Health, Wellness, and Readiness in the Fire Service

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National Development & Research Institutes
Heart Healthy Heroes
AHA National 0830390N
Purpose: National Formative Study of Critical Health Issues in the Fire & Emergency Services

FIRE Study
EMW-2007-FP-02571
Purpose: Longitudinal Epidemiologic Surveillance Study in the Fire & Emergency Services

Fuel to Fight Study
EMW-2009-FP-01971
Purpose: Longitudinal Nutritional Epidemiologic Study in the Fire & Emergency Services, Ad36

The First Twenty for Volunteer Firefighters
EMW-2013-FP-00983
The First Twenty in a Clinic Based Setting
NIH 1R34HL125790-01

Women in the Fire Service: 1R21HL119024-01A1
Purpose: Mixed Methods Study of Female Firefighters’ Health

Evaluation of NFFF’s Stress First Aid: EMW-2014-FP-00945
Purpose: Cluster Randomized Trial of the SFA Intervention
Cardiovascular disease is the leading cause of LODD and a major cause of morbidity among fire fighters.

For every cardiac LODD, an estimated 17 non-fatal cardiac events occur on duty each year.
Causes of CVD

Genetics
Baseline habits
Initial Body Composition & Fitness Level

Tobacco
Sedentary Behavior
Poor Diet
Smoke (gases & particulates)
Noise
Stress
Shift work / Sleep Deprivation

Regular Exercise
Physical Activity
Healthy Diet
Adequate Sleep
Moderate EtOH

Hypertension
Dyslipidemia
Diabetes
Obesity

Known CHD or Equivalent
Subclinical Disease +/- LVH

Death Disease Disability

Acute CVD Events

FIGURE 6. Theoretical model of atherosclerosis and possible adverse health outcomes in firefighters.

Soteriades et al., 2013
Firefighters & Cancer

Cancers Linked to Firefighting:
- Lung Cancer
- Leukemia
- Malignant Mesothelioma
- Stomach Cancer
- Intestinal Cancer
- Rectal Cancer
- Prostate Cancer
- Testicular Cancer
- Brain Cancer
- Multiple Myeloma
- Buccal/Pharynx Cancer
- Oesophagus Cancer
- Kidney Cancer
- Laryngeal Cancer
Risk Factors for Cancer

- Exposures
- Alcohol
- Diet
- Radiation
- Genetics
- Obesity
- Age
- Hormones
- Tobacco
- Excessive Sunlight
- Exercise
- Infectious Agents
Modifiable Risk Factors

- Obesity
- Fitness
- Nutrition
- Sleep
- Shift Schedule
- Alcohol Use
- Tobacco Use
- Exposures
Obesity and Body Composition of Firefighters

Definition of Obesity

**BMI (kg/m²)**
- Overweight = BMI ≥ 25 and < 30
- Class I = BMI ≥ 30 and < 35
- Class II = BMI ≥ 35 and < 40
- Class III = BMI ≥ 40

**Body Fat Percentage**
- Men, BF% > 25; Women, BF% > 30

**Waist Circumference**
- Men WC > 40 inches; Women WC > 35 inches
Overweight and Obesity Prevalence in the Fire & Emergency Services

US Overweight Prevalence = 68.0%*

US Obesity Prevalence = 33.8%*

*Flegal et al. JAMA 2010;303:235-241

Firefighter Data from Poston et al., 2011: FIRE Study
Range in the published literature, BMI ≥ 25: 73-88%
<table>
<thead>
<tr>
<th>Outcome</th>
<th>Risk Factor</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workers Compensation Claim</td>
<td>Obesity Status</td>
<td>≈300% increase</td>
</tr>
<tr>
<td>(Kuehl et al., 2012; PHLAME)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Disability</td>
<td>BMI</td>
<td>5% increase</td>
</tr>
<tr>
<td>(Soteriades et al., 2008)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-CHD Retirement</td>
<td>Obesity Status</td>
<td>≈300% increase</td>
</tr>
<tr>
<td>(Holder et al., 2006)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
• Class II and III obese firefighters (BMI>35) missed nearly 5 times the number of workdays than normal weight firefighters

• Excess costs associated with: overweight ($74.41), Class I obesity ($254.00), and Class II and III obesity ($1,682.90 ) per firefighter
## Incident Musculoskeletal Injuries

