

A PROFILE OF THE
**RURAL FIRE
PROBLEM**

UNITED STATES FIRE
ADMINISTRATION

IN THE UNITED STATES



This publication was produced under Contract EMW-94-C-443 for the United States Fire Administration, a directorate of the Federal Emergency Management Agency. It is a synopsis of *The Rural Fire Problem In The United States*. This condensed document is intended for use by a wide audience, including the fire service, the media, researchers, industry, government agencies and concerned citizens.

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While there are many similarities between fires in rural and non-rural areas, there are also many differences. Some of the differences, such as the higher incidence of heating fires in rural areas, point to issues that need to be considered when designing public education programs to reduce the number of fires and the deaths, injuries, and property loss associated with rural fires. For the purposes of this report, “rural” is defined as all counties that have populations of fewer than 20,000 persons and that are generally not adjacent to metropolitan areas.

Sources

This report is based on two different data sets: data on fire incidents from the National Fire Incident Reporting System (NFIRS) and mortality data from the National Center for Health Statistics (NCHS). Six years of mortality data (1983-1988) and three years of NFIRS data (1993-1995) serve as the basis for the findings in this report.

Characteristics of the Rural Fire Problem

There are some fundamental differences in the nature of the rural fire problem compared to non-rural differences. Among these differences are the causes of rural fires and the characteristics of residential structure fires, including how they start, where they originate, and how often smoke alarms are present and in operational condition.

WHERE FIRES OCCUR

Fires occur in the same types of locations in rural areas and in non-rural areas. Table 1 shows the distribution of rural fires and all U.S. fires broken down by property type. The table reveals that outside, structure, vehicle, and other fires occur in roughly the same proportion in rural areas as in the U.S. as a whole. The largest difference evident in Table 1 is for vehicle fires – 19 percent of rural fires are vehicle fires, compared to 24 percent of all U.S. fires

TABLE 1-DISTRIBUTION OF FIRES BY PROPERTY TYPE

Property Type	Percent Distribution	
	Rural	U.S.
Outside Fires	45%	43%
Structure Fires	35%	31%
Non-residential Structure Fires	10%	9%
Residential Structure Fires	25%	23%
Vehicle Fires	19%	24%
Other Fires	1%	2%
TOTAL FIRES*	100%	100%

* may not add to 100 percent due to rounding

Table 2 provides the distribution of casualties, both deaths and injuries, due to fire. Again, the distribution of deaths and injuries among outside, structure, vehicle, and other fires is very similar for rural areas and the entire U.S. There are slight differences, however. Outside and vehicle fires in rural areas account for slightly more casualties than for the U.S., while rural structure fires account for a slightly lower proportion of casualties.

TABLE 2
DISTRIBUTION OF CIVILIAN DEATHS AND INJURIES BY PROPERTY TYPE

Property Type	Percent of Deaths		Percent of Injuries	
	<i>Rural</i>	<i>U.S.</i>	<i>Rural</i>	<i>U.S.</i>
Outside Fires	4%	3%	6%	5%
Structure Fires	73%	78%	76%	81%
Non-residential Structure Fires	4%	6%	15%	13%
Residential Structure Fires	69%	72%	60%	68%
Vehicle Fires	21%	17%	13%	10%
Other Fires	2%	3%	5%	4%
TOTAL FIRES*	100%	100%	100%	100%

* may not add to 100 percent due to rounding

OUTSIDE FIRES

Outside fires account for 45 percent of all fires that occur in rural areas. Although these fires represent a high proportion of all rural fires, they are rarely associated with fire deaths or injuries. An average of only four percent of rural fire deaths and six percent of rural fire injuries were associated with outside fires from 1993-1995. The top three causes of outside fires reported to rural fire departments are open flame (45 percent), arson (16 percent), and natural causes (nine percent). In contrast to rural areas, in non-rural areas arson is the leading cause of outside fires and, at 44 percent, is nearly three times greater a problem than in rural areas.

STRUCTURE FIRES

When people think about fire, they generally think of fires that occur in buildings. Thirty-five percent of all rural fires occur in structures, a slightly higher proportion than is observed for the U.S. as a whole. This could be a cause for concern since structure fires in particular, are responsible for the vast majority of civilian deaths and injuries due to fire. However, as just noted, structure fires in rural areas account for a slightly lower proportion of fire deaths and injuries than is the case for the entire U.S.

The three leading causes of structure fires in rural areas are heating (29 percent), arson, and electrical distribution (tied at 12 percent). In contrast, the three leading causes of structure fires in non-rural areas are cooking, arson, and heating.

