

---

---

# **SOCIOECONOMIC FACTORS AND THE INCIDENCE OF FIRE**

---

---



*Federal Emergency Management Agency  
United States Fire Administration  
National Fire Data Center*

# **SOCIOECONOMIC FACTORS AND THE INCIDENCE OF FIRE**

June, 1997

*Federal Emergency Management Agency  
United States Fire Administration  
National Fire Data Center*

FA 170 / June 1997

This publication was produced under contract EMW-95-C-4717 by TriData Corporation for the United States Fire Administration, Federal Emergency Management Agency. Any information, findings, conclusions, or recommendations expressed in this publication do not necessarily reflect the views of the Federal Emergency Management Agency or the United States Fire administration.

## TABLE OF CONTENTS

<b>INTRODUCTION</b> .....	1
Why Study Socioeconomic Factors of Fire Risk?.....	1
Existing Literature.....	2
<b>Part I. Socioeconomic Indicators of Increased Fires Rates</b> .....	2
<b>Part II. How Income Level Affects Fire Risk in Urban Areas</b> .....	10
Socioeconomic Factors at the Level of the Neighborhood .....	10
Vacant and Abandoned Buildings.....	11
Neighborhood Decline.....	11
Arson .....	12
Socioeconomic Factors at the Level of the Household .....	13
Housing Quality .....	13
<i>Smoke Detectors</i> .....	15
Housing Affordability .....	17
Housing Structure .....	18
<i>Single Parent Households and the Presence of Children</i> .....	18
<i>Fire Risks of Elderly Persons</i> .....	21
<i>Overcrowded Households</i> .....	21
Socioeconomic Factors at the Individual Level .....	22
Careless Smoking and Alcohol and Drug Abuse .....	22
Low Levels of Education .....	23
Housing Tenure and Fire Risk .....	23
Social Pathology and Fire Risk .....	24
<b>Part III. How Poverty Affects Fire Risk in Rural Areas</b> .....	24
<b>Part IV. Why Study Socioeconomic Factors of Fire Risk?</b> .....	25
<b>Part V. Future Research</b> .....	26
<b>REFERENCES</b> .....	29

# SOCIOECONOMIC FACTORS AND THE INCIDENCE OF FIRE

## INTRODUCTION

Over the past 100 years, the risk of fire in America's homes has decreased dramatically. Myriad changes have helped make us safer, including the adoption and enforcement of building codes, changes in the way we heat our homes and cook food, and widespread use of smoke detectors. Still, each year in the U.S. there are over 400,000 fires in residential structures, and these fire kill and injure many people. Between 1983 and 1990, an average of 74 percent of all fire deaths occurred in residential fires, as did an average of 66 percent of all fire injuries.<sup>1</sup> However, research indicates that the risk of a fire in the home is not the same for everyone. Climate, building stock characteristics, and human factors importantly influence fire rates. This working paper concentrates on the last two categories, building stock characteristics and human factors. The intent is to identify socioeconomic factors that influence the complex and varied relationships between buildings, humans, and the occurrence of residential fires.

## Why Study Socioeconomic Factors of Fire Risk?

Why is it necessary to study socioeconomic factors related to increased fire risk? The most important reason is that socioeconomic factors are among the best known predictors of fire rates at the neighborhood level. While structural factors of buildings have an effect on the incidence of fire, of equal or greater importance today is how humans use and maintain those buildings. Year after year, the primary causes of residential structure fires include cooking, heating, incendiary or suspicious causes, smoking, and other causes directly related to human activities. Together these causes accounted for over 66 percent of all residential fires in 1994.<sup>2</sup>

---

<sup>1</sup> United States Fire Administration. *Fire in the United States, 1983 - 1990*. Washington, D.C.: Federal Emergency Management Agency, United States Fire Administration, 1990, p. 33 and pp. 51-52.

<sup>2</sup> National Fire Incident Reporting System database.

To explore how socioeconomic factors are related to fire rates, this paper is divided into five sections. The first section presents findings from research aimed at identifying the socioeconomic characteristics most closely related to increased fire rates. In the second section, the nature of the relationships between socioeconomic factors and differential fire rates is explored. The third section briefly addresses fire risks in rural locations, while the fourth and fifth sections review the importance of studying socioeconomic factors and suggest topics for future research, respectively. A comprehensive review of all the literature on this subject is beyond the scope of this working paper, but a supplementary bibliography is included to assist other researchers.

### **Existing Literature**

Most of the seminal studies relating socioeconomic characteristics to fire rates were conducted and published in the late 1970s. Since that time, the limited amount of research that has been conducted is contained mostly in unpublished doctoral dissertations and master's theses, restricting its availability to other researchers and policy makers. While the studies published in the late 1970s greatly advanced our understanding of the socioeconomic characteristics most closely associated with increased fire risk, contemporary published research is necessary to verify the continued relevance of these relationships. Similarly, population shifts have changed the very communities researchers investigated, suggesting that older studies need to be replicated to ascertain the effects of these changes. Regardless of these shortcomings, the existing literature points to specific socioeconomic characteristics that should be considered in the design of future research studies. The section below cites specific studies identifying those socioeconomic characteristics most commonly linked to higher fire rates.

## **Part I. Socioeconomic Indicators of Increased Fire Rates**

Virtually every study of socioeconomic characteristics has shown that lower levels of income are either directly or indirectly tied to an increased risk of fire. An early study attempting to quantify this relationship was published by Schaenman, Hall, Schainblatt, Swartz, and Karter in 1977. This work had several important findings. The first was that inter-city comparisons of fire rates were not useful. The authors found that significant variations in fire rates in given cities from year to year made it untenable to use socioeconomic variables to explain variations in fire rates across cities. For this reason, Schaenman et al. refocused their efforts on studying intra-city variations in fire rates,

using census tracts as their unit of analysis. They investigated six separate sets of census data. These included data for four cities (Charlotte, NC, St. Petersburg, FL, San Diego, CA, and Seattle, WA), one county (Fairfax County, VA), and a combination set with data from three of the cities and Fairfax County. The authors found that three variables were most effective in explaining variations in fire rates. These were *parental presence*, or the percentage of children under the age of 18 living with both parents; *poverty*, defined as the percentage of persons whose incomes fell below the poverty line; and *under-education*, or the percentage of persons over the age of 25 who had fewer than eight years of schooling. Each of these variables tested alone explained an average of over 39 percent of the variation in fire rates between census tracts for each of the cities, for Fairfax County, and for the combination data set.<sup>3</sup>

While these three variables were important in explaining variation in fire rates, seven other variables explained some of the variation, but not as much. These were *good education*, or the percent of persons over the age of 25 who had at least a high school education; *race*, or percentage black; *home ownership*, or percentage of year-round housing units that were owner-occupied; *adequate income*, or the percentage of families with annual incomes greater than \$15,000; *housing crowdedness*, or the percentage of year-round housing units with more than one persons per room; and two interaction variables, one for education and race and one for race and poverty. Each of these variables accounted for at least 20 percent of the variation in fire rates between census tracts in each of the six data sets.<sup>4</sup>

Two other variables explained some of the variation in fire rates in only some of the tests. *Housing vacancy*, or the percentage of year-round dwelling units that were vacant, was a moderately strong predictor for Seattle, St. Petersburg, and the combination data set. The *age of housing structures*, or the percentage of housing units in structures that were constructed prior to 1940, explained a moderate amount of fire rate variation in Fairfax County and St. Petersburg only.<sup>5</sup> This variation from city to city in the explanatory power of different socioeconomic variables demonstrates the sensitivity of these sorts of analyses to local conditions. It also reminds readers to be particularly cautious in interpreting data

---

<sup>3</sup> Philip Schaenman, John R. Hall, Jr., Alfred H. Schainblatt, Joseph A. Swartz, and Michael J. Karter. *Procedures for Improving the Measurement of Local Fire Protection Effectiveness*. Boston: National Fire Protection Association, 1977, p. 54 and pp. 57-58.

