

A Population-Based Descriptive Study of Housefire Deaths in North Carolina

MICHAEL J. PATETTA, MA, AND THOMAS B. COLE, MD, MPH

Abstract: We report a population-based study of housefire deaths in North Carolina in 1985 using data obtained from fire investigators and the North Carolina medical examiner system. The crude death rate was 3.2 per 100,000 population; age-specific death rates were highest for ages 75–84 years. Death rates for Whites were one-third as high as death rates for other races. Of those decedents tested for alcohol, 56 percent had blood alcohol levels ≥ 22 mmol/L. Most fatal fires were caused by heating units or cigarettes. (*Am J Public Health* 1990; 80:1116–1117.)

Introduction

Three-fourths of the 5,000 fire and burn deaths that occur annually in the United States are caused by housefires.^{1,2} In 1984, the US housefire death rate¹ was 1.9 per 100,000 population. However, in the South the rate¹ was 2.5 per 100,000, and in the Southeast in recent years rates have been in the range of 3.05–5.14 per 100,000.²

Studies of housefire mortality for the Southeast have found that most deaths occur in heating-related fires, whereas smoking-related fires are responsible for most of the deaths in other parts of the country.³ There is some evidence that the higher death rate for the Southeast may be attributable to a lower prevalence of smoke detectors and a greater use of portable heating equipment compared with other regions.^{4,5}

To describe the epidemiology of housefire deaths in a Southeastern state, we conducted a statewide, population-based study of housefire deaths in North Carolina.

Methods

Records of all housefire deaths in North Carolina in 1985 were obtained from the Office of the Chief Medical Examiner. State law mandates reporting of all fatal injuries to a medical examiner. County medical examiners complete a report (which includes toxicologic information, reports of death scene visits and interviews with witnesses, autopsy records, and other relevant data) for each investigated death for review by a forensic pathologist.

Information about the causes of the housefires was requested from the local fire marshalls or county sheriffs, and responses were received for 70 percent of housefire deaths. The causes of the housefires were documented in Medical Examiner Reports or State Bureau of Investigation Reports for an additional 22 percent of deaths.

Rates and proportions were calculated from pooled data. Housefire death rates are expressed per 100,000 population, but these rates are approximate because some decedents

were not North Carolina residents and information was not obtained for North Carolina residents who died out of state.

Results

In 1985, 159 housefires resulted in 200 deaths, accounting for 75 percent of all North Carolina deaths from fire and burns. All but three decedents were North Carolina residents. The crude death rate from housefires was 3.2 per 100,000 population. Death rates were highest (8.8/100,000) for persons ages 75–84 years (Table 1) and for persons other than White (7.1) (Table 2).

Of 157 persons who died at the scene of the fire and were tested for carboxyhemoglobin, 131 (83 percent) were reported by a medical examiner to have died of carbon monoxide poisoning and 26 from burns. Of the 26 not tested, seven (27 percent) were reported to have died of carbon monoxide poisoning and 19 from burns.

Of 160 decedents ≥ 15 years of age, 56 percent of the 130 tested for alcohol had blood alcohol levels ≥ 22 mmol/L (legally impaired under North Carolina driving laws). Of those tested, 85 percent who died in cooking-related housefires, 60 percent who died in smoking-related housefires, and 39 percent who died in heating-related housefires had blood alcohol levels ≥ 22 mmol/L.

Most of the victims (59 percent) died when single-family houses burned, although 76 percent of the North Carolina population lived in single-family houses according to the 1980 census. Although only 9 percent of the North Carolina population lived in mobile homes in 1980, 19 percent died in mobile home fires. Smoke detector information was provided for 72 fatal housefires. Of the 109 deaths in these housefires, 94 percent occurred in dwellings without smoke detectors.

More deaths resulted from housefires caused by heating units (33 percent) than from any other cause (Table 3). Of the 60 heating-related housefire deaths, 20 percent were associated with the use of flammable liquids and 25 percent with the ignition of furniture or furnishings. Woodstoves caused the fires that resulted in 37 percent of heating-related deaths, and kerosene heaters were responsible for an additional 20 percent.