<table>
<thead>
<tr>
<th>Longitudinal predictors of any injury and MS injury</th>
<th>Incident Injury</th>
<th>Incident MS Injury</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Body Composition</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Obesity, BMI Defined (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Normal Weight</td>
<td>--</td>
<td>--*</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.9 (0.7-5.2)</td>
<td>1.8 (0.4-8.6)</td>
</tr>
<tr>
<td>Obese</td>
<td>2.6 (0.9-7.4)</td>
<td>5.2 (1.1-24.5)</td>
</tr>
<tr>
<td>Obesity, Waist Circumference (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>under 40 inches</td>
<td>--</td>
<td>--*</td>
</tr>
<tr>
<td>over 40 inches</td>
<td>1.9 (1.0-3.6)</td>
<td>2.8 (1.2-6.4)</td>
</tr>
<tr>
<td>Obesity, Body Fat Defined (%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not Obese &lt;25%</td>
<td>--</td>
<td>--*</td>
</tr>
<tr>
<td>Obese</td>
<td>1.3 (0.7-2.5)</td>
<td>1.8 (0.8-4.0)</td>
</tr>
<tr>
<td><strong>Fitness</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>SRPA</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td>1.0 (0.8-1.1)</td>
<td>1.0 (0.8-1.3)</td>
</tr>
<tr>
<td>Maximum torso strength</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max/Weight (SD)</td>
<td>0.5 (0.2-1.4)</td>
<td>0.8 (0.2-3.1)</td>
</tr>
<tr>
<td>Flexibility</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average reach</td>
<td>0.9 (0.8-1.0)</td>
<td>1.0 (0.9-1.1)</td>
</tr>
</tbody>
</table>

* Risk adjusted models examining the association between body composition and MS injury controlled for age, smoking status, and physical activity

Jahnke et al., 2013
Reasons for Obesity Epidemic

- Nutrition Environment in the fire house
  - Irregular eating patterns
  - Portion size, meal planning, and traditions
  - Processed carbohydrates and sugar
- Metabolic impact of shift work
- Lack of support for physical activity in some departments
- Time constraints for healthy behaviors
- Behavioral health concerns
Food in the Firehouse

Firehouse Subs
Real Food, For Real Heroes
Founded By Firemen

Firehouse Cooking
Food From America's Bravest
R.G. Adams
Meals as Bonding

“…just eating with them on those days I put on some weight and it’s very difficult to do that because part of the fire service family is built around that kitchen table. That’s where it takes place. That’s where real problems are solved.”

“Yeah, at some stations, just everybody just brings their own food in…You know, they have problems in their groups and they don’t seem to cook up as much…just like guys that don’t get along together.”
Best Potato Soup - Feeds 6-8 people or 4-6 firefighters

- 4 Cups potatoes, diced but unpeeled
- 1/4 LB butter
- 2 Cups finely diced yellow onions
- 1/2 Cup flour
- 1 Quart warm water
- 1/4 Cup chicken bouillon
- 1 Cup potato flakes
- 4 Cups half and half
- 1/2 tsp. Tabasco sauce
- Salt, Pepper, Garlic powder and Dried Basil to taste

Sauté onions in melted butter for 10 minutes in large kettle. Add flour to onions and butter and cook for 5 minutes, stirring until flour is absorbed. In a separate container combine, water, chicken bouillon, potato flakes, and seasonings. Stir until no lumps remain. Add to onion mixture, 1 cup at a time. Add half and half, stirring until smooth and lightly thickened. Reduce heat and simmer for 15 minutes. In a separate pan, the potatoes should be covered with water and brought to a boil, and simmered for 20 minutes. Drain potatoes and add to soup to complete. If too thick for taste, milk may be added to thin down. Serve with chopped green onions and cheese sprinkled on top. Cook time approx. 40 minutes.
Top 6 Sources of Calories
Preliminary Data

#6  

#5  

#4  

#3  

#2  

#1
Standard Drink of Alcohol

one drink equals*:

12 oz.  =  5 oz.  =  1.5 oz.
Definition of Binge Drinking

Greater than 5 drinks within 2 hours for men
Greater than 4 drinks within 2 hours for women
Alcohol use among firefighters in the Central United States

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Background Although the U.S. Fire Service is concerned about alcohol use among firefighters, little research has been conducted on the topic.

Aims To survey alcohol use patterns among career and volunteer firefighters.

Methods Data were from a population-based cohort study of male firefighters conducted in randomly selected career and volunteer departments. Data were collected from 2008 to 2010.