<sup>4</sup> Schaenman, et al., 1977, pp. 57-59.

<sup>5</sup> Schaenman, et al., 1977, p. 59.

from studies that use socioeconomic variables to explain variations in city-wide fire rates. Wide variations in socioeconomic indicators and fire rates at the census tract level are obscured by city-level analyses, with the result that city-level studies are difficult to interpret and comparisons between different cities can be made only with caution.

Schaenman et al. found that four other variables did not appear to be related to variations in fire rates. These were the percent of *housing in one-unit structures; unemployment*, or the percentage of the male labor force over the age of 16 who was unemployed; *elderly*, or the percentage of the population over the age of 65; and *long-time residency*, or the percentage of persons over the age of 5 who had lived in the same housing unit since at least 1965.<sup>6</sup>

Of the variables that explained a lot or some of the variation in fire rates among census tracts within cities, *parental presence, good education, adequate income, and home ownership* were negatively correlated with fire rates. That is, as values of these variables increased, such as income, the fire rate decreased. All the other variables, including housing vacancy and age of housing, were positively correlated with fire rates--as the percent of impoverished persons in a census tract increased, for example, so did fire rates.

Schaenman et al. noted that most of the key predictor socioeconomic variables were interrelated, so the relative ranking of variables based on their ability to affect fire rates should be considered tentative.<sup>7</sup> For example, census tracts with low median incomes also tended to have a higher proportion of residents with low levels of education, and both of these factors are related to higher fire rates. The close relationship between the independent variables, such as income and education, made it difficult to determine which single independent variable accounted for the highest proportion of the difference in fire rates among the census tracts.

---

<sup>6</sup> Schaenman, et al., 1977, p. 59.

<sup>7</sup> Schaenman, et al., 1977, p. 59.

Another study of intra-city variations in fire rates was published in 1978 by Karter and Donner. For five cities, they presented data on the socioeconomic characteristic and the building characteristic they found to be most highly related to increased fire rates. After identifying the relevant characteristics, they used them to divide census tracts within each city into “low fire risk” and “high fire risk” categories and then calculated mean fire rates for each group. The difference in these average fire rates represented the increased fire risk for the group of high risk census tracts. The results for the five cities are summarized in Table 1.<sup>8</sup>

**Table 1.<sup>9</sup>**

City	Socioeconomic Characteristic	Difference in Mean Fire Rate	Building Characteristic	Difference in Mean Fire Rate
Syracuse, NY	Family stability <sup>a</sup>	Average fire rates were almost 4 times as high in tracts with low family stability	Crowdedness <sup>b</sup>	Average fire rates were almost 4 times as high in tracts ranked high on crowding
Newark, NJ	Poverty <sup>c</sup>	Average fire rates were almost 2 times as high in tracts with high levels of poverty	Ownership <sup>d</sup>	Average fire rates were more than 2 times as high in tracts with lower home ownership rates
Phoenix, AZ	Poverty	Average fire rates were almost 3 times as high in tracts with high levels of poverty	Crowdedness	Average fire rates were more than 2 times as high in tracts ranked high on crowding
Toledo, OH	Poverty	Average fire rates were more than 2 times as high in tracts with high levels of poverty	Ownership	Average fire rates were more than 2 times as high in tracts with lower home ownership rates
Kansas City, MO	Family stability	Average fire rates were almost 2 times as high in tracts with low family stability	Vacancy <sup>e</sup>	Average fire rates were almost 2 times as high in tracts with high vacancy rates

<sup>a</sup> percentage of person who are under 18 and living with both parents (Schaenman et al. call this variable “parental presence”)

<sup>b</sup> percentage of year-round housing units with at least 1.01 persons per room

<sup>c</sup> percentage of persons below the poverty level

<sup>d</sup> percentage of year-round housing units that are owner-occupied

<sup>e</sup> percentage of year-round housing units that are vacant

---

<sup>8</sup> Michael Karter, Jr. and Allan Donner. “The Effect of Demographics on Fire Rates.” *Fire Journal*. Vol. 72, no. 1 (January) 1978, p. 53.

<sup>9</sup> Karter and Donner, 1978, pp. 53-65.



As indicated in Table 1, the socioeconomic factors related to fire rates are sensitive to each city's unique conditions, and these can be traced back through the history of a city's populations and its buildings. In particular, cities are sensitive to population shifts such as the movements of large numbers of people into and out of a city. In this sense the continued movement of middle- and upper-income residents out of cities to the suburbs and the increasing isolation of the poorest residents in some inner-city neighborhoods has important effects on the socioeconomic characteristics of cities and urban housing stocks.<sup>10</sup> Though the housing stock appears to be "given" at any moment in time, the quality of any one housing unit is tied to the fortunes of those who occupy it and, particularly in the case of rental properties, continued maintenance by owners. This interplay of population and housing stocks in turn has profound implications for fire rates in different census tracts, as indicated by the studies above.

To learn more about higher fire rates in low income areas of large cities, Gunther (1981) studied fire-cause patterns in Toledo, Ohio neighborhoods. He divided Toledo's census tracts into five groups with different income and race characteristics. Using regression analysis, Gunther was able to show that there was a strong negative relationship between income and fire rates. As income rose, there was a significant drop in the fire rate, though this rate of decline slowed in the two census tract groups with the highest median incomes where fire rates were low overall. Similarly there were strong negative relationships between income and four out of the seven fire causes he investigated, specifically fires with incendiary/suspicious, smoking, cooking, or children playing origins. For each of these causes regression analysis suggested that the census tract groups with lower median incomes had markedly higher fire rate. Importantly, each of these causes is generally tied directly to human actions, rather than being caused by mechanical malfunction. This suggests that public education is the tool most readily available to help reduce the occurrence of these types of fires.<sup>11</sup>

---

<sup>10</sup> Harvard University Joint Center for Housing Studies. 1996. *Into the 21<sup>st</sup> Century: The State of the Nation's Housing*. Cambridge, MA: The Joint Center for Housing Studies, 1996, pp. 2-3.

<sup>11</sup> Paul Gunther. 1981. "Fire-Cause Patterns for Different Socioeconomic Neighborhoods in Toledo, OH." *Fire Journal*. Vol. 75, no. 3 (May), pp. 54-58.

The other three fire causes Gunther studied were fires caused by heating sources, electrical distribution within a housing unit, and appliances. He found that there was no strong income effect on fire rates within these categories of fire cause. In fact, there was no significant difference at all between the five income groups for appliance fires, and for heating fires, the two groups with the lowest median incomes had fire rates lower than the next highest income group. Gunther attributed this latter finding to the likelihood that a greater percentage of families living in the lowest two income groups lived in private apartments or public housing units where central heating systems were professionally installed and maintained, thus reducing the risk of fire. Electrical distribution revealed a slight but not statistically significant relationship to income.<sup>12</sup>

While the effects of income on fire rates were relatively easy to discern in the data, the effects of race were less so. Gunther found that the overall incidence of fires from all causes did not appear to be related to race after the effects of income were accounted for. For individual causes of fires, Gunther maintained that the data were less clear, but he did not provide any evidence showing a significant effect for race apart from income.<sup>13</sup>

Recent work by Jennings (1996) represents an attempt to conceptualize the complex interrelationships between environmental, structural, and human factors as they relate to fire. Greater understanding of the role played by socioeconomic factors is critical for at least two reasons. First, they have been shown, as reported above, to be powerful predictors of the incidence of fire in different types of neighborhoods. Second, Jennings claims that socioeconomic and environmental factors outweigh fire suppression factors, such as fire department resources, in determining losses from fires. These losses include both the dollar value of loss to property and the rate of injury and death among humans.<sup>14</sup>

In addition, the relative importance of socioeconomic factors for understanding residential fire risk has likely been rising in recent decades as technological changes, including broad-based installation of smoke detectors, have reduced the risk of fire for most U.S. households. Since fire risks have not declined at the same rate for all groups of people,

---

<sup>12</sup> Gunther, 1981, pp. 57-58.

