) conditions, a city experiences an average of 25 deaths per year, the chances are 68 percent (or the odds are about 2 to 1) that if the fire situation does not change, the next year will show between 20 and 30 deaths ($= 25 \pm \sqrt{25}$ or $\pm$ 20% $\times$ 25). For 95 percent chance (odds of 19 to 1) the interval should be doubled, giving 25 ± 10.[71]

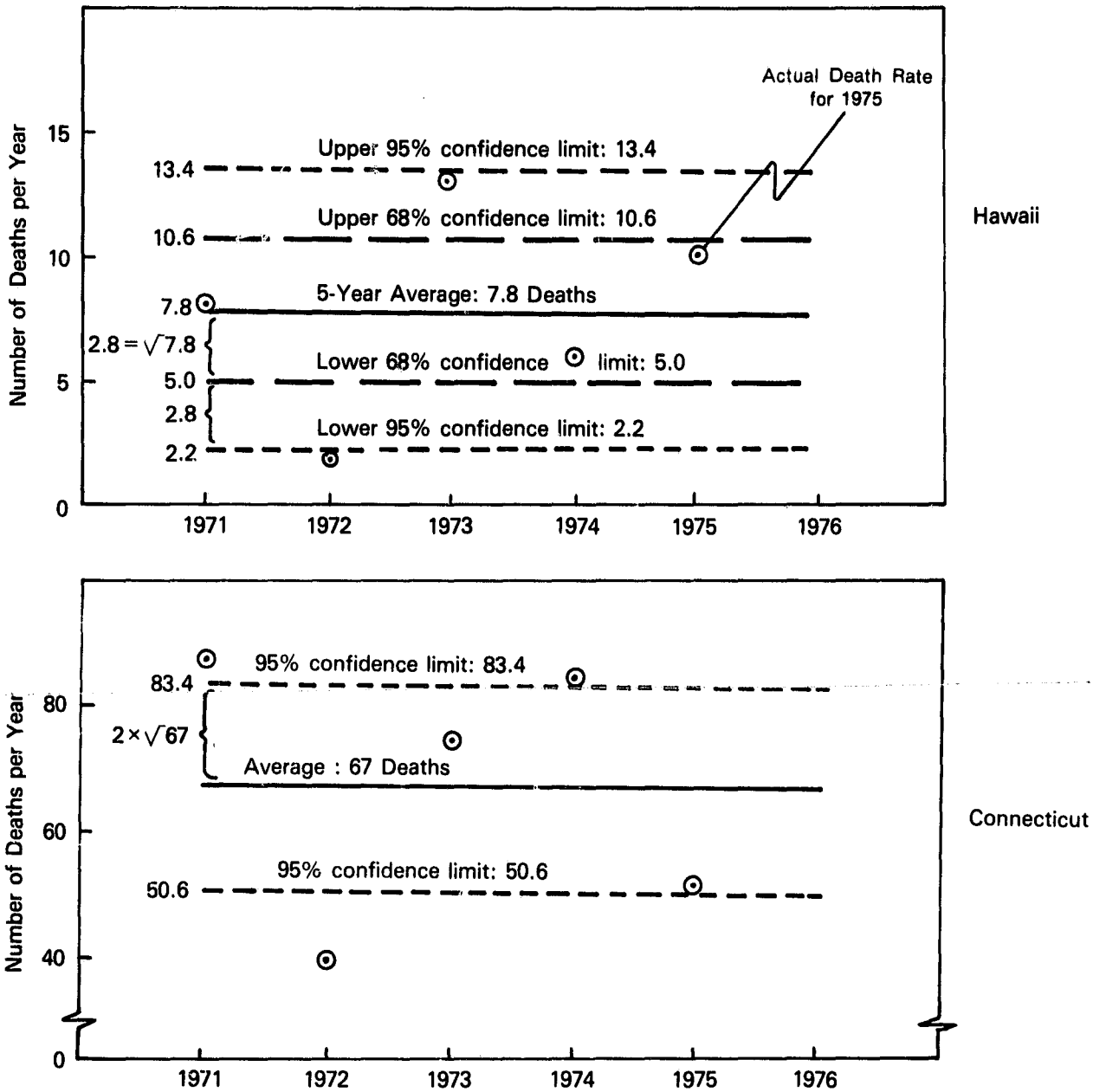
The low precision associated with small counts is important even for large cities. If too fine a subdivision of the data is used (e.g. fire caused by toasters), the precision will be too low to monitor trends, with statistical confidence, on a yearly basis. For a small community, even the total aggregated count for all fires or deaths may be too imprecise to conclude that a change is statistically significant. Increased precision can be obtained only by monitoring for longer than a year or by combining with data from neighboring communities.

The above rule can be adapted to provide trend charts (similar to quality control charts widely used in industrial production) for monitoring progress over several years. The two numerical examples in Figure VI-1 illustrates the construction of trend charts. The first example shows number of annual fire deaths for Hawaii, according to NCHS statistics, for the years 1971 to 1975. The "quality control" 68 percent limits of $\pm$ 2.8 (and 95 percent limits of $\pm$ 5.6) are based upon the five-year average of 7.8 deaths per year. If 1976 falls outside the limits, one can conclude (with confidence 68 percent, or 95 percent, as selected) that there has been a statistically significant change.

[70] Statistically, individual counts are assumed to occur randomly following the Poisson distribution for rare events, for which the standard deviation equals the square root of the mean. This distribution does not apply to dollar loss. Also, multiple (exposure) fires and multiple deaths and injuries are assumed to constitute a small fraction of the total. The square root formula usually leads to values that are slightly low since other important random factors (e.g. changes in yearly temperature profile) will increase the fluctuation.

[71] If the city's population has changed significantly during the period, the procedures for calculation of the mean and of the confidence limits require slight modification.

Figure VI-1. EXAMPLES OF QUALITY CONTROL CHARTS FOR NUMBER OF FIRE DEATHS



The example also indicates how well the square root formula applies to the data. Ideally, the 68 percent limits should include 68 percent of the points and the 95 percent limits should include 95 percent of the points. Actually, three out of five years (60 percent) fall within the 68 percent limits, but only four out of five years (80 percent) are within the 95 percent limits. (The low 1972 value was just barely outside the band.) Considering the complexity of the fire phenomenon, the agreement is amazingly good and more than adequate for practical application.

The second example in Figure VI-1, for Connecticut, also shows very good agreement, with the actual values being slightly outside the calculated limits.

Appendix VII

Tables of Fire Losses by Ignition Characteristics

(Discussed in Section IV)

Table VII-1. TYPE OF MATERIAL IGNITED IN STRUCTURE FIRES—California (CFIRS 1975), Ohio (NFIRS 1976)—Continued

Type of Material Ignited	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
Unknown gas	11	13	0	0	0	1	$92,350	$118,180
Natural gas	1,506	399	6	4	97	95	3,071,854	2,972,445
City gas (LP and air mix)	76	38	1	0	6	3	245,395	168,553
Manufactured gas	67	38	0	0	9	6	107,902	317,538
LP-gas	227	85	5	1	52	16	900,383	443,260
Anesthetic gas	8	13	0	0	0	0	14,450	102,600
Acetylene	60	20	0	2	6	3	222,765	239,930
Specialty gas other than anesthetic	20	17	1	0	10	9	2,098,945	95,750
Other gas	79	8	1	1	5	6	751,232	33,545
Unknown flammable, combustible liquid	469	159	8	2	55	34	4,662,840	1,242,092
Class IA flammable liquid	269	113	2	3	41	28	2,178,032	2,159,815
Class IB flammable liquid	427	124	9	1	71	29	3,402,401	585,107
Gasoline	1,610	763	14	3	194	164	5,228,194	5,520,961
Class IC flammable liquid	102	36	0	0	20	6	941,918	606,435
Class II combustible liquid	225	262	0	4	17	28	914,927	1,582,225
Class IIIA combustible liquid	84	116	0	1	5	6	357,527	491,357
Class IIIB combustible liquid	118	65	0	0	9	5	53,960	520,105
Other flammable, combustible liquid	458	58	3	0	34	10	1,248,664	224,257
Unknown volatile solid, chemical	495	8	0	0	16	1	484,200	80,300
Fat or grease (food)	4,969	1,929	4	8	187	210	3,710,213	2,772,527
Grease (non-food)	132	77	0	0	1	10	160,930	613,590
Polish, paraffin or wax	267	46	0	0	21	4	385,986	56,462
Adhesive, resin, tar	714	48	0	0	27	11	707,491	130,484
Applied paint, varnish	365	18	0	0	28	0	433,500	12,460
Combustible metal	206	109	0	0	9	4	236,278	173,785
Solid chemical	102	5	0	0	18	4	159,675	1,950
Radioactive material	4	2	0	0	0	0	500	200
Other volatile solid, chemical	117	17	0	0	7	1	72,187	25,964
Unknown plastic	134	65	0	0	7	5	352,907	781,606
Polyurethane plastic	0	34	0	0	0	4	0	176,484
Polystyrene plastic	0	9	0	0	0	1	0	1,483,510
Polyvinyl plastic	0	12	0	0	0	2	0	21,095
Polyacrylic plastic	0	64	0	1	0	5	0	73,325
Polyester plastic	0	336	0	8	0	94	0	1,942,648
Polyolefin plastic	0	130	0	1	0	30	0	408,913
Other plastic	3,001	56	4	0	93	15	5,602,096	141,179
Unknown natural product	59	17	0	1	2	2	75,860	284,860
Rubber, including synthetic rubber	1,969	940	0	3	46	96	2,314,760	3,053,714
Cork	6	10	0	0	1	0	26,275	26,210
Leather	23	18	0	0	0	3	32,890	9,440
Grass, leaves, hay, straw	943	471	2	2	26	168	2,435,606	5,279,775
Grain, natural fiber (pre-process) including feathers, felt, hemp, jute, cotton	557	338	3	6	32	41	2,122,159	1,078,914
Coal, coke, briquettes, peat	60	70	0	0	3	2	43,575	186,529
Food, starch (excluding fat, grease)	1,685	406	0	0	31	23	293,622	220,231
Tobacco	119	19	2	0	14	1	197,880	13,725
Other natural product	469	45	3	0	13	3	844,394	115,869
Unknown wood or paper	2,317	383	2	1	48	63	3,988,490	2,364,189
Growing wood	79	50	0	0	0	1	128,350	184,664
Wood felled but unsawn	191	69	0	1	11	5	427,116	119,975
Sawn wood, finished lumber	5,900	4,702	14	26	284	658	26,657,633	33,054,367
Wood shavings, sawdust, excelsior	298	62	1	0	5	9	467,295	249,130
Hardboard, plywood	446	403	2	1	11	60	2,397,878	2,914,087
Fiberboard, wood pulp	239	210	1	0	4	15	544,349	532,772
Uncoated paper	4,456	1,610	8	6	175	134	9,206,050	5,496,494
Cardboard	712	274	0	0	48	29	2,319,844	6,052,221
Other wood, paper	2,305	406	2	4	59	109	5,726,567	2,334,521
Unknown fabric, fur, textile	2,166	402	13	4	143	50	2,991,892	1,140,890

Table VII-1 cont'd. TYPE OF MATERIAL IGNITED IN STRUCTURE FIRES— California (CIFRS 1975), Ohio (NFIRS 1976)

Type of Material Ignited	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
Man-made fabric, fiber, finished goods	2,737	1,475	38	13	246	214	$8,488,510	$5,455,282
Cotton, rayon, cotton fabric, finished goods	7,782	3,052	75	34	557	400	14,660,524	5,947,549
Wool or wool mixture fabric, finished goods	380	183	3	1	12	21	648,371	529,383
Fur, silk, other fabric, finished goods	54	21	3	2	6	1	168,790	33,195
Wig	18	11	1	0	0	1	100,720	3,075
Human hair	8	2	0	0	2	0	12,750	200
Other fabric, fur, textile	628	102	4	2	49	17	1,309,352	255,971
Unknown material compounded with oil	30	7	0	0	1	0	34,125	940
Linoleum	30	25	0	0	5	4	38,565	117,495
Oil cloth	15	4	0	0	0	0	8,935	145
Treated and/or coated paper	93	34	0	0	6	4	445,037	81,576
Waterproof canvas	72	26	0	0	0	1	10,476	3,540
Oily rags	123	53	0	0	2	0	188,958	83,570
Asphalt treated material	164	103	0	0	4	3	291,389	636,391
Other material compounded with oil	128	17	0	0	5	5	110,977	59,395
Multiple types	0	1	0	0	0	0	0	0
Not applicable	365	287	0	0	7	16	163,616	310,649
Other type material	6,133	351	13	1	202	53	10,097,405	806,017
Unknown or unreported	8,336	1,962	54	69	714	541	39,104,625	22,760,235
Total	68,417	24,413	302	217	3,819	3,603	$177,925,312	$128,567,822

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Structure fires include both residential (including mobile home) and non-residential structure fires. Mobile property and outside fires are excluded.

