

Review

Exploring Occupational and Behavioral Risk Factors for Obesity in Firefighters: A Theoretical Framework and Study Design

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Firefighters and police officers have the third highest prevalence of obesity among 41 male occupational groups in the United States (US). However, few studies have examined the relationship of firefighter working conditions and health behaviors with obesity. This paper presents a theoretical framework describing the relationship between working conditions, health behaviors, and obesity in firefighters. In addition, the paper describes a detailed study plan for exploring the role of occupational and behavioral risk factors in the development of obesity in firefighters enrolled in the Orange County Fire Authority Wellness Fitness Program. The study plan will be described with emphasis on its methodological merits: adopting a participatory action research approach, developing a firefighter-specific work and health questionnaire, conducting both a cross-sectional epidemiological study using the questionnaire and a sub-study to assess the validity of the questionnaire with dietary intake and physical activity measures, and evaluating the strengths and weaknesses of the body mass index as an obesity measure in comparison to skinfold-based percent body fat. The study plan based on a theoretical framework can be an essential first step for establishing effective intervention programs for obesity among professional and voluntary firefighters.

Key Words: Obesity, Firefighter, Occupations, Behavior

Introduction

There are almost 1.1 million professional and voluntary firefighters in the United States (US) [1]. Obesity, an excessive accumulation of body fat [2], is a key health issue among firefighters who have a high risk for on-duty cardiovascular disease (CVD) mortality [3,4]. In a recent study using the 1997-

2002 National Health Interview Surveys (NHISs), firefighters, along with police officers, ranked third in obesity prevalence (30% having a body mass index [BMI] ≥ 30 kg/m²) among 41 US male occupational groups [5]. In earlier NHISs from 1986-1994, these occupations ranked fifth with the prevalence of 18%, so their obesity prevalence has increased in both relative and absolute measures (Fig.1). Firefighters are among the occupations with the highest prevalence of obesity despite the fact that they are the most active among the 41 male occupational groups and meet the Healthy People 2010 recommended leisure-time physical activity goals [6].

Despite the high obesity prevalence among firefighters [5,7], epidemiological studies on firefighters and obesity [8-13] have tended to focus on the associations between obesity and

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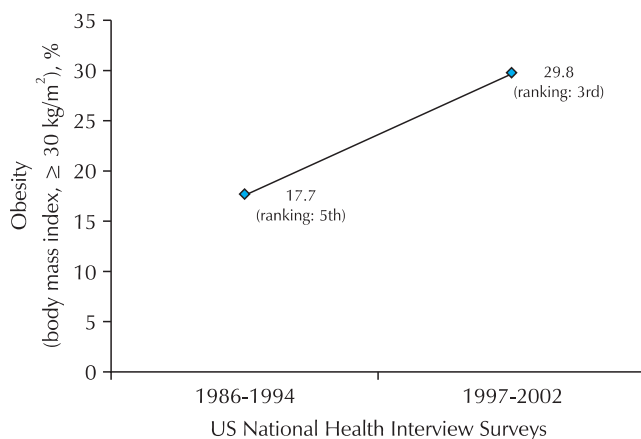


Fig. 1. Obesity prevalences of firefighters and police officers in the 1986-1994 and 1997-2002 National Health Interview Surveys of the United States (US). Ranking among 41 US male occupational groups. Raw data withdrawn from Caban et al. [4].

physiological covariates (e.g., blood pressures and lipid profiles). Only a few studies [14-17] have investigated occupational and behavioral risk factors for obesity in firefighters. Despite the well-documented preventive effects of regular physical activity and a healthy diet on obesity in general populations [18-26], in the few studies available, the associations between regular physical activity and obesity in firefighters are inconsistent. Two epidemiological studies failed to show a significant association between self-reported physical activity and obesity [14,15], while two experimental studies about supervised exercise training programs [16,17] reported a small, but statistically significant reduction of weight and body fat percent. The association between healthy diet behavior and obesity was supported in a recent cross-sectional study [14], but not in a prospective study [15]. To our knowledge, no study has examined the levels of physical activity, food consumption, and the eating behaviors of firefighters at work and during leisure-time in relation to obesity. Gerace and George [15] reported some socio-demographic and behavioral risk factors for obesity in firefighters (i.e., being unmarried, younger, Black, recent ex-smoker, fast-eater at stations, and financial insecurity) and Elliot et al. [14] reported beneficial effects of a supportive health climate at work on promoting healthy behaviors and managing weight.

The primary objective of this paper is to describe a theoretical framework for examining the relationship between working conditions, health behaviors, and obesity in firefighters. The paper will also describe a detailed study plan for exploring occupational and behavioral risk factors for obesity in firefighters that is based on the proposed theoretical framework and uses a participatory action research (PAR) model to ensure

that the study incorporates the formal and informal knowledge of firefighters' working conditions and behaviors.

Developing a Theoretical Framework on Work and Obesity in Firefighters

Do adverse working conditions increase the risk for obesity?

Evidence for an association between adverse working conditions and obesity has accumulated in recent experimental and longitudinal epidemiological studies in general working populations, including low work-related physical activity (e.g., sedentary work) [27-29]; shift work [30-33]; long working hours [34,35]; low job control [36,37]; high job demands [37]; high job strain (combination of low job control and high job demands) [36,38]; low social support at work [39]; and iso-strain (high job strain plus low social support at work) [39]. Nonetheless, the associations between working conditions of firefighters and obesity, and the relationships between working conditions and health behaviors for obesity in firefighters remain to be clarified. The working conditions of firefighters are virtually unique among the working population because of the 24-hour work shifts, the quasi-military work organization, and the pattern of generally routine firehouse-based activities interspersed with unpredictable calls for emergency medical care or to fight structural or wild land fires. It is important to understand whether and how occupational risk factors for obesity identified in the general working population are relevant to firefighters, and to consider whether the unique working conditions of firefighters add to or interact with the other risk factors for obesity.

Possible mechanisms for the associations between adverse working conditions and obesity

It is not clear yet how working conditions influence the risk of obesity [40]. However, several possible mechanisms have been proposed. First, a significant reduction of work-related physical activity (e.g., increasing sedentary labor), given the same level of energy consumption, could lead to a positive energy imbalance state [41]. Second, adverse working conditions may function as stressors to induce dysfunction of the hypothalamus [42-44], which could shift energy balance towards the positive via alterations of the autonomic nervous system, endocrine systems, and circadian rhythms in relation to lipid metabolism [42,45-48]. Third, adverse working conditions may cause obesity indirectly via changes in health behaviors. For example, high job demands [49], long working hours and shift work [50-52], and poor social support regarding dietary behaviors from

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