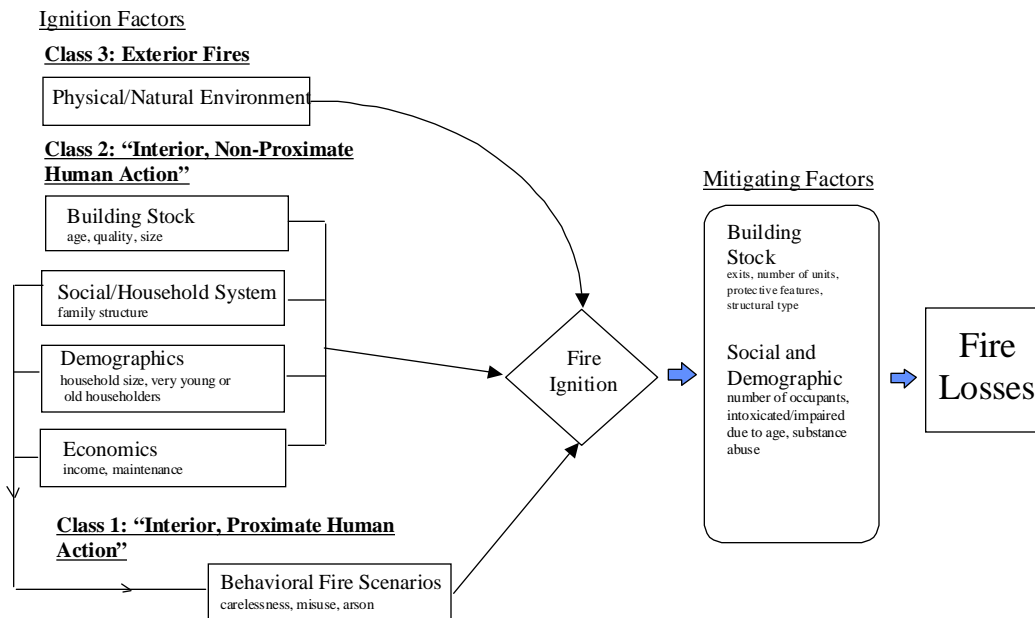
<sup>13</sup> Gunther, 1981, pp. 56-58.

<sup>14</sup> Jennings, Charles R. *Urban Residential Fires: An Empirical Analysis of Building Stock and Socioeconomic Characteristics for Memphis, Tennessee*. Unpublished doctoral dissertation, 1996, pp. 105-107.

socioeconomic factors are likely becoming more important for explaining relative residential fire risks.

Jennings’ conceptual model of fire initiation and fire loss appears in Figure 1.<sup>15</sup> For fires originating indoors (Class 1 and Class 2 fires), the model depicts interactions between four socioeconomic factors: characteristics of the building stock, characteristics of the social or household system, household demographics, and household economic factors. These interactions can lead to fire ignition indirectly, with no immediate human action, or directly, through human carelessness, misuse of equipment, or intent (arson).

Figure 1. Conceptual Model of Fire Initiation and Fire Loss ©



Jennings, 1996

To test the appropriateness of this model for explaining differences in fire rates, Jennings used multiple regression analysis on fire rate data for different census tracts within the city of Memphis, Tennessee. After a review of the literature and the merits of different

<sup>15</sup> Jennings, Charles, 1996, p. 122.

variables, Jennings chose four variables to represent the socioeconomic concepts in his model:

<b><u>Concept</u></b>	<b><u>Variable</u></b>
building stock	percent of vacant dwelling units
social/household system	percent of households headed by female single parents
demographics	percent of population less than 17 or older than 65
economics	median household income

These variables were selected on the basis of their consistency with the conceptual model and their correlation with residential fire rates. Other variables were eliminated from the final analysis because they were highly correlated with other variables included in the model. For example, Jennings found that income and education were highly positively correlated, meaning that income rose as education levels rose, so education had to be dropped from the regression analysis.<sup>16</sup>

Multiple regression analysis revealed that each of the variables in Jennings' final model was significant and that together they accounted for 63 percent of the variation in residential fire rates across census tracts.<sup>17</sup>

Jennings' model is an important step toward developing and testing a theory of fire ignition and losses. His work extends the current research beyond the identification of variables useful in predicting fire rates for different communities or different households. This is important because, as Schaenman et al. (1977) point out, identifying predictor variables is not the same as identifying causes of higher fire rates.<sup>18</sup> For example, while the incidence of poverty has been shown to be associated with increased fire risk, poverty in and of itself does not cause fires. From Jennings' model, theories about how various socioeconomic factors and ignition factors are related to residential fire rates can be developed and tested.

---

<sup>16</sup> Jennings, Charles, 1996, pp. 180-181 and p. 252.

<sup>17</sup> Jennings, 1996, p. 180.

<sup>18</sup> Schaenman et al., 1977, p. 57.

## Part II. How Income Level Affects Fire Risk in Urban Areas

The previous section reviewed several studies that identified important socioeconomic factors related to fire rates. This section will explore how those variables help explain variations in fire rates among different neighborhoods. The discussion focuses on one variable that was referenced directly or indirectly in each of the studies reviewed above--income. Consistent with the literature, the emphasis here is on ways in which people with lower incomes are exposed to greater fire risk than people with higher incomes. Also discussed is how some of the same factors that increase the risk of fire also increase the risk of fire-related injuries and deaths.

Income levels are an important measure because most of the socioeconomic risk factors related to fire are related to income. This discussion will focus on low income residents of urban areas and only briefly discuss fire risks of the rural poor. This emphasis is necessary for two reasons. First, neighborhood, housing, and population characteristics are very different in urban and rural areas, and their fire-incidence patterns and fire-cause patterns differ as a consequence. Second, most of the research into socioeconomic factors related to fire risk has focused on urban areas.

The presentation below uses a top-down approach to explore the socioeconomic factors associated with increased fire rates at three different levels:

- the level of the **neighborhood**,
- the level of the **household**, including housing unit characteristics and characteristics of the household members themselves, and
- the level of the **individual**

### **Socioeconomic Factors at the Level of the Neighborhood**

To understand variations in fire rates across different neighborhoods, it is useful to understand how neighborhood quality is tied to fire rates. Generally speaking, the well-being of a residential neighborhood is tied to the quality of its housing stock. The quality of this stock, however, can be diminished by the interrelated processes of fire and building abandonment. The question is, what makes poor neighborhoods more vulnerable to the threat of fire than other neighborhoods? Several explanations are offered below.