Table VII-2. FORM OF MATERIAL IGNITED IN RESIDENTIAL FIRES—California (CFIRS 1975), Ohio (NFIRS 1976)[1]—Continued

Form Material Ignited	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
Unknown finish/structural component.	450	94	0	5	7	21	$898,317	$1,072,949
Exterior roof covering	1,894	183	0	1	65	21	3,737,506	1,680,084
Exterior sidewall covering	757	513	0	0	29	60	2,605,820	1,980,146
Exterior trim including doors, porches	243	143	0	0	7	14	394,843	406,840
Floor covering incl. tile, carpet, stairs	829	557	6	8	65	65	3,328,905	2,735,929
Interior wall covering	788	946	8	16	63	169	4,004,637	6,386,130
Ceiling covering	118	122	0	0	5	4	290,450	399,106
Structural member, framing	1,243	1,657	4	9	90	274	6,029,879	12,111,260
Thermal acoustical insulation	184	195	5	0	11	18	241,306	941,189
Other finish/structural component	378	110	2	0	24	16	877,660	426,008
Unknown furniture	186	43	0	0	11	13	694,975	301,375
Upholstered furniture	2,941	1,292	56	34	293	238	8,850,971	4,693,832
Non-upholstered furniture	45	24	0	0	3	3	109,746	20,260
Cabinetry	564	348	5	3	49	75	2,106,819	1,340,681
Ironing board	15	9	0	0	1	2	6,375	9,385
Appliance housing or casing	0	3	0	0	0	0	0	10,050
Other furniture	379	88	4	6	32	34	996,099	527,247
Unknown soft goods, clothing	1,587	54	2	0	87	7	1,578,975	122,866
Mattress, pillow	2,694	1,557	22	11	182	190	3,492,525	2,186,139
Blanket, sheet, bedding	1,457	613	42	17	247	84	5,915,685	1,662,320
Linen, other than bedding	371	121	1	0	13	11	377,667	149,681
Clothing, not worn	1,094	698	4	1	62	79	2,574,275	1,931,567
Clothing, worn	83	50	10	7	33	20	113,665	115,970
Blind, drape, tapestry, curtain	597	239	4	0	22	21	1,031,899	458,154
Yard goods	53	24	0	0	2	0	137,285	44,785
Luggage	18	3	0	0	0	0	14,430	100
Other soft goods, clothing	290	66	2	0	16	8	518,980	112,376
Unknown type decoration	9	2	0	0	0	0	7,575	300
Christmas tree	60	13	1	0	13	1	524,886	36,250
Decoration for special event	80	31	0	0	2	6	105,295	31,100
Book	36	11	0	0	3	1	59,754	34,785
Magazine, newspaper, writing paper	642	265	2	5	42	37	1,237,652	735,915
Toy, game	100	41	0	2	7	7	168,181	38,430
Awning, canopy	34	7	0	0	0	0	38,850	1,230
Tarpaulin, tent	28	7	0	0	2	0	29,670	980
Other decoration	90	16	0	0	2	2	112,341	8,200
Unknown supplies, stock	10	7	0	0	0	2	27,200	1,850
Box, carton, bag	577	166	2	1	15	16	914,292	446,701
Basket, barrel	44	34	0	0	2	4	52,315	85,860
Pallet, skid (not in use)	1	3	0	0	0	0	300	250
Rope, cord, twine, yarn	15	7	0	0	1	0	6,230	8,580
Packing material	59	22	0	0	3	2	151,054	32,995
Bale storage	5	7	0	0	0	2	5,350	62,900
Bulk storage	26	18	0	0	0	4	136,151	74,615
Cleaning supplies	155	67	0	0	1	2	194,821	47,180
Other supplies, stock	76	14	0	0	3	2	143,045	9,380
Unknown power transfer equipment	42	14	0	0	0	1	72,990	53,595
Electric wire, cable insulation	3,328	945	4	5	64	31	3,000,867	1,429,474
Transformer	180	44	0	0	1	1	42,225	7,405
Conveyor, drive belt	45	34	0	1	0	9	87,365	128,285
Tire	20	6	0	0	1	0	28,676	800
Fuel	1,474	382	6	2	188	72	3,484,500	1,905,158
Other power transfer	211	18	0	0	3	0	201,142	36,100
Agricultural product	122	65	1	0	2	4	149,783	37,030
Fence, pole	71	15	0	0	0	0	36,955	11,010
Fertilizer	17	2	0	0	0	0	8,435	0
Growing, living form including forests, brush, grass	683	32	0	0	25	0	257,038	54,450
Rubbish, trash, waste	2,818	860	4	1	72	72	3,039,465	1,313,897

Table VII-2 cont'd. FORM OF MATERIAL IGNITED IN RESIDENTIAL FIRES—California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Form Material Ignited	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
Cooking materials	4,677	1,899	3	8	155	164	$2,267,167	$1,913,099
Sign	0	1	0	0	0	0	0	350
Dust, fiber, lint	574	214	0	0	1	4	181,932	87,445
Pyrotechnics, explosives	34	7	0	0	14	6	43,750	15,060
Atomized, vaporized liquid	94	53	2	2	20	21	619,752	207,099
Chips	78	1	0	0	5	0	46,445	500
Palletized materials	98	1	0	0	11	0	203,984	25
Gas, liquid in pipe/containers	1,211	322	7	2	130	79	2,736,057	953,719
Rolled material	53	11	0	0	1	1	205,162	1,460
Adhesive	0	0	0	0	0	0	0	0
Multiple form material	0	0	0	0	0	0	0	0
Form of material not applicable	0	5	0	0	0	1	0	19,400
Other form of material	9,212	262	60	0	524	28	22,464,471	394,313
Unknown or unreported	238	1,287	1	54	13	319	249,003	9,218,622
Total	46,585	16,970	270	201	2,745	2,348	$94,273,828	$61,335,226

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

NOTE: Mobile home fires are included with residential fires.

Table VII-3. EQUIPMENT INVOLVED IN IGNITION IN NON-RESIDENTIAL STRUCTURE FIRES—California (CFIRS 1975), Ohio 1976)[1]—Continued

Equipment Involved	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
Heater, type unknown	25	4	0	0	0	2	$295,301	$53,100
Central heating unit	240	126	0	0	9	26	1,456,302	1,322,055
Water heater	187	43	2	0	22	3	589,090	195,027
Fixed local heating unit	207	123	0	0	16	11	767,266	741,680
Indoor fireplaces	26	12	0	0	1	1	22,086	24,775
Portable heater	106	85	0	0	5	12	230,055	490,810
Chimney, flue	35	18	0	0	0	1	53,557	31,595
Chimney connector	9	18	0	0	0	2	1,450	62,863
Heat transfer system	16	8	0	0	0	2	4,650	59,250
Other heating system	85	14	1	0	3	0	165,787	105,663
Unknown cooking equipment	21	5	0	0	0	0	20,150	11,350
Fixed surface cooking unit incl. stoves	527	106	0	0	18	6	929,733	183,065
Fixed oven	125	33	0	0	4	3	24,117	53,245
Fixed food warmer	42	3	0	0	3	0	96,178	85
Deep fat fryer	197	67	0	0	5	32	270,732	351,511
Portable cooker, warmer	87	16	0	0	2	0	207,990	79,125
Open-fired grill	95	29	0	0	3	2	56,526	78,010
Greasehood, duct	71	36	0	0	0	5	135,861	344,485
Other cooking equipment	45	8	0	0	1	0	26,245	13,550
Unknown A/C, refrigeration equipment	7	2	0	0	0	1	1,040	7,000
Central A/C, refrigeration equipment.	128	21	0	0	0	0	52,587	18,105
Water cooler, tower	33	1	0	0	0	0	21,275	50
Fixed refrigerator unit	77	29	0	0	4	2	516,165	81,590
Fixed air conditioner	42	8	0	0	1	0	18,620	4,400
Portable A/C, refrigerator, including dehumidifiers	8	2	0	0	0	0	900	1,200
Other A/C, refrigeration	20	6	0	0	0	4	1,400	19,205
Unknown electric distribution equipment	272	85	0	0	4	21	459,350	5,017,405
Fixed wiring	663	163	0	0	18	32	3,831,652	3,112,334
Transformers	270	32	0	0	5	2	226,315	205,492
Meter, meter box	11	5	0	0	0	0	42,650	575
Switchboards, fuses, circuit breakers.	148	38	1	0	7	9	1,208,721	144,755
Switch, receptacle, outlet	108	31	0	0	1	2	175,906	49,227
Light, fixture, ballast, sign	778	139	0	0	10	3	399,064	842,994
Cord, plug	176	57	0	0	10	52	1,098,592	334,688
Lamp, light bulb	43	26	0	1	1	7	33,150	142,885
Other electric distribution equipment	143	14	0	0	2	10	665,012	891,592
Unknown appliances	80	7	0	0	2	0	218,740	26,650
TV, radio, stereo, tape player	68	22	0	0	5	2	173,258	36,805
Dryer	486	113	0	0	10	20	426,819	98,108
Washing machine	106	12	0	0	3	0	70,269	1,490
Floor care equipment incl. vacuum cleaners	16	2	0	0	4	0	53,546	1,050
Separate motor, generator	135	54	0	0	3	4	446,206	327,290
Electric hand tools	37	7	0	0	0	0	593,080	16,355
Electric blankets, steam irons (produce heat)	43	18	0	0	0	0	34,481	90,851
Other portable appliances not producing heat	26	7	0	0	0	0	12,811	1,475
Other appliances, equipment	147	22	0	0	4	4	224,445	167,179
Unknown special equipment	21	14	0	0	0	2	605	38,335
Radar, X-ray, TV, telephone equipment	29	7	0	0	0	1	236,750	273
Vending machine, drinking fountain	10	4	0	0	0	0	2,160	1,140
Office machine	58	8	0	0	3	0	49,020	26,450
Biomedical equipment	6	1	0	0	1	0	262,575	200
Pump, compressor	41	18	0	0	2	0	365,300	48,645
Internal combustion engine	155	11	0	0	4	2	169,145	40,710

Table VII-3 cont'd. EQUIPMENT INVOLVED IN IGNITION IN NON-RESIDENTIAL STRUCTURE FIRES—California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Equipment Involved	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
Conveyor	28	20	0	0	1	4	$104,650	$257,250
Printing press	8	9	0	0	1	6	42,805	30,175
Other special equipment	208	40	0	0	9	18	471,113	1,134,100
Unknown processing equipment	12	12	0	0	1	4	104,920	6,999
Furnace, oven, kiln	155	78	0	0	17	7	497,818	1,226,574
Casting, molding, forging equipment	36	17	0	0	3	2	100,210	1,118,444
Heat treating equipment	39	22	0	0	2	5	222,800	19,410
Working, shaping machines	110	44	1	0	4	17	398,271	237,510
Coating machines	16	14	0	0	0	2	28,501	23,640
Painting equipment	34	36	0	0	2	18	69,971	171,400
Chemical process equipment	28	15	0	0	7	11	2,232,300	387,675
Waste recovery equipment	12	15	0	0	0	0	38,250	5,450
Other processing equipment	100	25	0	0	15	2	2,346,860	72,120
Unknown service, maintenance equipment	13	18	0	0	0	4	355	173,250
Incinerator	17	31	0	0	0	0	18,650	9,105
Bearing, brake	27	2	0	0	1	0	57,265	0
Rectifier, charger	18	6	0	0	2	0	633,880	96,000
Tarpot	23	4	0	0	1	1	23,025	140
Arc, oil lamp	6	3	0	0	0	1	750	2,200
Elevator	15	5	0	0	0	0	5,500	500
Torches	0	0	0	0	0	0	0	0
Other service, maintenance equipment	124	58	2	0	7	8	384,368	812,946
Other object, exposure fire	491	34	0	2	11	14	436,915	519,411
Exposure fire, 50 ft. or more (removed)	42	11	0	0	0	0	117,540	38,670
Exposure fire, 1-50 ft. (detached)	314	168	2	0	13	25	735,072	823,465
Adjoining exposure	101	8	2	0	10	0	559,405	2,380
Attached, protected exposure	4	3	0	0	0	0	2,050	23,000
Attached, unprotected exposure	27	14	0	0	0	9	2,143,833	130,100
Vehicle	320	128	4	0	15	8	1,784,290	561,215
No equipment involved	8,226	2,912	9	12	314	420	26,909,045	17,076,328
Other equipment	382	10	0	0	12	0	1,208,397	1,050,720
Unknown or unreported	4,359	1,941	8	1	430	381	24,497,990	27,224,672
Total	21,832	7,443	32	16	1,074	1,255	$83,651,484	$67,232,596

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11.)

NOTE: Mobile property and outside fires are not included with non-residential structure fires.