Results There were 86% participants from 11 career and volunteer 13 departments included in the study with a response rate of 97%. Career firefighters drank approximately 10 days per month (just about half of their off-duty days) and drank relatively heavily on those days. Fifty-eight percent of career and 40% of volunteer firefighters averaged three or more drinks and similar percentages reported binge drinking on the days they consumed alcohol. In general, firefighters who drank but did not binge drink tended to have the best health outcomes, while those who binged drank typically were at highest risk of negative health outcomes. Ninety percent of career and 10% of volunteer firefighters who drank self-reported driving while intoxicated in the previous 30 days.

Conclusions Given the high rates of heavy and binge drinking, local and nationally coordinated efforts to increase the surveillance of drinking behavior among firefighters and the development of targeted prevention interventions are critically needed.

Key words Drinking; fire service; health.

Introduction Studies demonstrate a J-shaped relationship between alcohol intake and health, where moderate use is protective, while heavy consumption results in negative outcomes. Heavy alcohol use is associated with injuries [1], neurological impairment [2], social problems [3]; liver disease [4] and cancer [5]. Given their critical role in public safety, the National Fire Service (NFS) is concerned about alcohol use by firefighters [6]. This study provides the first population-based examination of patterns of alcohol use in the NFS.

Methods The data are from a large cohort study examining risk factors for injury among firefighters in the International Association of Fire Chief’s Missouri Valley Region (Colorado, Iowa, Kansas, Missouri, North Dakota, Nebraska, South Dakota, and Wyoming). Data were collected in 2008–10. Sampling methodology is presented in detail in a previous report [7].

The protocol was approved by the National Development and Research Institutes Review Board. Eleven career and 13 volunteer departments were randomly selected and contributed data to this study. The research team met with crews to overview the project, and of firefighters solicited, 97% agreed to participate. The survey was confidential, and no individual results were provided to the department. Given the very small number of females, only data from male firefighters are presented.

Measurement items were modeled after previous occupational surveys. Items included the following: alcohol use—During the past 30 days, have you had at least one drink of any alcoholic beverage such as beer, wine, a malt beverage, or liquor?; amount drank—During the past 30 days, on the days when you drank, about how many drinks did you drink on the average?;
Alcohol Use: Reasons

- **Shift Schedule**: “One thing that's different with us, though, I mean we work ten days a month, so we got a lot of days that we don't work the next morning. That's one reason why - maybe that's my excuse, I don't know.” Firefighter, Career

- **Camaraderie**: “I use it as an excuse to unwind on the four days, you know what I mean? You get together in a big group, go out, have a drink, tell war stories, laugh about stuff we did. Just act - act like exactly we did at the station, except do it with beer - with a drink.” Firefighter, Career

- **Stress Management**: “The stress of the job...when you get off...you want something that will help you unwind.” Firefighter, Career

- **Tradition**: “They (firefighters) all seem to be social and if you look back throughout the history of the fire service when my great grandfather was on up through the ranks what's union hall if there wasn't an open bar or a party somewhere.” Chief, Career
Alcohol Use and Abuse in a National Cohort of US Career Firefighters

**Survey (All participants)**
Heavy Drinking: 44.7%
Binge Drinking: 50.2%
Average daily intake: 3.5 drinks

**Dietary Recall**
(Off duty days)
Beer Drinks: 3.9
Wine Drinks: 2.0
Liquor Drinks: 6.8
Calories from alcohol:
• Average = 551.4 kcals
• Range = 12.5 to 3,404
25% Drank the Caloric Equivalent of 3 Snickers Bars (≥ 774 calories)
Can you outrun your dessert?
1 Pint – 1,360 calories

Running (5mph)
2 Hours, 5 Minutes

Race Walking
2 Hours, 30 Minutes

Walking-a-Dog Pace
5 Hours, 33 Minutes
Sugar Intake

12.8 grams  119.5 grams  442.1 grams
Average Intake: 290.9 g Carb/day

Minimum: 90.8 g Carb/day

Sisson (2009) The Primal Blueprint
Max: 834.2 g Carb/day

5 mph

5 hours 6 min

25.5 Miles

A MARATHON
“Exercise is what gets you hurt”
Line of Duty Injuries by Job Task

Data from Jahnke et al. 2013
Distribution similar to findings of Poplin et al., 2012
Exercise Injuries

Injury among a population based sample of career firefighters in the central USA

Sara A. Jahans, Walker S. Carlos Puson, Christopher Keith Haddick

ABSTRACT

Background: Rates of occupational injuries among firefighters are high because of the physically demanding and variable tasks required by their job. While description about injury is often short, few studies have explored individual risk factors and their relationship to occupational injury.