- **Vacant and Abandoned Buildings**

Neighborhoods in U.S. cities tend to be segregated by income level. In the poorest neighborhoods, building abandonment is more common than in other residential neighborhoods.<sup>19</sup> Vacant buildings represent a fire hazard for several reasons. First, they are more likely to experience severe fires than other types of buildings. Sternlieb and Burchell (1973) found that abandoned buildings were four times more likely than other structures in Newark, New Jersey to have a severe fire, often as the result of arson.<sup>20</sup> Second, homeless persons or others seeking shelter from the elements or the watchful eyes of neighbors may enter vacant buildings illegally. This situation can be especially dangerous in the winter months, when those seeking shelter may light fires indoors in an effort to keep warm. To the extent that persons seeking refuge in abandoned buildings are under the influence of alcohol or drugs, there is an added risk that careless use of smoking materials will ignite a fire.<sup>21</sup>

- **Neighborhood Decline**

Building abandonment can become a self-fulfilling prophecy for a neighborhood. The presence of vacant buildings may discourage apartment building owners, who often do not live in the neighborhood, from investing in their buildings. The withdrawal of routine maintenance services soon seriously erodes the quality of the housing units in those buildings, increasing the risk of fire from inadequately maintained heating or electrical systems, for example. In the worst case scenario, an owner may use arson as a means to force tenants out of a building or to fraudulently collect on an insurance policy, thereby “cashing in” his or her investment from the community. The end result is usually another vacant building in the neighborhood.

Related to the phenomena of disinvestment from poor neighborhoods by private citizens is disinvestment by large institutional actors, specifically banks, mortgage companies, and insurance companies. Prior to legislation prohibiting redlining, many of these private firms could legally refuse to underwrite mortgages or write fire

---

<sup>19</sup> Massey, Douglas and Nancy Denton. 1993. *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, MA: Harvard University Press, p. 132

<sup>20</sup> Sternlieb, George and Robert Burchell. “Fires in Abandoned Buildings.” *Fire Journal*. Vol. 67, no. 2, 1973, p. 28.

<sup>21</sup> Norton, Alison. 1989. “Fire Risks of the Homeless.” *Fire Journal*. Vol. 83, no. 6, (November/December) p. 33.

insurance in poor, particularly minority, communities. The resulting credit crunch meant that owners did not have access to capital to invest in the maintenance and improvement of their properties. Also, owners were discouraged from investing in their properties because, without a flow of mortgage money, they were unlikely to recover their investment through sale of the property. Thus the lack of available credit has played an important role in the process of building abandonment and neighborhood decline in poor neighborhoods. Abandonment, in turn, increases the incidence of fires caused by arson or human carelessness in those neighborhoods.

- **Arson**

Arson is a significant cause of fires and fire casualties in many metropolitan areas. Data from the National Fire Incident Reporting System (NFIRS) for 1994 reveal that arson and cooking fires were tied as the leading cause of residential fires in metropolitan areas, each accounting for 21 percent of fires. For residential fires in the U.S. as a whole, arson fires ranked third among the leading causes, accounting for only 14 percent of fires. Arson was also the leading cause of fire deaths in metropolitan areas in 1994, accounting for over one fourth of all residential fire deaths. In contrast, among all residential fire deaths in the U.S., the leading cause was careless smoking, which accounted for 24 percent of deaths. Arson was the second leading cause, accounting for 15 percent of deaths.<sup>22,23</sup>

Gunther (1981) specifically addressed the relevance of income for understanding how different neighborhoods are affected by arson. In Toledo he found that among all the fire-causes he studied, the relationship between income and incendiary or suspicious fires was the most dramatic. Regression analysis suggested that the group of census tracts with the lowest median income experienced about 100 to 120 incendiary or suspicious fires per 100,000 population. In contrast, the group of census tracts with a slightly higher median income experienced about 55 to 70 incendiary or suspicious fires per 100,000 population, a dramatically lower rate. Even worse, when compared

---

<sup>22</sup> United States Fire Administration, 1990, p. 355. In NFIRS, arson fires are those classified by fire departments as having “incendiary” or “suspicious” origins.

<sup>23</sup> This information is intended to give readers a general idea of how metropolitan and national data compare, but it must be interpreted with care. Due to the way the data is collected and reported in the National Fire Incident Reporting System (NFIRS), data from some areas that are largely rural in character are included under metropolitan areas.

to the group of census tracts with the highest median income, the poorest group of census tracts were predicted to have 14.4 times the number of incendiary or suspicious fires.<sup>24</sup>

In addition to the problem of arson and other fires in abandoned buildings, the quality of a neighborhood can also affect fire safety in another way. Since crime rates tend to be higher in low income neighborhoods, households in these neighborhoods may seek to make their homes safer by barring access through doors and windows. This may be accomplished by installing iron grilles on windows and doors or by other means, such as using furniture to block doors and passageways. The danger is that in the event of a fire, barred windows and blocked doorways and passageways make it harder for those inside a burning building to get out.<sup>25</sup> As a result, fire-related injuries and deaths are likely to be higher than they would normally be given the nature and severity of a particular fire.

## **SOCIOECONOMIC FACTORS AT THE LEVEL OF THE HOUSEHOLD**

The section above addressed socioeconomic factors relating neighborhood quality to the incidence of fire. This section narrows the scope to focus on the level of the household. Household-level factors relevant to fire rates include the quality of individual housing units, their affordability to residents, and the social structure of the households that reside in them. In the U.S., housing quality and housing affordability are closely related. The cost of a housing unit, whether for sale or to rent, is priced according to the quality of the unit given its location, amenities, etc., with the effect that higher income households can generally afford to live in higher quality units than lower income households. While recognizing the close connection between these concepts, housing quality and housing affordability are discussed separately to explore the unique ways they are related to income levels and relative fire risks.

- **Housing Quality**

Income is the primary determinant of the quality of housing for most households. In many urban areas, households with low incomes live in the oldest and most run-down

---

<sup>24</sup> Gunther, 1981, p. 56.

<sup>25</sup> Fahy, Rita and Alison Norton. 1989. "How Being Poor Affects Fire Risk..." *Fire Journal*. Vol. 83, no. 1 (January/February), p. 34.



portion of the city's housing stock. There are over 2.4 million inadequate, occupied rental housing units in center cities throughout the U.S., and over 62 percent of them were built prior to 1950.<sup>26</sup> Two trends suggest that the general condition of much center city housing will continue to deteriorate and the number of households living in inadequate units in these areas will increase. First is the increasing income gap between the well-off and the poor in the U.S., and the other is cutbacks in income support programs for low income households. Both of these trends, in different ways, undermine the rent-paying ability of low income households and suggest that poor quality housing will continue to be a reality for millions of low income households.<sup>27</sup> Living in an old, poorly maintained housing unit raises a household's risk of experiencing a fire for several reasons. First, older heating, plumbing, and electrical systems need adequate maintenance over their useful lives to ensure their continued safe operation. As discussed earlier, many apartment buildings in center city areas have not been adequately maintained. This increases the risk of mechanical malfunction and the possibility of a fire.

Second, the electrical wiring in many older houses and apartments poses a fire risk. Older wiring was not designed to carry the electrical loads placed upon it by modern appliances, such as microwave ovens, televisions, stereo equipment, etc., and excessive loads may lead to electrical fires. Similarly, residents may try to compensate for an older apartment's inadequate electrical system by running extension cords and placing excessive demands on limited electrical outlets, strategies which may also overload a socket or circuit and ignite an electrical fire.<sup>28</sup>

Third, fire risk increases for households that try to compensate for a building's inadequate heating system using stop-gap measures such as space heaters.<sup>29</sup> Space heaters and other types of alternate heating devices can increase fire risk in many ways: if they are older and have not been adequately maintained; if they are used incorrectly, too close to combustibles, or with inadequate ventilation; or if they are used in a

---

<sup>26</sup> Harvard University Joint Center for Housing Studies, 1996, p. 21. Units are considered inadequate if they lack any basic plumbing, heating, or other mechanical systems, or if other information regarding inadequate upkeep is available.