Appendix VIII

Additional Findings from the Household Survey of Fires

(Discussed in Section IV)

CONTINUED

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Table VIII-1. CHARACTERISTICS OF REPORTED AND UNREPORTED HOUSEHOLD FIRES

Characteristic	Reported		Unreported		Total	
	Number	Percent	Number	Percent	Number	Percent
Location:						
Residence	173	7.0%	1,754	71.0%	1,927	78%
All Other Household Fires (including car, garage, etc.)	150	6.0	386	16.0	536	22
Total	323	13.0	2,140	87.0	2,463	100
Activity:						
Cooking	37	1.5	1,127	46.0	1,164	47
Smoking	12	0.5	117	5.0	129	5
Playing with matches	9	0.4	49	2.0	58	2
Lighting fire	7	0.3	21	0.8	28	1
Other	258	10.0	826	34.0	1,084	44
Total	323	13.0	2,140	87.0	2,463	100
Material First Ignited:						
Grease/food	22	0.9	808	33.0	830	34
Appliances	30	1.2	481	20.0	511	21
Bedding/furniture	33	1.3	157	6.0	190	8
Engine	29	1.2	66	2.7	95	4
Trash/leaves	21	0.9	52	2.1	73	3
Household textiles (curtains, etc.)	11	0.4	58	2.4	69	3
Clothing	5	0.2	62	2.5	67	3
Dryers	10	0.4	32	1.3	42	2
Other	162	7.0	424	17.0	586	24
Total	323	13.0	2,140	87.0	2,463	100
Work Lost:						
Missed one or more days	27	1.1	20	0.8	47	2
No missed days	296	12.0	2,120	86.0	2,416	98
Total	323	13.0	2,140	87.0	2,463	100
Severity of Fire:						
More than $200 damage or resulting in at least one injury — Grease or food fire	5	0.2	51	2.0	56	2
More than $200 damage or resulting in at least one injury — Other fires	151	6.0	156	6.0	307	12.5
Less than $200 damage or no injury — Grease or food fire	17	0.7	757	31.0	774	31
Less than $200 damage or no injury — Other fires	150	6.0	1,176	48.0	1,326	54
Total	323	13.0	2,140	87.0	2,463	100%

Who Put Fire Out:	Fire Department		Male[1]		Female[1]		Other[2]		Total	
More than $200 damage or resulting in at least one injury — Grease or food fire	3	0.1%	12	0.5%	34	1.4%	7	0.3%	56	2%
More than $200 damage or resulting in at least one injury — Other fires	120	5.0%	77	3.0%	73	3.0%	37	1.5%	307	12%
Less than $200 damage or no injury — Grease or food fire	3	0.1%	191	8.0%	548	22.0%	32	1.3%	774	31%
Less than $200 damage or no injury — Other fires	80	3.0%	456	19.0%	625	25.0%	165	7.0%	1,326	54%
Total	206	8.0%	736	30.0%	1,280	52.0%	241	10.0%	2,463	100%

[1] Household member. [2] Neighbors, etc.

SOURCE: Joiner, B. L., Martin, R., and Gaumnitz, C., *Statistical Analysis of the Household Fire Survey* (Madison, WI: Statistical Laboratory, U. of Wisconsin, September 1977 for the National Fire Prevention and Control Administration), Grant No. NFPCA-76009.

NOTES: There were 2,463 fires reported by the sample households in the National Fire Household Survey. Numbers are uncorrected for any differential recall between fires reported to fire departments and those unreported. Some totals may not equal the sum of their elements due to round-off error.

Appendix IX

Tables of California and Ohio Residential Fire Incidents and Rates by Causes

(Discussed in Section VIII)

Table IX-1. NUMBER OF RESIDENTIAL FIRES BY CAUSE—California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Cause	Fires		Deaths		Injuries		Dollar Loss	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Number Reported[2]							
							(in thousands)	
Cooking	8,948	2,761	20	21	384	287	$ 5,995	$ 4,623
Smoking	6,174	2,302	100	37	596	307	11,827	4,796
Heating	6,058	2,169	16	20	356	258	13,476	8,416
Incendiary/Suspicious	4,871	2,107	20	9	287	315	16,468	8,774
Electrical Distribution	3,377	1,375	10	9	190	185	9,788	8,450
Appliances	3,077	1,215	7	7	126	112	4,414	2,365
Children Playing	1,999	1,418	3	7	120	202	3,181	3,194
Open Flame, Spark	2,675	543	7	9	129	66	3,824	1,649
Exposure	1,600	494	1	0	35	82	3,928	1,867
Flammable Liquids	413	147	4	0	47	45	928	688
Explosives, Fireworks	381	33	0	0	15	9	537	67
Air Conditioning, Refrigeration	379	83	2	0	9	6	576	349
Natural	262	297	0	1	11	22	293	1,185
Gas	161	57	1	1	35	36	334	835
Other Equipment	157	88	0	0	3	6	298	309
Other Heat	766	518	5	10	35	50	1,572	1,255
Unknown	5,287	1,363	74	70	367	360	16,835	12,514
Total residential	46,585	16,970	270	201	2,745	2,348	$94,274	$61,335

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.

NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Table IX-2. RATE OF RESIDENTIAL FIRES BY CAUSE—California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Cause	Fires		Deaths		Injuries		Dollar Loss	
	California	Ohio	California	Ohio	California	Ohio	California	Ohio
	Rate[2]							
Cooking	42	26	0.9	2	18	27	$0.28	$0.43
Smoking	29	21	5	3	28	29	0.56	0.45
Heating	29	20	0.8	1.9	17	24	0.64	0.78
Incendiary/Suspicious	23	20	0.9	0.8	14	29	0.78	0.82
Electrical Distribution	16	13	0.5	0.8	9	17	0.46	0.79
Appliances	15	11	0.3	0.7	6	10	0.21	0.22
Children Playing	9	13	0.1	0.7	6	19	0.15	0.30
Open Flame, Spark	13	5	0.3	0.8	6	6	0.18	0.15
Exposure	8	5	0	0	1.7	8	0.19	0.17
Flammable Liquids	1.9	1.4	0.2	0	2	4	0.04	0.06
Explosives, Fireworks	1.8	0.3	0	0	0.7	0.8	0.03	0.01
Air Conditioning, Refrigeration	1.8	0.8	0.1	0	0.4	0.6	0.03	0.03
Natural	1.2	3	0	0	0.5	2	0.01	0.11
Gas	0.8	0.5	0	0	1.7	3	0.02	0.08
Other Equipment	0.7	0.8	0	0	0.1	0.6	0.01	0.03
Other Heat	4	5	0.2	0.9	1.7	5	0.07	0.12
Unknown	25	13	3	7	17	33	0.79	1.16
Total residential	220	158	13	19	130	218	$4.45	$5.70

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[2] Fires/100,000 persons, deaths/million persons, injuries/million persons, dollar loss per capita. Based on 1975 Census estimates of California and Ohio populations.

NOTE: Some totals may not equal the sum of their elements due to round-off error. Absolute values less than two were rounded to the nearest tenth.

Table IX-3. NUMBER OF RESIDENTIAL FIRES BY DWELLING TYPE AND CAUSE— California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Cause	One- and Two-Family Dwellings		Apartments, Tenements, and Flats		Mobile Homes		Hotels, Motels, Inns, and Lodges		Other Residential		Total Residential	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number of Reported Fires[2]											
Cooking	5,910	1,935	2,752	730	177	60	85	32	24	4	8,948	2,761
Smoking	2,697	1,409	2,600	748	149	28	658	92	70	25	6,174	2,302
Heating	5,056	1,865	781	165	132	121	67	13	22	5	6,058	2,169
Incendiary/Suspicious	3,064	1,463	1,418	548	113	27	191	43	85	26	4,871	2,107
Electrical Distribution	2,579	1,132	529	128	184	83	65	25	20	7	3,377	1,375
Appliances	2,371	994	586	169	69	33	43	15	8	4	3,077	1,215
Children Playing	1,473	1,035	471	342	32	29	6	9	17	3	1,999	1,418
Open Flame, Spark	1,784	379	751	131	36	13	79	7	25	13	2,675	543
Exposure	1,254	408	267	59	56	18	11	6	12	3	1,600	494
Flammable Liquids	322	120	78	21	8	4	3	2	2	0	413	147
Explosives, Fireworks	335	30	40	1	2	0	2	0	2	2	381	33
Air Conditioning, Refrigeration	291	66	55	12	20	2	12	2	1	1	379	83
Natural	192	265	57	24	7	6	4	2	2	0	262	297
Gas	118	43	25	5	14	7	3	2	1	0	161	57
Other Equipment	97	60	36	19	14	10	8	0	2	0	157	88
Other Heat	569	404	155	91	22	12	17	9	3	2	766	518
Unknown	3,754	1,073	1,170	189	182	74	133	16	48	11	5,287	1,363
Total Residential Fires	31,866	12,680	11,771	3,382	1,217	527	1,387	275	344	106	46,585	16,970
Total Residential Deaths	168	145	74	37	16	16	8	3	4	0	270	201
Total Residential Injuries	1,754	1,747	783	477	74	68	105	42	29	14	2,745	2,348
Total Residential Dollar Loss (in thousands)	$66,396	$48,581	$22,122	$8,374	$3,072	$2,488	$1,958	$1,592	$723	$298	$94,274	$61,335

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.

NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Table IX-4. RATE OF RESIDENTIAL FIRES BY DWELLING TYPE AND CAUSE— California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Cause	One- and Two-Family Dwellings		Apartments, Tenements, and Flats		Mobile Homes		Hotels, Motels, Inns, and Lodges		Other Residential		Total Residential	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Rate[2]											
Cooking	28	18	13	7	0.8	0.6	0.4	0.3	0.1	0	42	26
Smoking	13	13	12	7	0.7	0.3	3	0.9	0.3	0.2	29	21
Heating	24	17	4	1.5	0.6	1.1	0.3	0.1	0.1	0	29	20
Incendiary/Suspicious	14	14	7	5	0.5	0.3	0.9	0.4	0.4	0.2	23	20
Electrical Distribution	12	11	2	1.2	0.9	0.8	0.3	0.2	0	0.1	16	13
Appliances	11	9	3	1.6	0.3	0.3	0.2	0.1	0	0.1	15	11
Children Playing	7	10	2	3	0.2	0.3	0	0.1	0	0	9	13
Open Flame, Spark	8	4	4	1.2	0.2	0.1	0.4	0.1	0.1	0.1	13	5
Exposure	6	4	1.3	0.5	0.3	0.2	0	0.1	0	0	8	5
Flammable Liquids	1.5	1.1	0.4	0.2	0	0	0	0	0	0	1.9	1.4
Explosives, Fireworks	1.6	0.3	0.2	0	0	0	0	0	0	0	1.8	0.3
Air Conditioning, Refrigeration	1.4	0.6	0.3	0.1	0	0	0	0	0	0	1.8	0.8
Natural	0.9	2	0.3	0.2	0	0.1	0	0	0	0	1.2	3
Gas	0.6	0.4	0.1	0	0	0.1	0	0	0	0	0.8	0.5
Other Equipment	0.5	0.5	0.2	0.2	0	0.1	0	0	0	0	0.7	0.8
Other Heat	3	4	0.7	0.8	0.1	0.1	0	0.1	0	0	4	5
Unknown	18	10	6	1.8	0.9	0.7	0.6	0.1	0.2	0.1	25	13
Total Residential Fires	150	118	56	31	6	5	7	3	1.6	1	220	158
Total Residential Deaths	8	13	3	3	0.8	1.5	0.4	0.3	0.2	0	13	19
Total Residential Injuries	83	162	37	44	3	6	5	4	1.4	1.3	130	218
Total Residential Dollar Loss	$ 3.13	$ 4.52	$ 1.04	$ 0.78	$0.15	$0.23	$0.09	$0.15	$0.03	$0.03	$ 4.45	$ 5.70

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[2] Fires/100,000 persons, deaths/million persons, injuries/million persons, dollar loss per capita. Based on 1975 Census estimates of California and Ohio populations. Rates within each occupancy category are based on the total state population, rather than the population residing in that category.

NOTE: Some totals may not equal the sum of their elements due to round-off error. Absolute values less than two were rounded to the nearest tenth.

