

# Risk of Hospitalization Among Firefighters: The National Health Interview Survey, 1986–1994

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This study assessed the risk of hospitalization among firefighters. Data were derived from a nationally representative sample of 235 897 employed men from the National Health Interview Survey. Firefighters aged 30 to 39 years were at significantly increased risk for hospitalization relative to other employed men in the same age group (odds ratio = 1.93; 95% confidence interval = 1.21, 3.09). Findings from this study and others support the call for longitudinal studies to monitor the health of this high-risk occupational group. (*Am J Public Health*. 2004;94:1938–1939)

The occupational risk of death among firefighters was underscored on September 11, 2001, when 345 members of the New York City Fire Department perished during their response to the World Trade Center attack.<sup>1</sup> However, in the 10 years prior to this event, 75 to 112 annual occupational deaths occurred among professional and volunteer firefighters in the United States.<sup>2</sup> Firefighters are also exposed to risk of communicable diseases, respiratory and cardiovascular diseases, and thermal and musculoskeletal injury.<sup>3–7</sup> Moreover, they have been shown to be at increased risk for site-specific cancers.<sup>8</sup>

The US Fire Administration has compiled the annual number of firefighter fatalities in the United States for the past 20 years.<sup>9</sup> The US Fire Administration also compiles information on firefighter injuries occurring at approximately one third to one half of all fires in the United States through the National Fire Incident Reporting System.<sup>10</sup>

However, to date, there have been no nationally representative studies of hospitalization risk among firefighters. This study examined hospitalization rates in male firefighters and compared them with hospitalization rates in males employed in all other occupations.

## METHODS

### Study Population and Design

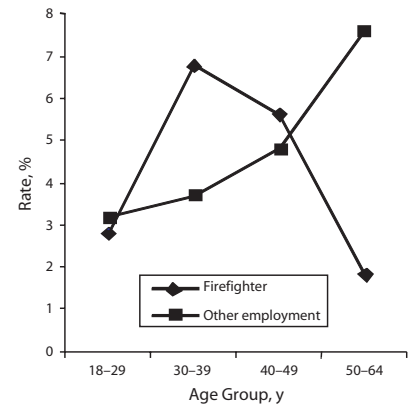
Conducted annually by the National Center for Health Statistics (NCHS), the National Health Interview Survey (NHIS) is a continuous multipurpose and multistage probability area survey of the US civilian noninstitutionalized population.<sup>11</sup> Each year, the NCHS collects health-related information from all adults residing in households selected to participate in the survey. A primary household respondent is asked to report on the health status of any adult member of the household not present for the interview. Throughout the 1986 to 1994 survey years, the response rate ranged between 95% and 98%. For the current analyses, complete data were available on 235 897 employed males, aged 18 to 64 years, who participated in the 1986 to 1994 NHIS. Of these, 923 were firefighters. The analyses were restricted to male workers because the data included only 38 female firefighters.

### Measures

Information on paid employment during the 2 weeks before the interview was collected for all persons aged 18 years or older. “Firefighter” was defined according to the following US census occupational codes: 413, 416, and 417.<sup>12,13</sup> Participants were asked to report how many times they had stayed in a hospital overnight or longer in the past 12 months. Age group (18–29, 30–39, 40–49, and 50–64), race/ethnicity (White, Black, all others), and educational attainment (less than high school education, high school graduate, greater than high school education) were included as covariates.

### Analyses

Because of the complex sample survey design, all analyses were completed with



**FIGURE 1—Age-specific rates of 1 or more hospitalizations in the previous 12 months, by employment (firefighter vs other) and age group.**

SUDAAN (Research Triangle Institute, Research Triangle Park, NC). This software takes into account design effects as well as sample weights, which were adjusted because of the use of multiple survey years.<sup>14</sup> Odds ratios (ORs) and corresponding 95% confidence intervals (CIs) are reported.

## RESULTS

Initial analyses of predictors of hospitalization in the previous 12 months indicated that there was a significant interaction between age and occupational status (Figure 1). Therefore, multivariate logistic regression was performed separately within each age group. Occupational status was not associated with risk of hospitalization among 18- to 29-year-old or 40- to 49-year-old participants (Table 1). However, relative to other employed adults in the same age group, the risk of hospitalization was significantly increased for firefighters aged 30 to 39 years (OR = 1.93; 95% CI = 1.21, 3.09) and significantly lower for firefighters aged 50 to 64 years (OR = 0.22; 95% CI = 0.05, 0.94).

## DISCUSSION

Information on the reasons for hospitalization was not collected in the NHIS. However, the increased risk of hospitalization

**TABLE 1—Multivariate Adjusted Odds Ratios (ORs) and 95% Confidence Intervals (CIs) for Hospitalization During the 12 Months Preceding the Interview Among Male Firefighters vs All Other Employed Males: National Health Interview Survey, 1986–1994**

Age Group, y, and Employment Type	Multivariate Adjusted OR <sup>a</sup>		
	n	OR	95% CI
18–29			
Not a firefighter	64 712	1.00	
Firefighter	189	0.94	0.40, 2.19
30–39			
Not a firefighter	70 065	1.00	
Firefighter	355	1.93	1.21, 3.09
40–49			
Not a firefighter	54 547	1.00	
Firefighter	275	1.17	0.70, 1.94
50–64			
Not a firefighter	45 650	1.00	
Firefighter	104	0.22	0.05, 0.94

<sup>a</sup>Adjusted for survey design, race/ethnicity, and educational level.

found in firefighters aged 30 to 39 years is likely caused, in part, by their occupational exposures. For example, 6 of the 14 non-heart-disease-related occupational deaths in 2001 occurred in professional firefighters aged 36 to 40 years (data exclude World Trade Center deaths).<sup>15</sup> Furthermore, the average age of firefighters filing workers' compensation claims is 35 years; the most commonly reported injuries leading to these claims are strains or sprains, overexertion, and burns.<sup>16</sup>

The lower risk of hospitalization among older firefighters may reflect, in part, a reduced occupational risk as these individuals move into more supervisory positions within the fire service and, perhaps, the acquisition of additional job-related safety skills. This lower risk also may be related to the healthy worker survivor effect. Firefighters who maintain good health in their later years will not face early retirement because of disability. Thus, older individuals who remain firefighters throughout their working lives could be expected to be healthier, on average, compared with per-

sons employed in other, less physically demanding occupations.

Findings from this study and the ongoing monitoring of occupational morbidity and mortality among firefighters reinforce the need for better training, the use and proper maintenance of safety equipment, the implementation of an incident management system by fire departments, and a focus on firefighter fitness.<sup>17,18</sup> Finally, this study, along with others documenting a range of adverse health effects associated with firefighting, supports the call for longitudinal studies to monitor the health of this high-risk occupational group. ■

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### Contributors

D.J. Lee and L.E. Fleming designed and coordinated both the research and the writing of the brief. O. Gomez-Marín and W. LeBlanc contributed to the study design, conducted the statistical analysis, and contributed to the writing of the brief.

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### Human Participant Protection

No protocol or institutional review board approval was needed for this study, because data were collected anonymously from a public health surveillance system in which adults voluntarily consented to interviews.

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