<sup>27</sup> Harvard University Joint Center for Housing Studies, 1996, p. 23.

<sup>28</sup> Jennings, 1996, p. 123.

<sup>29</sup> Jennings, 1996, p. 123.

household with children, especially very young children, who may interfere with the safe use of a space heater or other alternate heating device.

A notable exception to the relationship between low income status and increased fire risk from old and under-maintained housing stocks is the case of households receiving housing assistance. Public housing is available in most large cities in the U.S., and it is reasonable to expect that heating and electrical systems in some of these buildings are better maintained and pose less of a fire hazard than those commonly found in older, private market apartment buildings affordable to low income households. Households that receive rental subsidy certificates or vouchers should also be exposed to lower fire risks than other low income households because, at least in the federal Section 8 program, apartment units are inspected on an annual basis, and units that fail inspections are not eligible to participate.

Just as the quality of a household's dwelling unit can effect its fire risk, so does the quality of its furnishings. Considerable improvements have been made in the fire safety of many types of consumer products, particularly home furnishings. Today mattresses and upholstery are manufactured to be more resistant to ignition than ever before. Unfortunately, lower income households are more likely to have older furnishings which ignite more readily and which increase the risk of fire and fire-related injuries and deaths.

### ***Smoke Detectors***

Smoke detectors have contributed significantly to reductions in fire deaths. Between 1980 and 1990, the U.S. experienced a decrease in residential fire deaths of about 25 percent.<sup>30</sup> One reason that smoke detectors are so effective in saving lives is that a high proportion of fatal fires occur at night, and smoke detectors alert residents early enough that they have a better chance of escaping from burning buildings. 1994 NFIRS

---

<sup>30</sup> Smith, Charles L. 1994. *Smoke Detector Operability Survey Report on Findings (revised)*. Released by the Consumer Product Safety Commission, October 1994, p. 1

data show that only 19.2 percent of fire deaths occurred in homes known to have operational smoke detectors.<sup>31</sup>

It is also likely that smoke detectors have reduced the number of residential fires requiring fire department suppression services. In 1994, over 65 percent of residential fires occurred in households without operational smoke detectors. This raises two possibilities: either households with operational smoke detectors are more safety conscious, or smoke detectors allow residents to detect and extinguish small fires which are not reported to the fire department.<sup>32</sup>

The relationship between low income status and the presence of operational smoke detectors has not been firmly established. But it is likely that lower income households are less likely to have operational smoke detectors to the extent that:

- they live in older structures: for households living in dwelling units constructed between 1980 and 1992, 92 percent are estimated to have operational smoke detectors. This percentage drops to 82 percent for households in units built during the 1970s and 74 percent for units built prior to 1970.<sup>33</sup>
- they live in substandard units that are not maintained to building codes; or
- they are “shelter poor” (see below) or otherwise do not purchase or maintain smoke detectors.

At this point, it is known that neighborhoods with high proportions of low income households also have proportionately more fires than neighborhoods with more middle- and high-income residents, and that households without operational smoke detectors are almost two and a half times more likely to have reported fires than those with operational smoke detectors.<sup>34</sup> Taken together these facts suggest that low income households may have fewer operational smoke detectors and thus face higher fire risk. This is an important topic for future research, both to establish with greater certainty

---

<sup>31</sup> United States Fire Administration, 1990, p. 78. Unless otherwise noted, all information on smoke detectors from NFIRS refers to cases where their presence and operability was reported only.

<sup>32</sup> United States Fire Administration, 1990, p. 78.

<sup>33</sup> Smith, Charles L., 1994, pp. 16-17.

<sup>34</sup> 1990 census data on number of households is from Smith, Charles L., 1994, p. ii and p. 3, and data on smoke detector status in households reporting fires is from 1994 NFIRS data.

the relationship between household income and the presence of operational smoke detectors and then to specify the reasons. Are detectors missing completely or are they installed but not operational because they have been disconnected, they are missing batteries, or for other reasons?

- **Housing Affordability**

Housing affordability is another factor that affects a household's fire risk. Households are "shelter poor" if they are able to make their rent payments, but do not have enough left over to cover other basic needs, such as adequate food, clothing, and other household necessities.<sup>35</sup> According to the 1996 State of the Nation's Housing report, 20 percent of center city renters face "severe" rent payment burdens, meaning that 50 percent or more of their income goes toward housing costs. Among households in center cities that are low income, or households whose incomes are 50 percent or less of the area median, 45 percent have severe payment burdens.<sup>36</sup> With half of their monthly incomes going to pay rent, little is left over to provide for other necessities.

Shelter poverty can affect a household's fire risk in several ways. Most importantly, the lack of truly "disposable" income means that households are unlikely to invest in fire protection devices, such as smoke detectors or batteries for existing smoke detectors. Munson and Oates refer to this as the "positive income elasticity of demand for fire safety": the higher a household's income, the more it is willing to spend money on fire safety<sup>37</sup>. Shelter poverty can also effect a household's fire risk if it cannot afford to make utility payments. If one or more of a household's utilities are shut off, the household is likely to compensate with other, less fire-safe devices. For example if a household heats with gas and the gas is shut off, the household may turn to electrical space heaters or other methods to keep warm. Compared to central heating, these heating methods pose a much higher fire risk.

---

<sup>35</sup> Stone, Michael. *Shelter Poverty: New Ideas on Housing Affordability*. Philadelphia, PA: Temple University Press, 1993, p. 34.

<sup>36</sup> Joint Center for Housing Studies, 1996, p. 29.

<sup>37</sup> Munson, Michael J. and Wallace E. Oates. "Community Characteristics and the Incidence of Fire: An Empirical Analysis." In *The Social and Economic Consequences of Residential Fires*. Chester Rapkin, Ed. Lexington, MA: D.C. Heath and Co., 1983, p. 62 and p. 73.

For some households, the lack of affordable housing becomes a crisis. Increasingly, families are among those who find themselves homeless. A 1986 report by the U.S. Conference of Mayors quantified this phenomenon, estimating that families constituted 28 percent of the homeless in states they surveyed.<sup>38</sup> For families who seek shelter in vehicles or abandoned buildings after becoming homeless, their risk of fire rises precipitously as discussed earlier, particularly in cold weather.

- **Household Structure**

In addition to physical and economic conditions such as the quality and affordability of a housing unit, social factors related to household structure can also affect fire risk. The household characteristics most often included in studies of increased fire risk are the presence of single parent households (usually headed by females), the presence of children, the presence of elderly persons, and household crowding. The relevance of single parent households for increased fire risk is tied to the presence of children in the home, so these two topics are addressed together in the section below.

### *Single Parent Households and the Presence of Children*

Single parent households are related to increased fire risk in two ways. First, single parent households tend to be less affluent than two-parent households since there is only one income if the parent is not receiving support from other sources. These households are at greater risk of experiencing a fire for all the reasons associated with low income households generally.

Second, a single parent household generally has less flexibility to deal with household and child care contingencies. Kraizer et al. (1990) found that children in urban areas were left unattended more often than rural or suburban children. Parents told researchers that they left their children alone because they had no other choices. Under these circumstances, they attempted to make arrangements with neighbors or relatives who their children could turn to in the case of an emergency.<sup>39</sup>

---

<sup>38</sup> Norton, Allison, 1989, p. 32.