Appendix X

Detailed Tables of California and Ohio Residential Fires

(Discussed in Section IX)

Table X-1. NUMBER OF RESIDENTIAL COOKING FIRES BY TYPE OF EQUIPMENT AND IGNITION FACTOR —California (CFIRS 1975,) Ohio (NFIRS 1975)[1]—Continued

Type of Equipment / Ignition Factor	Stoves and Ovens		Deep Fat Fryer		Portable Cooking Unit		Open Fired Grill		Other Equipment	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]									
Misuse or Operational Deficiency:										
Unattended	2,322	1,095	11	27	64	22	12	7	49	25
Accidentally turned on, not turned off	408	236	1	4	15	11	0	0	11	9
Other operational deficiency	168	62	5	4	11	6	6	0	5	5
Abandoned, discarded material	78	15	1	0	2	0	8	0	4	0
Falling asleep	189	116	3	4	5	6	0	0	3	3
Inadequate control of open fire	217	50	2	0	2	1	11	3	5	3
Unconscious[3]	119	14	2	0	5	0	2	0	1	0
Other misuse of heat of ignition	1,345	151	16	4	26	0	4	0	146	14
Fuel spilled	105	42	0	2	7	2	6	0	4	0
Improper container for material ignited	36	97	2	0	3	5	5	4	2	5
Combustible too close to heat	386	38	0	0	27	2	15	0	9	1
Other misuse of material	479	126	2	2	11	5	42	4	28	3
(Subtotal Misuse)	(5,852)	(2,042)	(45)	(47)	(178)	(60)	(111)	(18)	(267)	(68)
Mechanical Failure, Malfunction:										
Short circuit	280	114	0	1	24	12	0	0	23	15
Part failure, leak, break	420	114	1	0	13	1	5	4	15	5
Lack of maintenance, worn out	128	20	0	1	7	2	3	0	10	2
Other mech. failure, malfunc.	199	101	9	6	49	19	2	0	31	8
(Subtotal Mech. Failure)	(1,027)	(349)	(10)	(8)	(93)	(34)	(10)	(4)	(79)	(30)
Design, Construction, Installation Deficiency	61	16	1	0	2	0	8	2	5	6
Other	914	22	2	0	19	1	32	0	220	3
Unknown	9	47	0	2	0	1	1	0	2	0
Total Fires	7,863	2,476	58	57	292	96	162	24	573	107
Total Deaths	18	19	0	1	0	1	1	0	1	0
Total Injuries	335	240	6	12	13	17	8	0	22	18
Dollar Loss in Thousands	$4,712	$3,958	$155	$133	$382	$319	$266	$15	$479	$197

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.
[3] This category also includes "Mental, physical impairment; drug, alcohol stupor."
NOTE: Some totals may not equal the sum of their elements due to round-off error.

Table X-1 cont'd. NUMBER OF RESIDENTIAL COOKING FIRES BY TYPE OF EQUIPMENT AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Ignition Factor	Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]							
Misuse or Operational Deficiency:								
Unattended	2,458	1,176	4	5	76	91	$1,484	$1,496
Accidentally turned on, not turned off	435	260	0	1	19	22	569	918
Other operational deficiency	195	77	0	0	7	11	104	128
Abandoned, discarded material	93	15	0	0	5	1	60	1
Falling asleep	200	129	1	1	11	15	136	165
Inadequate control of open fire	237	57	0	0	1	3	169	38
Unconscious[3]	129	14	2	2	2	4	58	29
Other misuse of heat of ignition	1,537	169	4	0	74	28	974	231
Fuel spilled	122	46	1	0	17	12	77	152
Improper container for material ignited	48	111	0	3	3	12	26	112
Combustible too close to heat	437	41	2	1	20	7	313	72
Other misuse of material	562	140	1	3	54	30	483	165
(Subtotal Misuse)	(6,453)	(2,235)	(15)	(16)	(289)	(236)	(4,453)	(3,507)
Mechanical Failure, Malfunction:								
Short circuit	327	142	1	0	5	2	68	444
Part failure, leak, break	454	124	0	1	12	14	371	123
Lack of maintenance, worn out	148	25	0	0	2	2	52	24
Other mechanical failure, malfunction	270	134	0	2	20	25	291	390
(Subtotal Mech. Failure)	(1,219)	(425)	(1)	(3)	(39)	(43)	(782)	(981)
Design, Construction, Installation Deficiency	77	24	0	1	7	6	110	51
Other	1,187	26	4	1	49	1	646	38
Unknown	12	50	0	0	0	1	4	46
Total Fires	8,948	2,760	—	—	—	—	—	—
Total Deaths	—	—	20	21	—	—	—	—
Total Injuries	—	—	—	—	384	287	—	—
Dollar Loss in Thousands	—	—	—	—	—	—	$5,995	$4,623

Table X-2. NUMBER OF FIRES IN STOVES AND OVENS IN RESIDENTIAL OCCUPANCIES BY TYPE OF FUEL AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)[1]—Continued

a. STOVES

Ignition Factor \ Type of Fuel	Gas		Electric		Other[2]		Total	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[3]							
Misuse or Operational Deficiency:								
Unattended	818	306	1,032	621	161	72	2,011	999
Accidentally turned on, not turned off	108	69	219	134	21	15	348	218
Other operational deficiency	39	17	42	13	19	19	100	39
Falling asleep	100	61	53	39	23	8	176	108
Inadequate control of open fire	122	31	40	10	30	6	192	47
Other misuse of heat of ignition	537	49	638	83	114	18	1,289	150
Combustible too close to heat	132	23	121	6	23	3	276	32
Other misuse of material ignited	187	97	204	91	51	25	442	213
(Subtotal Misuse)	(2,043)	(653)	(2,349)	(977)	(442)	(156)	(4,834)	(1,806)
Mechanical Failure, Malfunction:								
Short circuit	1	1	5	2	187	91	193	94
Part failure, leak, break	260	76	6	2	64	15	330	93
Other mechanical failure, malfunction	81	23	30	21	88	42	199	86
(Subtotal Mech. Failure)	(342)	(100)	(41)	(25)	(339)	(148)	(722)	(273)
Design, Construction, Installation Deficiency	21	7	7	3	15	5	43	15
Other	117	5	101	8	537	4	755	17
Unknown	3	10	3	11	2	20	8	41
Total	2,526	775	2,501	1,044	1,335	333	6,362	2,152

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Includes liquid and solid fueled equipment, as well as unknown fuel.
[3] Reported fire incidents shown do not include all fires attended by fire departments.

Table X-2 cont'd. NUMBER OF FIRES IN STOVES AND OVENS IN RESIDENTIAL OCCUPANCIES BY TYPE OF FUEL AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)[1]

b. OVENS

Ignition Factor \ Type of Fuel	Gas		Electric		Other[2]		Total	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[3]							
Misuse or Operational Deficiency:								
Unattended	184	43	99	45	28	8	311	96
Accidentally turned on, not turned off	32	9	23	7	5	2	60	18
Other operational deficiency	44	8	18	11	6	4	68	23
Falling asleep	8	4	4	3	1	1	13	8
Inadequate control of open fire	15	2	2	0	8	1	25	3
Other misuse of heat of ignition	146	17	73	10	34	3	253	30
Combustible too close to heat	67	3	36	2	7	1	110	6
Other misuse of material ignited	102	29	56	17	20	6	178	52
(Subtotal Misuse)	(598)	(115)	(311)	(95)	(109)	(26)	(1,018)	(236)
Mechanical Failure, Malfunction:								
Short circuit	1	0	2	1	84	19	87	20
Part failure, leak, break	38	13	3	2	49	6	90	21
Other mechanical failure, malfunction	60	9	25	13	43	13	128	35
(Subtotal Malfunction)	(99)	(22)	(30)	(16)	(176)	(38)	(305)	(76)
Design, Construction, Installation Deficiency	8	0	7	0	3	1	18	1
Other	68	2	44	3	47	0	159	5
Unknown	0	3	0	2	1	1	1	6
Total	775	142	392	116	336	66	1,501	324

Tabie X-3. NUMBER OF SMOKING FIRES IN RESIDENTIAL OCCUPANCIES AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)

Ignition Characteristic	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]							
Form of Heat of Ignition:							(in thousands)	
Cigarette	4,127	2,155	85	34	467	290	$9,143	$4,421
Pipe	33	18	0	1	6	2	68	16
Cigar	16	14	1	0	1	1	30	55
Other	192	34	3	0	19	2	476	58
Unknown	1,643	66	2	0	89	9	1,790	195
Total	6,011	2,287	91	35	582	304	$11,507	$4,745
Ignition Factor:								
Abandoned (cigarette)	3,424	1,790	46	26	259	220	7,393	3,849
Falling asleep	661	323	40	6	162	69	1,727	488
Children Playing	100	40	3	0	29	2	197	46
Unattended	38	3	0	0	1	0	79	17
Other	1,784	119	2	3	131	13	2,109	336
Unknown	4	12	0	0	0	0	2	9
Total	6,011	2,287	91	35	582	304	$11,507	$4,745
Area of Origin:								
Bedroom	2,494	1,017	46	9	288	141	4,377	1,297
Living room	1,590	602	37	22	200	114	4,236	1,688
Kitchen	289	134	3	2	23	11	696	292
Trash area	275	45	0	0	1	0	44	1
Garage area	162	19	0	0	5	1	253	69
Bathroom	113	71	0	0	9	9	175	83
Supply storage	75	22	0	0	0	0	67	30
Roof	66	8	0	0	1	0	65	2
Other	909	337	4	2	46	26	1,404	1,157
Unknown	38	32	1	0	9	2	190	126
Total	6,011	2,287	91	35	582	304	$11,507	$4,745

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.

Table X-4. NUMBER OF HEATING FIRES IN RESIDENTIAL OCCUPANCIES BY TYPE OF HEATING AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)[1]—Continued

Heating Type / Ignition Factor	Central Heating		Fixed Local Heating		Portable Heaters		Water Heaters		Chimney/Flue and Connector	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]									
Mechanical Failure, Malfunction										
Short circuit	102	68	40	12	22	15	14	7	1	1
Automatic control failure	70	78	26	21	2	4	30	11	3	0
Lack of maintenance, worn out	93	53	86	13	6	1	31	11	41	34
Part failure, leak, break	100	42	107	26	9	3	126	25	14	20
Other malfunction	110	120	64	32	11	10	34	18	0	7
(Subtotal Mech. Failure)	(475)	(361)	(323)	(104)	(50)	(33)	(235)	(72)	(59)	(62)
Misuse or Operational Deficiency:										
Fuel spilled	5	14	11	6	1	1	140	29	2	0
Cleaning, refinishing, painting with flammable material	6	5	12	3	2	0	86	35	0	0
Improper storage of flammable material	0	55	1	28	0	31	5	82	0	13
Combustible too close to heat	182	19	508	10	63	12	266	30	17	2
Improper container for flammable material	13	9	22	2	2	2	49	21	0	1
Other misuse of material ignited	12	18	41	13	3	1	57	14	10	8
Inadequate control of open fire	1	0	1	2	2	0	1	1	10	6
Other misuse of heat of ignition	19	12	57	9	31	23	9	4	11	6
Unattended	1	4	30	7	11	13	2	0	1	0
Overloaded	5	14	8	8	2	1	0	0	6	3
Other operational deficiency	24	23	69	24	12	6	35	9	17	14
(Subtotal Misuse)	(268)	(173)	(759)	(112)	(129)	(90)	(650)	(225)	(73)	(53)
Design, Construction, Installation Deficiency:										
Design deficiency	12	5	17	5	1	0	8	0	26	13
Construction deficiency	8	8	30	17	3	0	14	3	41	20
Installed too close to combustibles	32	23	96	22	10	9	26	6	47	32
Other design, construction, installation	33	11	74	11	9	3	31	3	48	18
(Subtotal Design)	(85)	(47)	(217)	(55)	(23)	(12)	(79)	(12)	(162)	(83)
Other	80	11	329	6	46	1	269	4	104	4
Unknown	1	33	3	17	0	6	1	6	3	7
Total Fires	909	625	1,631	294	248	142	1,234	319	401	209
Total Deaths	2	9	7	1	3	3	2	1	0	0
Total Injuries	26	86	94	27	26	34	139	51	9	17
Dollar Loss in Thousands	$1,517	$2,147	$3,727	$1,437	$1,038	$605	$3,620	$762	$719	$615

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.
NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Table X-4 cont'd. NUMBER OF HEATING FIRES IN RESIDENTIAL OCCUPANCIES BY TYPE OF HEATING AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)