RESIDENTIAL STRUCTURE FIRES

Residential structure fires account for only 25 percent of fires in rural areas but over two-thirds of fire deaths and 60 percent of fire injuries. The leading cause of rural residential structure fires is heating – at 36 percent it is nearly three times as prevalent as the next leading cause, cooking (13 percent). Moreover, residential structure fires in rural areas are more than two times as likely to be caused by heating as fires in non-rural areas. Heating is the cause of only 15 percent of residential fires in non-rural areas. This finding is of considerable importance because of the higher incidence of deaths and injuries in residential structure fires.

Fatal Fires The top three causes of fatal fires in rural homes are heating (26 percent), careless smoking (23 percent), and electrical distribution (17 percent). In contrast, heating fires account for only 12 percent of fatal fires in non-rural areas, making them the third leading cause rather than the leading cause. In non-rural areas the top two leading causes are careless smoking (28 percent) and arson (17 percent).

Smoke Alarm Performance The lack of working smoke alarms is a significant problem in rural areas. The majority (58 percent) of rural fires occur in homes without smoke alarms. To compound this problem, 15 percent of rural fires occur in homes where smoke alarms are pre-

sent but do not operate. Smoke alarms were present and operational in only 27 percent of rural residential fires (versus 35 percent of non-rural fires). Therefore 73 percent of rural residential structure fires occurred in homes without operational smoke alarms.

Area of Fire Origin Because of the prevalence of heating fires, the most common area of fire origin in rural fires is chimneys (21 percent). The next most common areas are cooking areas (19 percent) with lounge areas and sleeping areas tied for third (11 percent). As heating and cooking are the leading causes of rural fires, it is not surprising that chimneys and kitchen areas are the leading areas of fire origin. Heating equipment rooms are identified as the area of fire origin in only a small proportion of rural heating fires, suggesting that most rural heating fires are not related to central heating.

Extent of Flame Damage The extent of flame damage that residential structures sustain is worse in rural areas than in non-rural areas. A higher proportion of homes in rural areas are unprotected, wood frame construction. A higher proportion of rural fires result in damage that extends to entire structures rather than being confined to objects or rooms of origin. This is likely due to two factors. Emergency response times are longer in rural areas due to longer travel distances. Additionally, fires may burn before being noticed in rural areas due to lower population densities.

Heating Fires

The lack of maintenance of heating devices is a serious cause of residential heating fires in rural areas. Lack of maintenance includes creosote build-up in chimneys and stovepipes, and was cited in 78 percent of rural heating fires. This suggests a critical need for public education in rural areas to make people aware of the hazards of not properly maintaining heating equipment, chimneys, and vents.

Because heating fires are central to an understanding of the fire problem in rural areas, this section is devoted to a more in-depth investigation of these fires. This includes discussions of the equipment involved in the ignition of rural heating fires, the types of materials most commonly ignited, and the most common ignition factors.

EQUIPMENT INVOLVED IN IGNITION

The leading equipment involved in fire ignition for rural heating fires is fixed stationary heating units, accounting for 38 percent of all residential heating fires. Fixed stationary heating units included equipment such as wood stoves and kerosene heaters that are maintained in a lone location rather than moved around. Chimneys and indoor fireplaces, accounting for 25 percent and 11 percent of fires respectively, are the second and third leading pieces of equipment involved in ignition. Together, these two types of equipment

account for 62 percent of all rural heating fires. Interestingly, “fixed stationary” rather than “portable” heaters are identified as the culprit in this analysis.

TYPE OF MATERIAL IGNITED

Consistent with the fact that many rural heating fires start in fixed stationary heating units, chimneys, and fireplaces, the leading category of the type of material ignited is adhesive, resin, and tar. Resin is the material that builds up in chimneys and is often responsible for chimney fires. Adhesive, resin, and tar are the types of material ignited in almost half of all heating fires in rural areas. The next most common type of material ignited is sawn wood (19 percent), another material associated with wood stoves and fireplaces.

IGNITION FACTOR

The leading ignition factor is mechanical failure or malfunction, which accounts for 64 percent of these fires. Misuse of material ignited and operational deficiency, accounting for 11 percent and 10 percent respectively, are the second and third leading ignition factors. One important finding of this report is that people need to be educated about the proper maintenance and use of various heating devices, and they need to know that their chimneys need to be professionally cleaned and inspected each year before they use them.

Variations in the Rural Fire Problem – the North versus the South

Similar to the U.S. as a whole, outside fires are the leading category of fires in both northern and southern rural areas, though the proportion is slightly lower in the North. For both the North and the South, structure fires are the second leading category of fires. The average number of deaths per structure fire in rural areas of the North is higher than in rural areas of the South.

MANUFACTURED HOUSING

Manufactured housing (often referred to as “mobile” or “trailer” homes) is a special category of residential dwelling. Although only a small fraction of the overall U.S. population lives in manufactured housing, the manufactured housing fire problem is significant – especially in rural areas.