<sup>39</sup> Kraizer et al. 1990. "Children in Self-Care: A New Perspective." *Child Welfare* (November/December), p. 575.

In another study, Fahy (1993) found that parents left children home alone for a variety of reasons. Whether single-parent or two-parent families, Fahy found that these reasons included:

- parents went out on a quick errand,
- parents were out socializing,
- parents were at work when their child care arrangements fell through,
- parents went out on an extended errand, and
- the babysitter left the home before the parents returned.<sup>40</sup>

The fire risks associated with leaving children home alone also extend to cases where an adult is home, but children are unsupervised. In both of these cases, fire risk is higher due to children's curiosity about fire and their propensity to play with matches, lighters, and other fire-related materials. The limited life experiences of children make them unable to comprehend the enormity of careless actions involving fire. Data from 1989 through 1993 reveal that among all fires that resulted in the death of a small child, over one-third (37 percent) were caused by children playing.<sup>41</sup> Fires can also result from children cooking without supervision.

The risk posed by children playing is even greater in households without operational smoke detectors. In these cases, even if an adult is present in another part of the home, smoke or fire may not alert them until it is too late to escape, particularly if the adult is asleep when the fire breaks out.

Gunther (1981) shows that, relatively speaking, children playing fires are an even greater problem in low income neighborhoods than other neighborhoods. In Toledo he found that the poorest group of neighborhoods had a rate of children playing fires that was 14.2 times as high as the wealthiest group of neighborhoods.<sup>42</sup> This helps explain the National Fire Protection Association's finding that among black children, who are

---

<sup>40</sup> Fahy, 1993, p. 56.

<sup>41</sup> National Fire Protection Association. 1996. Presentation at the 1996 Fire and Life Safety Symposium, July 11, 1996.

<sup>42</sup> Gunther, 1981, pp. 56-57.

disproportionately represented in low income households, “home fires are the leading cause of injury-related deaths for children between ages 1 and 9.”<sup>43</sup>

To the extent that low income households are less able to afford or access quality and reliable daycare and their children spend time at home by themselves, their fire risk increases. Single parent households have an additional challenge in that only one adult is available to respond to a child care crisis should one arise. Currently many programs at the local, state, and federal levels are emphasizing “self-sufficiency” programming for families receiving income support assistance. But given the serious fire risk associated with leaving children at home alone, adequate attention must be paid to the availability and affordability of quality day care and after school programs.

Without them many more parents may be tempted or forced to allow children to spend time at home alone, especially children returning home from school.

While low income households, and single parent households in particular, may face higher risks of fires caused by unattended or unsupervised children, no household with children is immune to this threat. Fahy reports that a more important factor than poverty in explaining the incidence of fires started by children playing is the reticence of parents to recognize instances when they leave their children home alone or unsupervised.<sup>44</sup> Kraizer et al. found that most parents, regardless of socioeconomic background, did not consider running out to do a quick errand as leaving their children “unattended”. They also found that most parents overestimated the ability of their children to deal with mundane household occurrences, such as answering the telephone or dealing with strangers who came to the door.<sup>45</sup> Parents’ failures to recognize instances when they leave their children alone or unsupervised also means that they are not cognizant of the increased fire risks their children face during these times.

---

<sup>43</sup> National Fire Protection Association, 1996.

<sup>44</sup> Rita Fahy. 1993. “Leaving Children Unsupervised is Playing with Fire.” *Fire Journal*. Vol. 87, no. 3 (May/June), p. 58.

<sup>45</sup> Kraizer et al., 1990, p. 575 and p. 578.

### ***Fire Risks of Elderly Persons***

Each year a disproportionately high number of elderly people are killed in residential fires. In 1990, elderly people over the age of 70 represented 8 percent of the U.S. population, yet they accounted for 18 percent of all those killed in residential fires. While the elderly accounted for only 7 percent of all those who were injured in fires, this is likely a consequence of the fact that elderly persons injured in a fire are more likely to die of their injuries. Beginning at age 70, an individual's risk of dying in a fire rises dramatically. Those between the ages of 70 and 74 have a 50 percent greater chance of being killed in a fire than the population at large. By age 85, the risk of dying is more than 250 percent higher than for the overall population.

The nature of the risk that elderly persons face is two-fold: on the one hand, they may be exposed to greater risk than the population at large, and on the other they may be less able to escape a fire due to physical or mental limitations. Elderly persons are at greater risk for experiencing fires because everyday activities, especially cooking, can become more dangerous if a person's physical or mental capabilities decline. This risk of fire is compounded for persons who are on medications that make them less alert or for those who smoke and drink alcohol alone. Studies are necessary to determine if low income elderly persons are more at risk than other elderly persons of experiencing or being injured or killed in a residential fire.

### ***Overcrowded Households***

Many studies of the relationship between socioeconomic variables and fire rates include a variable for "overcrowding". While overcrowding, which is usually defined as more than one person per room in a dwelling unit, is more of a problem in low income communities, it is not clear how it relates to increased fire rates. Jennings suggests that the more people there are in a household the greater the wear and tear on a dwelling unit's mechanical systems, and this may increase the risk of fire.<sup>46</sup> Another possibility is that "overcrowding" as defined in some studies is another indicator of poverty, one that taps a dimension of poverty not accounted for in other measures.

While its affects on fire incidence rates are not well established, the impact of overcrowding on fire injury and death rates is more straightforward. One way low

---

<sup>46</sup> Jennings, 1996, p. 124.



income families deal with the lack of affordable housing is by doubling up in homes with extended family members or friends. By increasing the number of people in a given household, the number of potential victims of a fire also rises. Also, the more people there are in a household, the more difficult it can be to get everyone out of a burning unit. This is especially true for households with very young or very old household members who may be unable to escape flames or smoke on their own. In addition, households without operational smoke detectors have less time to escape a fire, and their ability to access all areas in the home to alert or retrieve other household members is diminished.

## **SOCIOECONOMIC FACTORS AT THE INDIVIDUAL LEVEL**

In the sections above, the socioeconomic factors associated with increased fire risk at the neighborhood and household levels were examined. This section completes the top-down presentation of fire risks by discussing individual-level socioeconomic factors related to fire risk. Factors at the level of the individual include the incidence of careless smoking, the incidence of alcohol and drug abuse, education levels, and type of housing tenure.

- **Careless Smoking and Alcohol and Drug Abuse**

Careless smoking is a leading cause of fire deaths and injuries in the U.S. While careless smoking accounted for only 7 percent of all residential fires in 1990, it was responsible for 26 percent of all fire deaths and 15 percent of all fire injuries.<sup>47</sup> Studies have shown that cigarette smoking is inversely related to income, so low income households are arguably at greater risk from fires caused by careless smoking.<sup>48</sup> In Toledo, Gunther (1982) found significant differences in the rates of careless smoking fires among the five groups of neighborhoods he studied. The rate of careless smoking fires for the group with the lowest median income was 8.5 times as high as the rate for the group with the highest median income.<sup>49</sup>

Closely related to the topic of careless smoking is alcohol and drug abuse. Intoxicated persons are at greater risk of falling asleep while smoking, and improperly discarded or

---

<sup>47</sup> United States Fire Administration, 1990, pp. 70-71. The percentages given reflect data on fires with known causes.

<sup>48</sup> Report by the Centers for Disease Control in Jennings, 1996, pp. 70-71 and p. 243.

<sup>49</sup> Gunther, 1981, p. 56.

dropped cigarettes are a dangerous ignition source. The proximity of the sleeping person to the origin of the fire illustrates why these fires tend to be so deadly, particularly if the victim is too inebriated to recognize the danger or successfully escape.