Heating Type / Ignition Factor	Fireplaces		Other and Unknown		Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]											
Mechanical Failure, Malfunction:												
Short circuit	0	1	6	4	185	108	0	0	3	1	$149	$254
Automatic control failure	0	0	4	3	135	117	2	1	10	11	331	520
Lack of maintenance, worn out	133	26	5	1	395	139	0	0	4	3	377	244
Part failure, leak, break	16	14	8	4	380	134	1	2	11	14	1,099	719
Other malfunction	18	11	25	4	262	202	1	3	17	35	731	1,101
(Subtotal Mech. Failure)	(167)	(52)	(48)	(16)	(1,357)	(700)	(4)	(6)	(45)	(64)	(2,687)	(2,837)
Misuse or Operational Deficiency:												
Fuel spilled	5	2	4	2	168	54	0	0	47	15	1,182	159
Cleaning, refinishing, painting with flammable material	2	0	0	0	108	43	1	0	35	8	278	35
Improper container for flammable material	3	24	0	5	9	238	0	2	3	62	18	781
Combustible too close to heat	82	4	13	0	1,131	77	5	0	76	6	3,510	268
Improper storage of flammable material	7	1	1	1	94	37	0	0	2	9	256	93
Other misuse of material ignited	129	28	26	3	277	85	0	1	35	28	712	216
Inadequate control of open fire	42	16	0	0	57	25	0	0	5	2	225	25
Other misuse of heat of ignition	62	16	22	2	211	72	1	2	16	13	353	290
Unattended	20	7	5	3	70	34	0	0	5	4	276	144
Overloaded	36	8	1	1	58	35	0	1	0	4	55	95
Other operational deficiency	84	21	3	2	243	99	0	1	1	18	309	276
(Subtotal Misuse)	(472)	(127)	(75)	(19)	(2,426)	(799)	(7)	(7)	(222)	(160)	(7,173)	(2,382)
Design, Construction, Installation Deficiency:												
Design deficiency	65	46	3	0	132	69	1	0	11	1	225	104
Construction deficiency	115	126	4	0	215	174	0	0	9	14	508	488
Installed too close to combustibles	42	56	11	6	264	154	3	0	9	10	636	458
Other design, construction, installation	97	52	31	2	323	100	0	2	12	10	616	334
(Subtotal Design)	(319)	(280)	(49)	(8)	(934)	(497)	(4)	(2)	(41)	(35)	(1,985)	(1,385)
Other	412	12	78	1	1,318	39	1	0	47	1	1,600	62
Unknown	12	31	0	1	20	101	0	4	1	11	28	602
Total Fires	1,382	502	250	45	6,055	2,136	—	—	—	—	—	—
Total Deaths	1	2	1	3	—	—	16	19	—	—	—	—
Total Injuries	53	48	9	8	—	—	—	—	356	271	—	—
Dollar Loss in Thousands	$2,382	$1,439	$470	$263	—	—	—	—	—	—	$13,474	$7,268

Table X-5. NUMBER OF INCENDIARY/SUSPICIOUS FIRES IN RESIDENTIAL OCCUPANCIES BY IGNITION CHARACTERISTIC—California (CFIRS 1975), Ohio (NFIRS 1976)[1]

Ignition Characteristic	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]						(in thousands)	
Type of Fire:								
Incendiary, not civil disturbance	2,764	1,140	15	3	127	159	$7,845	$4,234
Suspicious, not civil disturbance	2,030	944	5	6	158	156	8,438	4,478
Incendiary, during civil disturbance	41	12	0	0	2	0	89	19
Suspicious, during civil disturbance	36	11	0	0	0	0	96	42
Total	4,871	2,107	20	9	287	315	$16,468	$8,774
Form of Heat of Ignition:								
Incendiary device	232	201	3	0	11	25	420	1,115
Match	2,042	685	4	0	76	63	4,428	1,619
Other flame	480	636	6	3	45	125	1,953	3,539
Cigarette	63	27	0	0	5	2	166	47
Fireworks	66	6	0	0	2	0	65	7
Other	196	84	0	2	7	21	452	357
Unknown	1,792	468	7	4	141	79	8,984	2,090
Total	4,871	2,107	20	9	287	315	$16,468	$8,774
Material Ignited:								
Gasoline	243	177	2	2	16	27	824	802
Kerosene	53	59	0	0	2	9	113	414
Other flammable liquid	418	124	11	0	29	18	2,444	588
Paper	704	283	0	0	25	25	906	365
Wood	482	474	0	1	32	82	2,055	2,089
Fabric	1,301	442	3	3	60	56	2,819	1,367
Other	532	321	1	0	54	55	2,256	1,431
Unknown	738	222	3	3	69	43	5,050	1,719
Total	4,871	2,107	20	9	287	315	$16,468	$8,774

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.
NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Table X-6. NUMBER OF RESIDENTIAL ELECTRICAL DISTRIBUTION FIRES BY ELECTRICAL COMPONENT AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)[1]—Continued

Ignition Factor \ Electrical Component	Fixed Wiring		Lamps, Fixtures		Cords, Plugs		Switch, Outlets		Light Bulbs		Other	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]											
Mechanical Failure, Malfunction:												
Short circuit	426	274	90	77	385	160	229	68	22	12	93	177
Part failure, leak, break	46	6	18	4	23	4	44	3	1	1	33	7
Lack of maintenance, worn out	30	14	17	1	78	9	18	1	4	4	18	4
Automatic control failure	3	1	1	0	5	0	3	0	0	0	2	5
Other malfunction	102	70	29	24	87	47	57	18	6	7	96	56
(Subtotal Mech. Failure)	(607)	(365)	(155)	(106)	(578)	(220)	(351)	(90)	(33)	(20)	(242)	(249)
Design, Construction, Installation Deficiency	86	22	32	28	31	7	40	3	22	5	23	11
Misuse or Operational Deficiency:												
Misuse of heat of ignition	4	3	20	6	6	6	1	2	17	5	4	2
Improper container for flammable material	0	1	0	8	0	3	0	0	0	16	0	2
Combustible too close to heat	3	0	73	10	9	0	4	0	48	4	5	0
Other misuse of material ignited	4	0	18	9	7	3	12	2	4	0	6	5
Overloaded	21	15	6	4	55	19	12	5	1	0	17	11
Unattended	2	1	11	5	2	1	1	2	3	0	4	0
Accidentally turned on, not turned off	1	0	10	6	2	1	2	0	7	1	2	6
Other operational deficiency	25	6	12	11	7	3	10	2	14	6	15	6
(Subtotal Misuse)	(60)	(26)	(150)	(59)	(88)	(36)	(42)	(13)	(94)	(32)	(53)	(32)
Other	83	5	38	6	41	3	49	1	29	4	425	2
Unknown	1	8	0	0	3	3	0	1	1	4	0	8
Total Fires	837	426	375	199	741	260	482	108	179	65	743	302
Total Deaths	0	2	2	1	5	3	2	2	1	0	0	1
Total Injuries	52	68	18	19	62	39	18	16	6	6	34	37
Dollar Loss in Thousands	$3,157	$3,594	$1,105	$729	$2,747	$1,197	$923	$618	$671	$186	$1,488	$2,022

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).

[2] Reported fire incidents shown do not include all fires attended by fire departments.

NOTE: The number of fires involving light bulbs and improper containers may result from interpretation of codes or encoding errors. Dollar loss totals may not equal the sum of their elements due to round-off error.

Table X-6 cont'd. NUMBER OF RESIDENTIAL ELECTRICAL DISTRIBUTION FIRES BY ELECTRICAL COMPONENT AND IGNITION FACTOR—California (CFIRS 1975), Ohio (NFIRS 1976)

Ignition Factor	Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]							
Mechanical Failure, Malfunction:								
Short circuit	1,245	768	3	1	77	101	$4,346	$4,605
Part failure, leak, break	165	25	0	0	2	0	244	29
Lack of maintenance, worn out	165	29	0	0	4	3	334	141
Automatic control failure	14	7	0	0	0	0	98	22
Other malfunction	377	221	3	6	24	41	1,372	2,360
(Subtotal Mech. Failure)	(1,966)	(1,050)	(6)	(7)	(107)	(147)	(6,394)	(7,156)
Design, Construction, Installation Deficiency	234	76	1	1	29	11	682	260
Misuse or Operational Deficiency:								
Misuse of heat of ignition	52	24	1	0	3	1	97	67
Improper container for flammable material	0	30	0	0	0	6	0	107
Combustible too close to heat	142	14	1	0	3	1	264	7
Other misuse of material ignited	51	19	0	0	3	1	265	20
Overloaded	112	54	0	0	10	7	380	286
Unattended	23	9	0	0	2	1	44	27
Accidentally turned on, not turned off	24	14	0	0	1	0	30	56
Other operational deficiency	83	34	0	0	1	4	202	126
(Subtotal Misuse)	(487)	(198)	(2)	(0)	(23)	(21)	(1,281)	(695)
Other	665	21	1	1	30	6	1,734	79
Unknown	5	24	0	0	1	0	0	155
Total Fires	3,357	1,369	—	—	—	—	—	—
Total Deaths	—	—	10	9	—	—	—	—
Total Injuries	—	—	—	—	190	185	—	—
Dollar Loss in Thousands	—	—	—	—	—	—	$10,691	$8,346

Table X-7. NUMBER OF APPLIANCE FIRES IN RESIDENTIAL OCCUPANCIES BY APPLIANCE TYPE AND IGNITION FACTOR— California (CFIRS 1975), Ohio (NFIRS 1976)[1]—Continued

Appliance Type / Ignition Factor	Dryer		TV, Radio, Phonograph		Portable Appliance Producing Heat[2]		Washing Machine		Other[3]	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[4]									
Mechanical Failure, Malfunction:										
Short circuit	75	64	358	201	86	42	77	29	148	77
Part failure, leak, break	72	20	109	19	17	3	34	5	50	8
Lack of maintenance, worn out	122	71	20	12	19	2	31	3	35	11
Automatic control failure	82	72	0	3	17	14	3	1	10	7
Other malfunction	111	74	183	75	39	23	41	15	103	35
(Subtotal Mech. Failure)	(462)	(301)	(670)	(310)	(178)	(84)	(186)	(53)	(346)	(138)
Design, Construction, Installation Deficiency	40	11	16	0	5	1	2	1	19	7
Misuse or Operational Deficiency:										
Misuse of heat of ignition	14	9	4	0	30	5	3	2	40	12
Improper container for flammable material	1	26	0	3	0	5	1	0	0	7
Combustible too close to heat	60	9	4	0	4	4	3	0	28	1
Other misuse of material ignited	81	19	2	4	14	5	8	1	17	12
Overloaded	26	12	8	3	2	2	15	8	21	5
Unattended	22	18	3	3	21	13	2	0	12	7
Accidentally turned on, not turned off	2	0	2	2	27	9	1	0	14	5
Other operational deficiency	57	26	21	5	8	0	5	3	23	7
(Subtotal Misuse)	(263)	(119)	(46)	(20)	(106)	(43)	(38)	(14)	(155)	(56)
Other	212	8	52	2	21	0	17	2	211	0
Unknown	1	20	1	15	0	1	1	4	2	5
Total Fires	978	459	785	347	310	129	244	74	733	206
Total Deaths	2	0	4	7	1	0	0	0	0	0
Total Injuries	24	25	23	43	31	12	1	3	44	29
Dollar Loss in Thousands	$555	$353	$1,576	$1,068	$[illegible]	$279	$70	$60	$1,133	$605

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference [illegible]).
[2] Includes electric blankets, steam irons and other appliances producing controlled heat. Portable cooking equipment contained in Table X-1.
[3] Includes vacuum cleaners, motors, generators, electric hand tools, portable appliances not producing heat, and unknown equipment.
[4] Reported fire incidents shown do not include all fires attended by fire departments.

NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Table X-7 cont'd. NUMBER OF APPLIANCE FIRES IN RESIDENTIAL OCCUPANCIES BY APPLIANCE TYPE AND IGNITION FACTOR— California (CFIRS 1975), Ohio (NFIRS 1976)

Ignition Factor	Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[4]							
Mechanical Failure, Malfunction:								
Short circuit	744	413	0	1	37	33	$1,304	$903
Part failure, leak, break	282	55	0	0	2	9	246	69
Lack of maintenance, worn out	227	99	0	0	4	5	90	63
Automatic control failure	112	97	0	0	7	8	159	85
Other malfunction	477	222	3	4	18	33	657	567
(Subtotal Mech. Failure)	(1,842)	(886)	(3)	(5)	(68)	(88)	(2,456)	(1,687)
Design, Construction, Installation Deficiency	32	20	1	0	0	0	150	27
Misuse or Operational Deficiency:								
Misuse of heat of ignition	91	26	0	0	4	2	185	49
Improper container for flammable material	2	41	0	0	0	2	1	69
Combustible too close to heat	99	14	0	0	5	0	215	11
Other misuse of material ignited	122	41	1	0	18	8	268	78
Overloaded	72	30	0	0	0	2	50	13
Unattended	62	41	0	0	4	3	158	84
Accidentally turned on, not turned off	46	16	0	0	2	4	177	94
Other operational deficiency	114	41	0	0	8	0	110	87
(Subtotal Misuse)	(608)	(252)	(1)	(0)	(41)	(21)	(1,164)	(485)
Other	513	12	2	0	13	1	492	29
Unknown	5	45	0	2	1	2	4	137
Total Fires	3,050	1,215	—	—	—	—	—	—
Total Deaths	—	—	7	7	—	—	—	—
Total Injuries	—	—	—	—	123	112	—	—
Dollar Loss in Thousands	—	—	—	—	—	—	$4,265	$2,365

Table X-8. NUMBER OF RESIDENTIAL FIRES CAUSED BY CHILDREN PLAYING LISTED BY IGNITION CHARACTERISTIC— California (CFIRS 1975), Ohio (NFIRS 1975)[1]

Ignition Characteristic	Fires		Deaths		Injuries		Dollar Loss	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]							
Form of Heat of Ignition:							In Thousands	
Matches	1,107	964	2	3	74	133	$2,121	$1,711
Lighter	149	184	0	0	7	28	362	421
Candle	117	62	0	0	12	6	273	300
Fireworks	0	13	0	0	0	1	0	30
Gas fueled equipment	97	36	1	0	7	2	77	35
Electrical equipment	64	21	0	2	3	6	20	33
Other	130	109	0	0	15	16	210	379
Unknown	318	31	0	1	2	1	134	275
Total	1,982	1,420	3	6	120	193	$3,197	$3,184
Area of Origin:								
Bedroom	698	687	2	4	59	82	1,429	1,468
Living area	180	146	0	0	5	32	457	494
Kitchen	136	116	0	0	6	14	92	151
Bathroom	51	33	0	0	2	2	63	10
Closet	90	72	0	0	9	13	300	163
Supply storage	22	54	0	2	1	9	8	66
Laundry room	25	29	1	0	8	1	36	30
Garage	154	21	0	0	13	2	296	31
Other	343	240	0	0	17	38	472	562
Unknown	283	22	0	0	0	0	45	209
Total	1,982	1,420	3	6	120	193	$3,197	$3,184
Type of Material Ignited:								
Cotton or rayon fabric	636	588	0	1	36	78	982	1,087
Man-made fabric	165	192	0	0	13	23	382	561
Other fabric	82	81	1	0	12	15	244	210
Paper	252	155	0	2	12	19	459	323
Wood	78	92	0	0	4	11	180	392
Natural fiber	41	54	0	0	1	13	53	99
Polyester plastic	0	37	0	2	0	2	0	72
Gasoline	51	16	1	0	16	7	103	87
Other	371	163	0	0	19	21	484	247
Unknown	306	42	1	1	7	4	312	106
Total	1,982	1,420	3	6	120	193	$3,197	$3,184
Form of Material Ignited:								
Mattress	330	379	0	0	14	33	246	532
Bedding	185	178	2	1	19	26	509	489
Upholstered chair or sofa	123	158	0	0	5	46	304	609
Wearing apparel not on person	141	136	0	0	13	21	465	315
Trash	164	111	0	0	0	8	237	117
Roof covering	15	7	0	0	1	0	71	8
Newspaper, etc.	86	53	0	2	5	11	203	120
Curtain, drapery	67	44	0	0	2	2	99	71
Fuel	53	8	1	0	14	7	63	65
Toy	51	16	0	2	0	2	36	12
Box, carton, bag	34	29	0	0	2	1	24	19
Cooking material	37	11	0	0	1	1	5	22
Wearing apparel on person	6	13	0	0	5	5	5	12
Other	682	245	0	0	39	27	893	524
Unknown	8	32	0	1	0	3	36	270
Total	1,982	1,420	3	6	120	193	$3,197	$3,184

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.

NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Appendix XI

Number of Reported Residential Fires by Community and Cause

(Discussed in Section X)

Table XI-1. NUMBER OF REPORTED RESIDENTIAL FIRES BY COMMUNITY AND CAUSE—Continued

Community (Source of Data)	Population Estimate (Year)	Cause of Fire					
		Cooking	Smoking	Heating	Incendiary/ Suspicious	Electrical Distribution	Appliances
		Number Reported[1]					
NFIRS States:							
California (1)	21,185,000 (75)	8,948	6,174	6,058	4,871	3,577	3,077
Ohio (2)	10,759,000 (75)	2,761	2,302	2,169	2,107	1,375	1,215
Ohio Communities (2):	(73)						
Cities over 200,000 persons	2,499,113	1,115	1,329	481	1,255	380	365
Cleveland	678,615	73	375	63	404	50	32
Columbus	540,933	251	237	131	270	86	103
Cincinnati	426,245	383	309	62	148	70	62
Toledo	377,423	168	152	118	135	86	80
Akron	261,520	130	101	59	87	49	67
Dayton	214,377	110	155	48	211	39	21
Cities 50,000-200,000 persons	1,052,049	234	230	137	181	95	120
Youngstown	133,452	9	21	13	50	15	6
Canton	106 897	14	12	7	16	10	10
Parma	101,482	10	10	6	2	4	3
Lorain	79,025	18	24	8	17	3	6
Springfield	78,032	28	20	19	16	7	22
Kettering	72,051	16	6	7	8	6	2
Lakewood	67,865	27	20	11	2	5	4
Hamilton	66,195	22	21	7	15	11	14
Euclid	66,108	17	9	7	7	3	13
Warren	62,118	2	14	2	6	2	3
Mansfield	56,638	10	18	7	17	3	5
Cleveland Heights	56,071	14	17	9	4	5	8
Elyria	53,853	18	15	16	9	6	9
Lima	52,262	29	23	18	12	15	15
Cities 25,000-50,000 persons	1,012,674	313	218	169	147	122	156
Communities under 25,000 persons	6,179,535	1,074	518	1,370	525	761	561
UFIRS Cities (3):							
Total UFIRS Cities	2,513 956	1,353	976	662	999	361	328
Jacksonville, FL	579,669 (75)	317	185	153	140	69	67
Denver, CO[2]	523,700 (76)	354	243	133	210	84	72
Kansas City, MO	486,500 (75)	145	210	96	344	47	46
Tucson, AZ	305,200 (76)	158	80	88	98	54	44
Wichita, KS	265,455 (76)	90	128	97	26	58	27
Syracuse, NY	185,000 (76)	222	91	78	156	41	57
Madison, WI	168,432 (75)	67	39	17	25	8	15

[1] Reported fire incidents shown do not include all fires attended by fire departments. Estimated completeness is on the order of 90 percent for California, 50 percent for Ohio (Reference 11). For the cities shown the degree of completeness may vary from one population group to another. Care should be taken in comparing these cities.

[2] The Denver Fire Department has jurisdiction over Denver city and county.

[3] The total dollar loss per capita for the UFIRS cities excludes Syracuse, which does not record that information, and is based on a population of 2,328,956.

SOURCE: (1) 1975 CFIRS, (2) 1976 NFIRS, (3) 1976 UFIRS, except Kansas City (May 1975-April 1976).

Table XI-1 cont'd. NUMBER OF REPORTED RESIDENTIAL FIRES BY COMMUNITY AND CAUSE

Community (Source of Data)	Cause of Fire				Total Fires	Total Deaths	Total Injuries	Dollar Loss in Thousands
	Children Playing	Open Flame, Spark	Other	Unknown	Number Reported[1]			
NFIRS States:								
Calfiornia (1)	1,999	2,675	4,119	5,287	46,585	270	2,745	$94,274
Ohio (2)	1,418	543	1,717	1,363	16,970	201	2,348	$61,335
Ohio Communities (2):								
Cities over 200,000 persons	795	228	730	424	7,102	82	840	$14.873
Cleveland	226	53	268	193	1,737	23	145	4,965
Columbus	133	44	106	95	1,456	21	257	2,443
Cincinnati	202	65	111	11	1,423	13	151	2,296
Toledo	95	22	113	55	1,024	10	139	1,795
Akron	64	25	70	41	693	10	78	1,656
Dayton	75	19	62	29	769	5	170	1,718
Cities 50,000-200,000 persons	141	60	115	113	1,426	10	275	3,688
Youngstown	26	6	13	11	170	3	31	692
Canton	20	3	4	31	127	3	31	421
Parma	7	1	6	10	59	1	8	240
Lorain	16	7	8	7	114	2	21	411
Springfield	16	7	16	3	154	0	26	126
Kettering	4	1	3	4	57	0	20	168
Lakewood	4	7	9	2	91	0	15	139
Hamilton	8	7	6	8	119	0	21	91
Euclid	1	4	6	2	69	0	15	26
Warren	7	3	2	5	46	0	0	127
Mansfield	13	4	5	6	88	0	16	333
Cleveland Heights	7	4	13	1	82	0	16	188
Elyria	3	1	9	9	95	1	30	307
Lima	9	5	15	14	155	0	25	419
Cities 25,000-50,000 persons	107	54	117	122	1,525	11	268	4,300
Communities under 25,000 persons	369	199	742	690	6,809	97	853	37,497
UFIRS Cities (3):								
Total UFIRS Cities	381	194	665	675	6,594	43	650	$8,862[3]
Jacksonville, FL	83	31	159	204	1,408	9	67	3,428
Denver, CO[2]	74	40	77	80	1,367	7	89	653
Kansas City, MO	66	44	163	363	1,524	10	188	2,439
Tucson, AZ	30	26	112	8	698	2	75	1,302
Wichita, KS	51	21	58	0	556	7	86	502
Syracuse, NY	60	18	76	14	813	8	120	—[3]
Madison, WI	17	14	20	6	228	0	25	528

Appendix XII

Number of California and Ohio Fires in Non-Residential Structures by Cause

(Discussed in Section XI)

Table XII-1. NUMBER OF FIRES IN NON-RESIDENTIAL STRUCTURES BY OCCUPANCY TYPE AND CAUSE—California (CFIRS 1975), Ohio (NFIRS 1976)[1]—Continued

Cause	Occupancy Type											
	Public Assembly		Education		Institutions		Stores, Offices		Basic Industry		Manufacturing	
	Calif	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio
	Number Reported[2]											
Incendiary/Suspicious	637	177	990	148	598	114	781	197	73	16	311	66
Electrical Distribution	301	98	83	15	162	22	855	156	605	18	276	67
Open Flame, Spark	141	22	151	3	247	43	262	47	45	11	175	80
Smoking	244	64	57	35	588	158	365	100	23	3	136	52
Exposure	59	19	20	2	9	1	158	48	74	1	133	23
Cooking	793	189	27	6	91	20	98	23	12	1	81	19
Appliances	94	26	29	5	190	44	435	83	27	5	231	58
Heating	179	49	34	11	82	13	255	86	48	14	137	66
Flammable Liquid	30	5	19	2	4	1	167	35	50	4	199	72
Children Playing	24	11	62	8	4	6	33	16	11	0	40	5
Natural	13	12	12	5	14	7	53	13	33	3	140	76
Air Conditioning, Refrigeration	89	21	16	3	28	8	121	22	9	2	28	5
Gas	13	1	4	0	2	1	26	12	31	2	53	24
Explosives, Fireworks	8	3	1	0	1	0	11	0	6	0	6	0
Other Equipment	31	10	20	7	40	10	89	45	84	9	361	182
Other Heat	38	22	9	5	15	6	86	47	27	3	96	45
Unknown	363	54	159	16	164	20	586	126	120	4	522	69
Total Fires	3,057	783	1,693	271	2,239	474	4,381	1,056	1,278	96	2,925	909
Total Deaths	1	0	0	0	5	3	7	7	1	0	12	0
Total Injuries	140	100	57	24	84	85	142	338	41	15	367	211
Total Dollar Loss (in thousands)	$15,339	$6,976	$6,332	$2,217	$1,973	$1,199	$20,756	$16,068	$2,848	$880	$19,324	$16,003

[1] Estimated completeness is on the order of 90 percent for California and 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.

NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Table XII-1 cont'd. NUMBER OF FIRES IN NON-RESIDENTIAL STRUCTURES BY OCCUPANCY TYPE AND CAUSE —California (CFIRS 1975), Ohio (NFIRS 1976)

Cause	Occupancy Type													
	Storage		Vacant, Construction		Other		Total Fires		Total Deaths		Total Injuries		Dollar Loss in Thousands	
	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Calif.	Ohio	Ohio	Calif.
	Number Reported[2]													
Incendiary/Suspicious	1,007	772	491	613	69	63	4,957	2,166	4	6	192	257	$24,589	$16,087
Electrical Distribution	242	182	20	4	24	10	2,568	572	1	1	55	130	7,922	8,674
Open Flame, Spark	573	198	163	47	189	24	1,946	475	2	1	39	44	3,263	3,331
Smoking	283	136	85	19	56	7	1,837	574	3	1	75	37	3,594	634
Exposure	535	185	42	17	137	17	1,167	313	5	0	28	43	4,490	1,358
Cooking	46	17	8	3	4	2	1,160	280	0	0	34	46	1,587	1,045
Appliances	103	31	4	0	2	1	1,115	253	0	0	31	29	2,247	749
Heating	133	153	12	11	23	23	903	426	3	0	54	55	3,419	2,722
Flammable Liquid	157	99	24	2	8	1	658	221	9	0	63	31	3,569	2,324
Children Playing	237	265	47	54	19	24	477	389	0	2	32	22	1,078	684
Natural	109	113	4	3	2	5	380	237	0	0	26	174	872	4,109
Air Conditioning, Refrigeration	9	2	1	1	1	1	302	65	0	0	5	7	611	131
Gas	16	16	2	0	1	0	148	56	1	3	14	14	3,022	1,540
Explosives, Fireworks	46	12	3	0	2	1	84	16	0	0	1	3	124	25
Other Equipment	109	43	13	4	4	1	751	311	0	0	34	56	4,567	2,390
Other Heat	143	108	27	26	10	4	451	266	0	0	16	49	644	835
Unknown	798	439	133	62	83	33	2,928	823	4	2	375	258	18,055	20,595
Total Fires	4,546	2,771	1,079	866	634	217	21,832	7,443	—	—	—	—	—	—
Total Deaths	6	5	0	1	0	0	—	—	32	16	—	—	—	—
Total Injuries	197	386	41	93	5	3	—	—	—	—	1,047	1,255	—	—
Total Dollar Loss (in thousands)	$15,527	$22,380	$1,329	$1,300	$224	$209	—	—	—	—	—	—	$83,651	$67,233

Appendix XIII

Dollar Loss and Number of California and Ohio Fires in Mobile Properties by Cause

(Discussed in Section XI)

Table XIII-1. NUMBER OF CALIFORNIA FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (CFIRS 1975)[1]—Continued

Mobile Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Number of Reported Fires[2]								
Auto, Taxi, Race Car, Ambulance	2,005	2,281	319	1,066	301	14	100	48	9,596
Bus, Trolley	79	169	15	45	14	2	3	1	466
Terrain Vehicles[3]	40	29	3	2	3	0	4	3	305
Motor Homes and Trailers[4]	39	34	8	9	18	10	8	14	52
Mobile Home (non-residential use)	49	33	14	27	31	2	5	5	16
Other Passenger Transport	44	29	4	6	2	1	2	2	147
Trucks over one ton	146	174	34	92	43	3	6	6	510
Trucks under one ton	165	154	28	131	37	5	9	8	524
Tank Truck	28	27	4	14	9	0	1	3	74
Trash Truck	18	8	12	14	3	0	2	0	37
Other Freight Transport	30	143	32	57	8	0	19	3	255
All Rail Transport	21	14	20	3	9	1	0	2	12
All Water Transport	31	23	5	6	17	5	3	4	40
All Air Transport	1	4	0	0	0	0	3	0	29
Tractors	9	43	14	2	11	1	3	1	81
Other Heavy Equipment	15	13	1	3	3	1	2	0	54
Special and Other Vehicles	5	5	3	1	3	1	3	2	39
Total	2,725	3,183	516	1,478	512	46	173	102	12,237

[1] Estimated completeness is on the order of 90 percent for California.
[2] Reported fire incidents shown do not include all fires attended by fire departments.
[3] Includes motorcycles, golf carts, snowmobiles, and dune buggies.
[4] Includes pickup trucks, mounted campers, bookmobiles, and both travel and camping trailers.

Table XIII-1 cont'd. NUMBER OF CALIFORNIA FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (CFIRS 1975)

Mobile Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Number of Reported Fires[2]								
Auto, Taxi, Race Car, Ambulance	79	46	30	171	29	611	1,718	2,977	21,391
Bus, Trolley	2	2	4	5	3	53	65	96	1,024
Terrain Vehicles[3]	1	0	1	5	1	7	20	55	479
Motor Homes and Trailers[4]	7	0	13	8	0	11	31	36	298
Mobile Home (non-residential use)	6	1	2	4	0	90	69	34	388
Other Passenger Transport	4	0	1	2	1	9	28	81	363
Trucks over one ton	7	11	1	20	3	106	231	207	1,600
Trucks under one ton	6	6	1	22	2	57	157	157	1,469
Tank Truck	0	3	0	3	0	14	37	33	250
Trash Truck	1	3	0	0	1	10	47	44	200
Other Freight Transport	1	4	2	11	3	43	82	449	1,142
All Rail Transport	0	1	1	1	0	38	25	29	177
All Water Transport	0	1	0	0	1	2	10	32	180
All Air Transport	0	1	1	2	0	3	3	8	55
Tractors	0	1	0	10	0	58	62	21	317
Other Heavy Equipment	1	0	0	11	0	25	20	19	168
Special and Other Vehicles	2	0	0	4	0	8	3	8	87
Total	117	80	57	279	44	1,145	2,608	4,286	29,588

Table XIII-2. DOLLAR LOSS FROM CALIFORNIA FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (CFIRS 1975)—Continued

Mobile Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Dollar Loss in Thousands								
Auto, Taxi, Race Car, Ambulance	$1,265	$670	$84	$288	$139	$5	$106	$20	$2,645
Bus, Trolley	36	32	0	10	2	0	1	1	101
Terrain Vehicles [2]	12	8	0	0	0	0	1	0	85
Motor Homes and Trailers [3]	67	21	194	7	12	1	13	35	50
Mobile Home (non-residential use)	19	24	38	12	47	0	1,205	0	3
Other Passenger Transport	22	5	5	0	0	1	3	0	43
Trucks over one ton	165	89	5	32	50	0	18	2	407
Trucks under one ton	124	85	1	33	59	7	0	1	150
Tank Truck	26	8	0	1	3	0	0	0	95
Trash Truck	1	3	0	1	0	0	0	0	46
Other Freight Transport	153	68	7	35	42	0	11	7	58
All Rail Transport	8	41	26	0	18	0	0	4	1
All Water Transport	66	69	12	0	4	25	2	31	91
All Air Transport	0	0	0	0	0	0	1	0	652
Tractors	2	46	12	0	1	1	0	0	63
Other Heavy Equipment	21	10	1	0	0	5	0	0	113
Special and Other Vehicles	11	0	0	0	0	0	0	0	9
Total	$2,007	$1,191	$393	$427	$386	$49	$1,366	$96	$4,628

[1] Estimated completeness is on the order of 90 percent for California.
[2] Includes motorcycles, golf carts, snow mobiles, and dune buggies.
[3] Includes pickup trucks, mounted campers, bookmobiles, and both travel and camping trailers.

NOTE: Some totals may not equal the sum of their elements due to round-off error.

Table XIII-2 cont'd. DOLLAR LOSS FROM CALIFORNIA FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (CFIRS 1975)[1]

Mobile Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Dollar Loss in Thousands								
Auto, Taxi, Race Car, Ambulance	$15	$22	$19	$91	$4	$112	$441	$885	$6,818
Bus, Trolley	0	0	1	0	0	13	9	21	235
Terrain Vehicles[2]	0	0	10	1	1	1	2	9	134
Motor Homes and Trailers[3]	3	0	59	7	0	2	36	44	569
Mobile Home (non-residential use)	0	0	3	10	0	58	23	100	1,547
Other Passenger Transport	0	0	0	5	0	1	2	6	100
Trucks over one ton	1	2	0	40	0	31	160	98	1,105
Trucks under one ton	0	1	0	11	0	16	71	81	645
Tank Truck	0	12	0	22	0	1	14	20	210
Trash Truck	0	0	0	0	0	2	1	8	65
Other Freight Transport	0	0	0	2	0	17	29	181	624
All Rail Transport	0	0	0	0	0	71	4	28	212
All Water Transport	0	0	0	0	4	3	6	49	356
All Air Transport	0	140	0	59	0	1	18	0	873
Tractors	0	0	0	325	0	236	113	18	822
Other Heavy Equipment	0	0	0	8	0	1	18	4	188
Special and Other Vehicles	0	0	0	0	0	1	1	0	26
Total	$22	$184	$94	$589	$10	$579	$956	$1,563	$14,599

Table XIII-3. NUMBER OF CHIO FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (NFIRS 1976)[1]—Continued

Mobile Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Number of Reported Fires[2]								
Auto, Taxi, Race Car, Ambulance	1,473	242	270	782	107	9	18	9	4,597
Bus, Trolley	9	1	0	3	1	0	1	0	15
Terrain Vehicles[2]	16	2	2	9	4	0	0	1	159
Motor Homes and Trailers[3]	22	12	4	8	5	4	3	10	28
Mobile Home (non-residential use)	6	0	1	2	1	1	0	5	2
Other Passenger Transport	2	0	1	1	0	2	0	0	9
Trucks over one ton	34	20	15	35	13	0	0	8	135
Trucks under one ton	74	17	19	57	9	1	1	3	252
Tank Truck	1	3	1	0	1	0	0	2	11
Trash Truck	3	1	4	9	1	0	0	0	32
Other Freight Transport	33	15	7	14	12	1	2	9	38
All Rail Transport	29	3	15	8	1	1	3	6	10
All Water Transport	4	3	1	3	2	0	2	0	4
All Air Transport	0	0	0	0	0	0	0	0	4
Tractors	3	4	3	2	2	1	1	0	71
Other Heavy Equipment	9	3	8	1	3	0	2	2	35
Special and Other Vehicles	6	1	6	1	0	5	0	0	99
Total	1,724	327	357	935	162	25	33	55	5,501

[1] Estimated completeness is on the order of 50 percent for Ohio (Reference 11).
[2] Reported fire incidents shown do not include all fires attended by fire departments.
[3] Includes motorcycles, golf carts, snowmobiles, and dune buggies.
[4] Includes pickup trucks, mounted campers, bookmobiles, and both travel and camping trailers.

Table XIII-3 cont'd. NUMBER OF OHIO FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (NFIRS 1976)[1]

Mobile Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unkown	Total
	Number of Reported Fires[2]								
Auto, Taxi, Race Car, Ambulance	46	31	3	27	19	67	1,997	1,241	10,938
Bus, Trolley	1	1	0	0	0	0	32	7	71
Terrain Vehicles[2]	1	0	1	2	2	1	16	15	231
Motor Homes and Trailers[3]	3	1	9	1	1	1	14	12	138
Mobile Home (non-residential use)	0	0	0	0	1	0	2	1	22
Other Passenger Transport	1	0	0	0	0	0	2	3	21
Trucks over one ton	3	3	1	3	0	14	86	54	424
Trucks under one ton	4	1	0	3	1	3	94	70	609
Tank Truck	0	0	0	1	0	4	11	2	37
Trash Truck	0	4	0	0	0	2	17	15	88
Other Freight Transport	6	2	0	1	0	18	104	32	294
All Rail Transport	7	5	1	0	0	6	18	15	128
All Water Transport	3	1	1	2	0	0	2	3	31
All Air Transport	0	0	0	0	0	0	2	1	7
Tractors	0	4	0	1	1	3	51	29	176
Other Heavy Equipment	0	0	0	0	1	6	11	10	91
Special and Other Vehicles	2	0	0	0	0	3	7	13	143
Total	77	53	16	41	26	128	2,466	1,523	13,449

Table XIII-4. DOLLAR LOSS FROM OHIO FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (NFIRS 1976)[1]—Continued

Mobile Property Type	Cause								
	Incendiary/ Suspicious	Electrical Distribution	Flame, Spark	Smoking	Exposure	Cooking	Appliances	Heating	Flammable Liquids
	Dollar Loss in Thousands								
Auto, Taxi, Race Car, Ambulance	$1,520	$102	$53	$170	$47	$2	$9	$1	$1,632
Bus, Trolley	63	0	0	1	0	0	0	0	11
Terrain Vehicles[2]	8	0	2	2	0	0	0	0	55
Motor Homes and Trailers[3]	74	45	0	3	3	2	12	26	31
Mobile Home (non-residential use)	15	0	0	3	0	4	0	12	0
Other Passenger Transport	0	0	0	2	0	0	0	0	2
Trucks over one ton	52	12	3	24	29	0	0	19	128
Trucks under one ton	54	11	6	34	2	0	0	2	134
Tank Truck	0	23	0	0	0	0	0	0	64
Trash Truck	0	0	0	0	0	0	0	0	93
Other Freight Transport	177	40	7	9	20	2	0	36	129
All Rail Transport	129	6	27	6	0	0	62	10	1,176
All Water Transport	8	9	0	4	0	0	8	0	4
All Air Transport	0	0	0	0	0	0	0	0	42
Tractors	1	30	0	1	50	10	0	0	140
Other Heavy Equipment	26	2	9	0	1	0	30	0	196
Special and Other Vehicles	1	0	0	0	0	0	0	0	24
Total	$2,137	$288	$114	$266	$157	$21	$122	$109	$3,870

[1] Estimated completeness is on the order of 50 percent for Ohio (Reference 11).
[2] Includes motorcycles, golf carts, snowmobiles, and dune buggies.
[3] Includes pickup trucks, mounted campers, bookmobiles, and both travel and camping trailers.

NOTE: Dollar loss totals may not equal the sum of their elements due to round-off error.