Causes of Fires As in other types of rural residences, the leading cause of manufactured housing fires in rural areas is heating. In the rural South, cooking fires are tied with heating fires as the leading cause of fires in manufactured housing (19 percent). In the rural North heating fires are the leading cause and account for 26 percent of fires in manufactured housing. This discrepancy is likely explained by the climate, since more heating is required in Northern areas.

Smoke Alarm Performance The lack of working smoke alarms in manufactured housing is a significant problem. A majority of rural manufactured housing fires occur in residences without smoke alarms (63 percent). When the number of manufactured housing fires without operating smoke alarms are included in this percentage, the proportion of homes without a functional smoke alarm rises to 75 percent.

This problem is even more exaggerated in manufactured housing in the rural South. Seventy-three percent of these fires occur in homes without smoke alarms. Once non-operating alarms are considered, fully 81 percent of fires occur in structures that are not protected by a functional smoke alarm. This compares to 70 percent of manufactured home fires in the rural North.

The lack of operating smoke alarms in manufactured housing is of grave concern. These homes tend to be smaller than other types of homes, so a fire may engulf the entire structure quicker, giving residents less time to escape than in other types of dwellings.

Rural Fire Deaths

The following is an analysis of U.S. fire deaths in rural areas based on mortality data from 1983-1988. This is the most recent data available in which rural fire deaths can be distinguished from non-rural fire deaths using the definitions relied upon in this report.

TABLE 3-U.S. FIRE DEATHS RATES IN RURAL AND NON-RURAL AREAS

1993 Rural/Non-rural	1983-1988 Population	Average Annual Fire Deaths	Fire Deaths per Fire Deaths	Million Population
Total U.S. Population	245,139,132	34,584	5,764	23.5
Rural	21,840,693	4,054	676	30.9
Non-rural	223,298,439	30,530	5,088	22.8
White Population	205,834,339	23,681	3,947	19.2
Rural	19,382,873	2,877	480	24.7
Non-rural	186,451,466	20,804	3,467	18.6
African American Population	29,621,848	10,213	1,703	54.8
Rural	1,879,767	999	167	88.6
Non-rural	27,742,081	9,214	1,536	55.4
Native American Population	2,096,447	398	66	31.5
Rural	461,521	168	28	60.7
Non-rural	1,634,926	230	38	23.4
Asian and Pacific Islander Pop.	7,586,498	132	22	2.9
Rural	116,532	6	1	8.6
Non-rural	7,469,966	126	21	2.8

Fire Death Rates in Rural Areas

As Table 3 suggests, fire death rates over the 1983-1988 time period were 36 percent higher in rural areas than non-rural areas. These differences are even greater when fire death rates are broken down by race and ethnicity.

Within rural areas, the majority of annual fire death victims are White. In per capita terms, however, African Americans and Native Americans have higher risks of dying as a result of fires than do Whites.

Table 3 shows that the overall fire death rate for African Americans was over two times that of the general U.S. population. This disparity was even greater in rural areas. African Americans living in the rural area had a death rate of 88.6 per million people. This was over three and one-half times greater than the fire death risk for rural Whites.

While African and Native Americans living in the rural area suffered significantly higher fire death risks than other groups, the absolute numbers of their fire deaths were relatively modest, especially for Native Americans. Whereas an average of 480 fire death victims each year were White, 167 fire death victims were African American and 28 were Native American.

The Distribution of Fire Deaths in Rural Areas

While the death rate is higher in rural areas and for certain subgroups of the population, the distributions of fire deaths by age, race, and gender are similar in “rural” and “non-rural” areas.

Fire Deaths by Race

- The majority of rural fire deaths were White, with African Americans second, Native Americans third, and Asian and Pacific Islanders last.

Fire Deaths by Gender

- The distribution of male and female fire deaths was similar in both rural and non-rural populations. Nearly twice as many men died in fires as women.

Fire Deaths by Age Group

- Rural fire deaths tended to affect a larger portion of the younger population than non-rural fire deaths.

Fire Deaths among Whites by Age Group

- The rural and non-rural age profiles for white fire deaths were similar, but the age distribution skewed slightly towards the younger rural population.
- The very young, the very old, and middle-aged population groups shared the same percentage of fire deaths.
- Rural young people aged 1-24 were represented a higher proportion of fire deaths than their non-rural counterparts. Accordingly, the older population (55-75) accounted for a slightly lower proportion of fire deaths.
- Young adults aged 25-34 represented the largest single group for both rural and non-rural groups.

Fire Deaths among African Americans by Age Group

- The rural and non-rural African American age profiles were very similar. But, the age distribution was skewed towards the older rural population.
- A larger percentage of very elderly (over 75 years) rural African Americans died in fires than their non-rural counterparts.