- **Low Levels of Education**

Fahy (1989) identifies low levels of education as contributing to fire risk and suggests that those with little education are less likely to “grasp the full import of public fire safety education messages”.<sup>50</sup> Low literacy levels may also inhibit the ability to read instruction manuals and warning labels for cooking and heating devices, increasing the chance that they will be used incorrectly and in a manner that increases the risk of fire. There is an important connection between education levels and income levels, especially in the U.S.’s increasingly high-tech workplaces, and people with low levels of education are far more likely than others to have low incomes. Further research is needed to ascertain how important low education levels are in increasing fire risk relative to other factors such as income.

- **Housing Tenure and Fire Risk**

Another variable that has been studied in association with fire rates is housing tenure. Several studies have found that lower rates of owner-occupation, which are more typical in low income communities, are related to increased fire rates. The difficulty is in specifying the nature of this relationship. Munson and Oates (1983) suggest that by virtue of owning their own homes, owner-occupiers may have a tendency to better maintain their homes, thereby reducing the likelihood of mechanically-caused fires, and they may be more careful in their everyday routines, reducing the likelihood of cooking, careless smoking, or other types of fires that result from human carelessness. Owner-occupiers may also have more of a vested interest in purchasing and maintaining fire protection devices such as smoke detectors as a means of protecting their equity investments.<sup>51</sup>

---

<sup>50</sup> Fahy, 1989, p. 36.

<sup>51</sup> Munson and Oates, 1983, p. 62.

- **Social Pathology and Fire Risk**

Another area that needs further study is ways in which arson fires are related to the stresses associated with living in socially and economically depressed inner city neighborhoods. Fahy (1989) suggests that higher rates of incendiary and suspicious fires may be manifestations of the complex and often overwhelming problems people are more likely to experience in these neighborhoods.<sup>52</sup> Recent increases in the rate of residential arsons may be evidence of this phenomena. The increase may indicate that an increasing proportion of arson fires are targeted at individuals rather than motivated by profit.<sup>53</sup> Fahy also suggests that the stresses of living in disadvantaged communities may lead to higher rates of child playing fires and fires set by juveniles. These areas are all in need of further study.

### **Part III. How Poverty Affects Fire Risk in Rural Areas**

Though a full analysis of the unique fire risks of rural populations is not undertaken here, a few of the risks unique to rural areas are presented briefly. First, a 1982 study by Gunther tied high rates of rural fire deaths to variations in climate and income. He found that fire-death rates were much higher in the South than in the North, and, contrary to what one might imagine, the rate of fire deaths attributable to heating fires was higher in the South.<sup>54</sup> Gunther explained these findings by noting the greater extent of rural poverty in the southern states, but climate also played an important role.<sup>55</sup>

Since the climate is generally milder in the South, fewer households have warm air furnaces than households in the North (43 percent compared to 56 percent in the North). Instead, a higher proportion of households use less fire-safe heating methods, such as room heaters, fireplaces, portable heaters, and wood stoves. If not properly vented, or if too close to other combustible household items, these heating methods present a serious fire risk. In 1976, 38 percent of all southern households heated primarily with either room

---

<sup>52</sup> Fahy, 1989, p. 35.

<sup>53</sup> United States Fire Administration, 1990, p. 219.

<sup>54</sup> For the purposes of his analysis, Gunther classified the following states as “southern” : Delaware, Maryland, Virginia, West Virginia, North Carolina, South Carolina, Georgia, Florida, Kentucky, Tennessee, Alabama, Mississippi, Arkansas, Louisiana, Oklahoma, and Texas.

<sup>55</sup> Gunther, 1982, p. 34

heaters (with and without flues), fireplaces, portable heaters, or wood stoves, and among African Americans this figure rose to 68 percent. In contrast, only 14 percent of northern households used one of these methods as their primary heating source.<sup>56</sup>

Fahy and Norton (1989) identify two additional factors that distinguish the fire risks of poor rural households from their urban counterparts. First, the communities in which the rural poor live are less likely to be able to afford the level of fire protection services widely available in urban areas. Second, there is a greater likelihood that poor rural households live in remote locations far from available fire suppression equipment or that their houses are difficult to find. These factors slow the response time of the fire department and may increase the extent of the loss caused by a fire.

Clark (1982) argues that fire safety in rural areas is compromised by other factors, as well. He cites less strict adherence to building codes and greater use of low-cost building designs and materials in rural housing as serious fire safety risks.<sup>57</sup>

#### **Part IV. Why Study Socioeconomic Factors of Fire Risk?**

Socioeconomic factors are among the best predictors of fire rates at the neighborhood level. If the data were available, it would likely be found that the relationships between socioeconomic status and fire rates are even stronger at the household level. While structural factors of buildings affect fire rates, of greater importance are the myriad ways in which human activity directly and indirectly impacts fire risk. This report has explored how variations in the socioeconomic circumstances of human occupants of buildings and neighborhoods can critically impact fire rates.

In 1994, cooking, incendiary or suspicious causes, careless smoking, and children playing accounted for almost half of all fires in residential structures. If heating causes are added, this proportion rises to two-thirds of all fires.<sup>58</sup> Since fires resulting from human activities

---

<sup>56</sup> Gunther, 1982, p. 39.

<sup>57</sup> Clark, Frederick E. 1982. "Firesafety in Rural America." *Fire Journal* (July), p. 41.

<sup>58</sup> Heating fires are not necessarily caused by the direct or indirect actions of humans. Some heating fires result from mechanical malfunctions rather than human use, misuse, or neglect.

account for a high proportion of residential fires, public education represents one of the most important avenues for reducing the incidence and severity of home fires.

Analysis of differential fire risks for different socioeconomic groups is an important guide to designing and targeting public education and fire-safety outreach campaigns. For example, public education campaigns targeted to middle income groups should focus on the importance of maintaining operational smoke detectors in homes. In contrast, fire reduction efforts in center city areas need to recognize that low income households are less likely to be willing to pay for smoke detectors and batteries on their limited budgets. Due to the elevated level of stress in their lives generally, they are also less likely to prioritize fire safety. These considerations should effect both the content and form of fire safety campaigns.

Similarly, to attenuate the rate of child playing fires, middle income groups need to be educated about the dangers inherent in leaving children unattended, even for brief periods of time. But this strategy is not likely to be effective with low income households who may leave their children alone due to a lack of child care options. These two brief examples demonstrate that fire prevention efforts need to be sensitive to the needs and concerns of different socioeconomic groups, as indicated by differences in fire rates, different distributions of fire causes, and the presence of unique fire risk factors within communities. These challenges are in addition to those of creating fire prevention strategies that reach people who speak a variety of languages and have a wide variety of literacy levels.

## **Part V. Future Research**

At the present time, additional research into the socioeconomic factors associated with increased fire rates is necessary because much of the current literature is over fifteen years old. The relationships documented in the articles from that time period need to be replicated, both to test for the durability of those relationships and to look for changes that may have occurred over time.

An important resource for future studies is the National Fire Incident Reporting System (NFIRS). This database contains a great deal of information on fires that have occurred in the U.S. since the late 1970s.<sup>59</sup> Researchers can match information on fires from NFIRS with other information sources, such as data from the Census Bureau, to investigate relationships between the incidence of fire and socioeconomic status. New computer software and increases in the amount of data available in electronic formats have made this type of research more manageable than in prior years.