Table XIII-4 cont'd. DOLLAR LOSS FROM OHIO FIRES IN MOBILE PROPERTIES BY CAUSE AND MOBILE PROPERTY TYPE (NFIRS 1976)[1]

Mobile Property Type	Cause								
	Children Playing	Natural	Air Cond., Refrigeration	Gas	Explosives, Fireworks	Other Equipment	Other Heat	Unknown	Total
	Dollar Loss in Thousands								
Auto, Taxi, Race Car, Ambulance	$14	$9	$0	$26	$16	$28	$784	$796	$5,218
Bus, Trolley	0	0	0	0	0	0	3	101	180
Terrain Vehicles[2]	0	0	1	0	0	1	2	8	85
Motor Homes and Trailers[3]	0	10	28	1	1	0	10	4	261
Mobile Home (non-residential use)	0	0	0	0	0	0	0	10	46
Other Passenger Transport	0	0	0	0	0	0	0	20	25
Trucks over one ton	0	0	0	0	0	4	155	124	555
Trucks under one ton	0	0	0	16	0	0	35	60	358
Tank Truck	0	0	0	0	0	0	19	36	102
Trash Truck	0	0	0	0	0	0	5	36	137
Other Freight Transport	0	4	0	0	0	3	165	56	661
All Rail Transport	15	1	6	0	0	2	14	128	1,588
All Water Transport	0	0	10	6	0	0	1	17	70
All Air Transport	0	0	0	0	0	0	0	0	42
Tractors	0	9	0	0	6	1	50	125	427
Other Heavy Equipment	0	0	0	0	0	25	18	12	323
Special and Other Vehicles	0	0	0	0	0	2	2	12	46
Total	$34	$35	$47	$52	$24	$71	$1,271	$1,556	$10,183

Glossary of Selected Terms Used in This Report

Death rates are the deaths per year per 1,000,000 resident population in each category. For example, the "female death rate" is the total number of females killed each year per 1,000,000 females in the population.

Fatalities include immediate deaths connected with a fire and injuries which became fatalities within one year as a result of a fire.

Fire is the occurrence of an uncontrolled, destructive or explosive burning, regardless of whether it is reported to a fire department or not, or is brought under control prior to the arrival of a fire department. Thus, "false alarms" are not considered fires, while small fires with no injury or little property loss are included.

Injury is physical damage to an individual which is the direct result of a fire and which requires (or should require) professional medical treatment within one year of the incident, or which results in at least one day of restricted activity immediately following the incident. Injuries to firefighters are included unless specifically noted as being omitted.

Injury rates are the injuries per 1,000,000 resident population in each category unless otherwise noted.

Structures are any assembly of materials forming a construction for occupancy or use. Buildings, bridges, and open platforms are all forms of a structure.

Direct dollar loss is the dollar value of physical damage to property (structure and contents) as a result of a fire. Medical and other indirect costs are excluded.

Fire casualty is a person injured or killed as a direct result of a fire.

References

1. *Accident Facts, 1976.* Chicago, Ill.: National Safety Council, 1976.
2. *America Burning: Report of the National Commission on Fire Prevention and Control.* Richard E. Bland, Chairman. Washington, DC: Government Printing Office, 1973.
3. "Are We Winning the War Against Fire Waste? A Sequel." *Fire Journal,* March 1973, p. 51.
4. Balanoff, Thomas. *Fire Fighter Mortality Report.* Washington, DC: International Assotion of Fire Fighters for the National Fire Prevention and Control Administration and the Center for Fire Research, Institute for Applied Technology, National Bureau of Standards, May 1976. Contract No. 4-35909.
5. Berl, Walter G., and Halpin, Byron M. "Fire-Related Fatalities: An Analysis of Their Demography, Physical Origins and Medical Causes." Presented at the Symposium on Fire Standards and Safety, National Bureau of Standards, Gaithersburg, MD, April 5 and 6, 1976.
6. Bukowski, Richard. *Center for Fire Research,* National Bureau of Standards, Gaithersburg, MD. Correspondence.
7. Clarke, Ramsey. *On Crime in America.* New York, NY: Simon and Schuster, 1970.
8. *Comprehensive Study of Firefighter Injuries and Injury Reporting Systems, A.* Washington, DC: International Association of Fire Fighters, October 1977. Fire Administration Grant NFPCA-76056.
9. Derry, Louis, Principal Investigator. *Analysis of NFPA Data for National Fire Loss Estimates.* Boston, MA: National Fire Protection Association, 1977. Fire Administration Contract No. 7-34753.
10. Derry, Louis. National Fire Protection Association. Boston, MA. Private conversation, September 30, 1977.
11. Eisenberg, Daniel, and Getis, Robert, Principal Investigators. *Initial NFIRS Data Validation Study.* Philadelphia, PA: Auerbach Associates, Inc. for the National Fire Prevention and Control Administration, March 1977. Contract No. 6-34583.
12. Favro, Philip C. "Introduction: Some Observations and Conclusions." In *Summary and Analysis—California Fire Incident Reporting System 1976.* Sacramento, CA: California State Fire Marshal, 1977.
13. Federal Bureau of Investigation. *Crime in the United States: Uniform Crime Statistics.* Washington, DC: U. S. Department of Justice, 1975.
14. Federal Fire Council, *Federal Fire Experience, Detailed, Annual Report—Fiscal Year 1974.* Washington, DC: Government Printing Office, 1974.
15. Federal Fire Council. *Federal Fire Experience, Detailed, Annual Report—Fiscal Year 1975.* Washington, DC: Government Printing Office, 1975.
16. *Federal Fire Strategies: An Intergovernmental Analysis of NFPCA Program Directions,* B. Michael Kahl, Project Director (Yorba Linda, CA: Kahl Associates, Inc. Research consultants for the National Fire Prevention and Control Administration, June 1977).
17. "Fires and Fire Losses Classified, 1974." *Fire Journal,* September 1975, pp. 43-45.
18. "Fires and Fire Losses Classified, 1975." *Fire Journal,* November 1976, pp. 17-19.
19. Flora, Jarius D., et al. *Fire Data Methodology: National Estimates of Fire Injuries.* Ann Arbor, MI: Highway Safety Research Institute, The University of Michigan, May

References—Continued

1978. Fire Administration Grant No. NFPCA-76028.

20. Fristrom, Geraldine. *Fire Deaths in the United States: Review of Data Sources and Range of Estimates*. Washington, DC: National Fire Prevention and Control Administration, September 1977.
21. Gratz, David G., and McCune, Dennis H., Principal Investigators. *Fire Service Physical Fitness Programs*. Washington, DC: International Association of Fire Chiefs Foundation, June 1977. Fire Administration Grant No. NFPCA-76025.
22. Halpin, Byron M., et al. *The Assessment of Fire Protection Systems Impact on Actual Fire Incidents*. Laurel, MD: Applied Physics Laboratory, Johns Hopkins University, Fire Problems Program, Technical Report No. 35, August 1977. Fire Administration Grant No. NFPCA-76045.
23. Halpin, Byron M., et al. "Fire-Related Fatalities: An Analysis of Their Demography, Physical Origins and Medical Causes." *Fire Standards and Safety*. American Society of Testing Materials, STP 614 (1977): 26-54.
24. Harlow, David W. "International Fire Losses, 1974." *Fire Journal*, November 1975, p. 43.
25. *Insurance Facts*. New York, NY: Insurance Information Institute, 1976.
26. Joiner, Brian L.; Martin, Richard; and Gaumnitz, Cynthia. *Statistical Analysis of the National Household Fire Survey*. Madison, WI: Statistical Laboratory, University of Wisconsin, September 1977. Fire Administration Grant No. NFPCA-76009.
27. Karter, Michael J. *Fire Rates and Census Characteristics—A Descriptive Approach*. Boston, MA: National Fire Protection Association. Fire Administration Grant No. NFPCA-76043.
28. Metropolitan Life Insurance Co. "Catastrophic Accidents, a 35-Year Review." *Statistical Bulletin*, March 1977, pp. 1-4.
29. *Montana State Fire Marshal Bureau—Annual Report 1976*. Helena, MT: Department of Justice, 1976.
30. Munson, Michael J., and Ohls, James C. *Indirect Losses Arising from Residential Fires*. Princeton, NJ: Princeton University, August 1978. Fire Administration Grant No. NFPCA-77007.
31. National Center for Health Statistics. *National Health Survey* (various publications). Rockville, MD: U.S. Department of Health, Education and Welfare, Public Health Service.
32. Oliver, Raymond B., Project Director, *Baton Rouge Fire Household Study*. Baton Rouge, LA: Louisiana Department of Public Safety, forthcoming. Fire Administration Grant No. NFPCA-77009.
33. Rardin, Ronald L., and Mitzner, Morris. *Determinants of International Differences in Reported Fire Loss: Preliminary Investigation*. Atlanta, GA: Georgia Institute of Technology, forthcoming. Fire Administration Grant No. NFPCA-76023.
34. Schaenman, Philip S., et al. *Measuring Fire Protection Outcomes: Some Further Improvements*. Boston, MA: National Fire Protection Association and The Urban Institute, 1977.
35. Tikkala, William R., Director. Cooperative Fire Protection, Forest Service, U.S. Department of Agriculture. Washington, DC: Private communication, October 19, 1977.
36. *Uniform Coding for Fire Protection 1976 (NFPA No. 901)*. C. Walter Stickney, Chairman. Boston, MA: National Fire Protection Association, 1976.
37. U.S. Bureau of the Census. *Statistical Abstract of the United States, 1975 (96th Edition)*. Washington, DC: U.S. Department of Commerce, 1975.
38. U.S. Bureau of the Census. *Statistical Abstract of the United States, 1976 (97th Edition)*. Washington, DC: U.S. Department of Commerce, 1977.
39. *Urban Guide for Fire Prevention and Control Master Planning*. Prepared by the Mountain View and Los Angeles City Fire Departments and the Mission Research Corporation. Washington, DC: Government Printing Office, 1977. Fire Administration Grant No. NFPCA-75006.

References—Continued

40. Vigansky, Henry. Statistical Climatology Branch, National Oceanic and Atmospheric Administration, U.S. Department of Commerce, Washington, DC. Correspondence, April 20, 1977.

41. Wadsworth, Ethel. *Results of the National Household Fire Survey*. Cambridge, MA: Technology and Economics, Inc., August 1977. Purchase Order #CPSC 77-68700.

42. "1974 Annual Death and Injury Survey." *The International Fire Fighter*. November 1975, pp. 8-13.

43. "1975 Annual Death and Injury Survey." The *International Fire Fighter*. November 1976, pp. 9-16.

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Table 14. "CAUSE" CATEGORIES USED IN THIS REPORT

Sorting Sequence	"Cause" Category[1]	Definition
1	Exposure	Caused by heat spreading from another hostile fire.
2	Natural Source	Caused by sun's heat, spontaneous ignition, or chemical, lightning, or static discharge.
3	Incendiary/Suspicious	Fire deliberately set or suspicious circumstances.
4	Explosives, Fireworks	Self-evident; explosives used as incendiary devices included in category 3.
5	Smoking	Cigarettes, cigars, pipes as heat of ignition.
6	Children Playing	Includes all fires caused by children playing with any materials contained in the categories below.
7	Heating Systems	Includes central heating, fixed and portable local heating units, fireplaces and chimneys, water heaters as source of heat.
8	Cooking Equipment	Includes stoves, ovens, fixed and portable warming units, deep fat fryers, open fired grills as source of heat.
9	Air Conditioning, Refrigeration	Includes dehumidifiers and water cooling devices as well as all air conditioning and refrigeration equipment as source of heat.
10	Electrical Distribution	Includes wiring, transformers, meter boxes, power switching gear, outlets, cords, plugs, lighting fixtures as source of heat.
11	Appliances	Includes TV's, radios, phonographs, dryers, washing machines, vacuum cleaners, separate motors, hand tools, electric blankets, irons, electric razors, can openers as heat source.
12	Gas	Material first ignited was a gas: natural, LP, manufactured, anesthetic, acetylene, other gas.
13	Flammable, Combustible Liquid[2]	Material first ignited was flammable liquid: gasoline, ethyl alcohol, ethyl ether, acetone, jet fuel, turpentine, kerosene, diesel fuel, cooking oil, lubricating oil, etc.
14	Open Flame, Spark (Heat from)	Includes torches, candles, matches, lighters, open fire, backfire from internal combustion engine as source of heat.
15	Other Equipment	Includes special equipment (radar, X-ray, computer, telephone, transmitters, vending machine, office machine, pumps, printing press), processing equipment (furnace, kiln, other industrial machines), service, maintenance equipment (incinerator, elevator).
16	Other Heat	Includes all other fires caused by heat from fuel-powered objects, heat from electrical equipment arcing or overloaded, and heat from hot objects not covered by above groups.
17	Unknown	Cause of fire undetermined or not reported.

[1] "Cause" as used here is a shorthand notation for what is sometimes a complex chain of events leading to a fire.
[2] Note that incendiary fires involving flammable liquids are covered in category 3, not 13.

END