TABLE 1—Age-specific Housefire Death Rates,* North Carolina, 1985

Age Group (years)	Number of Deaths	Death Rate
0–4	23	5.5
5–14	17	1.9
15–24	20	1.8
25–34	12	1.1
35–44	20	2.4
45–54	22	3.5
55–64	27	4.6
65–74	35	8.1
75–84	19	8.8
≥ 85	5	8.1
Total	200	3.2

*Death rates per 100,000 population are approximate because all in-state deaths were counted regardless of the state of residence.

Address reprint requests to Thomas B. Cole, MD, MPH, Injury Control Section, North Carolina Department of Environment, Health, and Natural Resources, P.O. Box 27687, Raleigh NC 27611-7687. (He was with the Division of Field Services, Epidemiology Program Office, CDC, Atlanta.) Mr. Patetta is also with the Injury Control Section. This paper, submitted to the *Journal* August 17, 1989, was revised and accepted for publication January 23, 1990.

TABLE 2—Race/Sex-Specific Housefire Death Rates,* North Carolina, 1985

Race/Sex Group	Number of Deaths	Death Rates
White Males	65	2.8
White Females	34	1.4
Other** Males	54	7.1
Other Females	47	5.7
Total	200	3.2

*Death rates per 100,000 population are approximate because all in-state deaths were counted regardless of the state of residence.

**With the exception of one American Indian male, all deceased persons of other races were Black. Census data for 1985 do not provide population estimates for Blacks and American Indians.

TABLE 3—Housefire Deaths by Cause* of Fire, North Carolina, 1985

Cause of Fire	Number (%) of Deaths
Heating	60 (33)
Smoking	47 (26)
Cooking	16 (9)
Electrical	15 (8)
Arson	10 (6)
Open Flame	9 (5)
Children Playing	9 (5)
Natural	1 (1)
Undetermined	16 (8)
Total**	183 (101)

*Causes are assigned according to the hierarchy used by the National Fire Data Center of the Federal Emergency Management Agency, so that the number of deaths in each successive cause is exclusive of all previously listed causes. For 17 deaths, cause of fire information was not provided by fire investigators.

**Total is > 100% due to rounding.

The second most common cause of housefire deaths was smoking (26 percent). Of the 47 smoking-related housefire deaths, 89 percent occurred in fires caused by the ignition of furniture.

Discussion

Only 16 persons who died in 1985 as result of housefires in North Carolina left the scene of the fire alive. Therefore efforts to improve the emergency treatment and transport of persons injured in housefires could prevent at most 8 percent of housefire deaths. To prevent housefire deaths, fires must be prevented or escaped.

Assuming that the proportion of the North Carolina population living in mobile homes did not change from 1980 to 1985, mobile home dwellers are 2.7 times as likely to die in housefires as persons who live in single-family detached homes. A similar risk was found in New Mexico.⁶

We estimate that the lethal⁷⁻¹⁰ combination of alcohol and cigarettes resulted in at least one-fourth of the deaths reported in this study. The proportion of fatally injured persons tested who were impaired with alcohol was greater for housefires (56 percent) than that for any other cause of unintentional injury in North Carolina. The use of fire-safe cigarettes¹¹ may be the most effective way to prevent deaths associated with drinking and smoking.^{2,6}

Escape from housefires is facilitated by early warning, which can be provided by smoke detectors.^{8,12} The risk of death from housefire is estimated to be 2.5 times greater for persons who live in homes without smoke detectors.¹³ Unfortunately, persons who are very young, very old, or very drunk may not be able to respond to an alarm.^{11,13-15} From our data we estimate that these groups accounted for over half of the deaths.

Our study indicates that the risk of housefire death is likely to be multifactorial, with ignition source, type of dwelling, and behavior each playing important roles.

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