Methods: The current study reports data from a population based sample of 462 career firefighters from 11 county-selected fire departments in the Missouri Valley region of the USA (Kansas, Missouri, Iowa, North Dakota, South Dakota, Colorado, Wyoming, Nebraska) who participated in a study examining risk for negative cardiovascular outcomes. Injury information were assessed between injury and demographic characteristics, body composition, fitness, and health behaviors.

Results: Firefighters were more likely to be injured during physical exercise and those who reported regular physical activity had a reduced injury risk for men compared with those who didn’t exercise at all (OR 0.82, 95% CI 0.63 to 0.89).

Conclusions: Findings highlight the benefit of physical training for firefighters despite the risk of injury during exercise.

Firefighting is a dangerous occupation with injury could reaching nearly occupational groups.

Table 2: Type of injuries incurred by firefighters, baseline

<table>
<thead>
<tr>
<th>Type of injury</th>
<th>% of firefighters</th>
<th>% of injuries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dislocation, strain, sprain</td>
<td>18.8%</td>
<td>76.3%</td>
</tr>
<tr>
<td>Superficial injury, open wound</td>
<td>3.2%</td>
<td>13.0%</td>
</tr>
<tr>
<td>Concussion, internal injury</td>
<td>1.3%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Fractures</td>
<td>0.4%</td>
<td>5.2%</td>
</tr>
<tr>
<td>Eye injury</td>
<td>0.4%</td>
<td>1.7%</td>
</tr>
<tr>
<td>Amputation</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Acute poisoning, infection</td>
<td>0.1%</td>
<td>0.9%</td>
</tr>
<tr>
<td>Respiratory injury</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Thermal stress/heat exhaustion</td>
<td>0.0%</td>
<td>0.0%</td>
</tr>
<tr>
<td>Heart attack, stroke</td>
<td>0.2%</td>
<td>0.9%</td>
</tr>
</tbody>
</table>

Table 5: Relationship between exercise and non-exercise injuries

<table>
<thead>
<tr>
<th>Exercise injury</th>
<th>Non-exercise injury</th>
</tr>
</thead>
<tbody>
<tr>
<td>OR (95% CI)</td>
<td></td>
</tr>
<tr>
<td>4.60 (1.73 to 12.24)</td>
<td></td>
</tr>
<tr>
<td>0.53 (0.32 to 0.85)</td>
<td></td>
</tr>
</tbody>
</table>

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Reducing Exercise Injuries

- Warm ups
- Encourage scaling
- Discuss importance of proper form
- Functional exercises
- Time limitations
- Hydration
- Intensity
- Equipment availability
Unadjusted Rates of Current Smoking
13.6% for Career Firefighters
17.4% for Volunteer Firefighters
Rates of Smokeless Tobacco Use

SLT Users Were:
• Younger
• Had fewer years in the Fire & Emergency Services
• A small percent (15.7%) used because of departmental restrictions on smoking
Sleep in the Fire & Emergency Services

- Sleep Disorders (37%; Barger et al. 2015)
  - Linked to: depression, CVD, crashes, diabetes, anxiety, obesity
- 48+ Hour Schedules
- Linking Shifts
- Busy Houses
- Private Quarters
- Sleep Promoting Environments
Factors associated with EDS included a 48 hour schedule, shared sleep area in department, and a second job outside fire service.
Behavioral Health

- Post Traumatic Stress Symptoms
- Anxiety
- Depression
- Suicide
- Substance Use/Abuse
What to do?

- Eliminate tobacco use
- Focus on obesity intervention
  - Nutrition – processed foods and sugars
  - Fitness – across domains, function
- Implement department wellness programs
- Clean gear (hoods, gloves)
- Wear SCBAs
- Regular, relevant, physical ability testing
- Appropriate medical surveillance and intervention
“Because when we hit the fire ground, your risk factors become my risks.”

~ Firefighter Steve Mast
Special Thanks to:

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Funders: AHA, FEMA & NIH
Participating Departments
Fire Chief Advisory Panel
Center’s Advisory Board