Additional topics addressed in this report and deserving of attention include:

- ***Smoke Detectors:*** Do low income households have smoke detectors present in their households in the same proportions as the general population? Are installed detectors operational to the same extent as in other households? If not, what issues are at work in addition to the expense of purchasing or maintaining detectors?
- ***Arson:*** Arson fires can be an act of vandalism, arson-for-profit, pyromania, spite, or revenge. Is there evidence that the relative distribution of these motivations is changing? For example are an increasing proportion of all arson fires motivated by spite or revenge? If so, how does this phenomena impact low income communities relative to other communities?
- ***Household Composition:*** How does the size and composition of households impact fire rates and fire injury and death rates? Some studies have found the variable “overcrowding” to be significant, but its relationship to increased fire rates needs to be specified. Studies are also needed to determine the impact of household composition relative to absolute household size on increased fire rates. Do these variables have different effects at different income levels?
- ***Child Playing Fires:*** Is there a relationship between the incidence of child playing fires and the presence of adult smokers in the household? Studies reveal that a higher proportion of low income persons are smokers, and other studies show that low income households are more likely to have child playing fires. Does the presence of a smoker in a household increase the risk that young children will have greater access to lighters and matches and play with them?

---

<sup>59</sup> Today NFIRS generally has information on between 45 percent and 50 percent of all fires that occur in the U.S. in a given year.

- ***Child Playing Fires:*** What proportion of child playing fires occur while children are home alone? What is the age distribution of those children who start fires?
- ***Regional Variations in Fire Death Rates:*** Are there still regional variations in fire death rates? Demographic changes, particularly in the southern states, may have affected death rate patterns and differences between regions. Are any existing differences still related to relative poverty levels?

## REFERENCES

- Clark, Frederick E. 1982. "Firesafety in Rural America." *Fire Journal* (July), pp. 40-41 and pp. 105-106.
- Fahy, Rita. 1993. "Leaving Children Unsupervised is Playing with Fire." *Fire Journal*. Vol. 87, no. 3 (May/June), pp. 54-58.
- Fahy, Rita and Alison Norton. 1989. "How Being Poor Affects Fire Risk..." *Fire Journal*. Vol. 83, no. 1 (January/February), pp. 29-36.
- Gunther, Paul. 1981. "Fire-Cause Patterns for Different Socioeconomic Neighborhoods in Toledo, OH." *Fire Journal*. Vol. 75 (May), pp. 52-58.
- Harvard University Joint Center for Housing Studies. 1996. *Into the 21<sup>st</sup> Century: The State of the Nation's Housing*. Cambridge, MA: The Joint Center for Housing Studies.
- Jennings, Charles R. 1996. *Urban Residential Fires: An Empirical Analysis of Building Stock and Socioeconomic Characteristics for Memphis, Tennessee*. Unpublished doctoral dissertation.
- Karter, Jr., Michael J. and Allan Donner. 1978. "The Effect of Demographics on Fire Rates." *Fire Journal*. Vol. 72, no. 1 (January), pp. 53-65.
- Kraizer, Sherryll, Susan Witte, George E. Fryer, Jr., and Thomas Miyoshi. 1990. "Children in Self-Care: A New Perspective." *Child Welfare* (November/December), pp. 571-581.
- Massey, Douglas and Nancy Denton. 1993. *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, MA: Harvard University Press.
- Munson, Michael J. and Wallace E. Oates. 1983. "Community Characteristics and the Incidence of Fire: An Empirical Analysis." In *The Social and Economic Consequences of Residential Fires*. Chester Rapkin, Ed. Lexington, MA: D.C. Heath and Co.
- National Fire Protection Association. 1996. Presentation at the 1996 Fire and Life Safety Symposium, July 11, 1996.



Norton, Alison. 1989 "Fire Risks of the Homeless." *Fire Journal*. Vol. 83, no. 6 (November/December) pp. 28-37.

Schaenman, Philip et al. 1977. *Procedures for Improving the Measurement of Local Fire Protection Effectiveness*. Boston: National Fire Protection Association, pp. 53-71.

Smith, Charles L. 1994. *Smoke Detector Operability Survey Report on Findings (revised)*. Released by the Consumer Product Safety Commission, October 1994.

Sternlieb, George and Robert Burchell. 1973 "Fires in Abandoned Buildings." *Fire Journal*. Vol. 67, no. 2 (March), pp. 24-31.

Stone, Michael. 1993. *Shelter Poverty: New Ideas on Housing Affordability*. Philadelphia, PA: Temple University Press.

United States Fire Administration. 1993. *Fire in the United States, 1983 - 1990*. Washington, D.C.: Federal Emergency Management Agency, United States Fire Administration.

## OTHER REFERENCES

Bertrand, Alvin L. and Lawrence S. McKenzie. 1976. *The Human Factor in High Fire Risk Urban Residential Areas: A Pilot Study in New Orleans, Louisiana*. Washington, D.C.: U.S. Department of Commerce, National Fire Prevention and Control Administration.

Brotman, Billie Ann and Pauline Fox. "The Impact of Economic Conditions on the Incidence of Arson: Comment." *Journal of Fire Risk and Insurance*. Vol. 55, no. 4, pp. 751-754.

Chandler, S.E., A. Chapman, and S. J. Hallington. "Fire Incidence, Housing, and Social Conditions -- the Urban Situation in Britain." *Fire Prevention*, no. 172, 1984, pp. 15-20.

Donnell, Robert P. *Fire In the City: Spatial Perspectives on Urban Structural Fire Problems*. Unpublished Doctoral Dissertation. Syracuse University, 1980.

Fenner, Deborah Ballou. *Austin Fire Service Demand: A Frequency and Regression Analysis*. Unpublished Master's Thesis, University of Texas at Austin, May 1990.

Gilliam, George A. *An Analysis of Residential Fire Patterns in Highland Park, Michigan 1970-1977 Using Individual Unit, Block, and Census Tract Data*. Unpublished Master's thesis. Detroit, MI: Wayne State University, 1985.

Goetz, Barry Joel. *The American Fire Service and the State: Government Organization and Social Inequality*. Unpublished Doctoral Thesis, University of California, Berkeley, 1991.

Karter, Michael Jr. and Allan Donner. *Fire Rates and Census Characteristics -- An Descriptive Approach*. Boston: National Fire Protection Association, June 1977.

Karter, Michael Jr. and Allan Donner. *Fire Rates and Census Characteristics -- An Analytic Approach*. Boston: National Fire Protection Association, July 1977.

Munson, Michael. *Residential Fire and Urban Neighborhoods: An Empirical Analysis of Charlotte, North Carolina*. Unpublished Doctoral Thesis, Princeton University, September 1977.

Munson, Michael. "Urban Neighborhoods and the Fear of Fire." In Chester Rapkin, Ed. *The Social and Economic Consequences of Residential Fires*. Lexington, MA: D.C. Heath and Company, 1983, pp. 165-194.

Murrey, Joe H. Jr., Robert E. Pitts, Dani A. Smith, and Kenneth W. Hollman. "The Relationship Between Selected Socioeconomic Variables and Measures of Arson: A Cross-Sectional Study." *Fire Technology*, vol. 23 no. 1, February 1987, pp. 60-73.

Runyan, Carol W., Shrikant I. Bangdiwala, Mary A. Linzer, Jeffrey J. Sacks, and John Butts. "Risk Factors for Fatal Residential Fires." *New England Journal of Medicine*. Vol. 327, September 17, 1992, pp. 859-863.

Schaenman, Philip, Barbara Lundquist, Hollis Stambaugh, Elyse Camozzo, and Anthony Granito. *Overcoming Barriers to Public Fire Education in the United States*. Arlington, VA: TriData Corporation, 1987.