EPIDEMIOLOGICAL STUDY OF MALE FIREFIGHTERS’ HEALTH IN THE STATE OF RORAIMA, BRAZIL

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ABSTRACT
To examine concerns and socio-cultural elements’ impact on perceptions of male firefighters’ in Roraima, Brazil, regarding their health risks. A questionnaire survey was conducted to understand their perception. Of the 255 firefighters (mean age 29.35 ± 7.24 years) surveyed, 97% did not smoke, 62% did not regularly consume alcohol, 89% ate healthily and exercised regularly, 78% had medical appointments in previous year, and 94% had blood test 6 months before. Skin and colon cancer were less common (significantly more likely in married (p < 0.001), and older firefighters (p < 0.001) with more children (p = 0.035) and higher income (p = 0.046)). The hazardous nature of work contributes to perceptions of higher incidences of diseases, which offer a basis for healthy public policy adjustments, dietary changes and health practices.

Keywords: Firefighters, Smoke, Alcohol, Skin and Colon Cancer, Healthy Public Policy

INTRODUCTION
Firefighters are among the various cultures and sub-cultures that exist within every society or social structure (Babbie, 2007). Within every major city, firefighters have their own subordinate group that defines the people within this sub-culture (Babbie, 2007). In the broadest of contexts, culture is defined as any system or structure that includes the customs, beliefs, knowledge, art, morals, laws, or any other capabilities or habits acquired by man through social inauguration (Bonauto and Silverstein, 2007). This description presents an accurate depiction of the distinctively separate sub-culture that comprises firefighters, and exists within but completely separate from the host society. More specifically, in many societies, the firefighter is heralded as an iconic personification of heroism within the culture.

The nature of the job of fighting fires places workers at high risk of small to severe injuries, developing numerous debilitating diseases, or even death (Creswell, 2009). Significant health risks are present since firefighters are exposed to toxic smoke from the fires they fight on a daily basis. Population studies regarding air pollution involving fire smoke exposure indicate that inhalation of particulate matter resulting from wildfires causes increased respiratory health effect morbidity (Daniels et al., 2013). Firefighters are exposed to carcinogenic agents, such as diesel fire engine exhaust, benzene, soot, chloroform, styrene, and formaldehyde, which are all substances that can be either absorbed through the skin or inhaled and are often present in the firehouse and at the scene of a fire (Francisco, 2012). Studies have also revealed that there is an unequivocal correlation between the exposure to numerous carcinogens and chemicals that firefighters experience during the course of their employment and their increased risk for cancer (Goldammer, 2000).

Speculative research has identified epidemiological trends indicating that there is evidence linking employment as a firefighter to as many as 23 different types of cancer, particularly common tumors that attack the stomach, skin, prostate, or brain, as well as cancers of the pancreas, bladder, colon, rectum, esophagus, kidney, and blood (Francisco, 2012). In comparison to the typical breadth of projected Relative Risks (RR) due to occupational exposures, firefighters have an overall 100% increased chance of developing any form of cancer, specifically a 100% higher probability of developing testicular cancer, a 50% increased possibility for multiple myeloma and non-Hodgkin’s lymphoma, and a 28% greater risk of prostate cancer when compared with populations of non-firefighters (Francisco, 2012; Griswold, 2008).
Accelerated decline in lung function has also been associated with the number of fires fought (Greven, 2011), whilst firefighters have also been shown to be at a much higher risk of developing illnesses such as depression, mood disorders, such as Post-Traumatic Stress Disorder (PTSD), substance abuse problems, emphysema, cardiovascular disease, and a multitude of other health issues (Harper, 2006). Furthermore, distinct disparities have been noted regarding the quality of healthcare services provided to those of lower socioeconomic status (Hebdige, 1999). This disparity is demonstrated in statistics that indicate higher infant mortality rates for African Americans that are more than twice those for Caucasians, greater incidences of obesity among Hispanics, and significantly higher death rates among African Americans from breast, lung, and colorectal cancer than Caucasians, Hispanics, or Asians (Hulett et al., 2008).

This work is based on the hypothesis that the hazardous nature of firefighter work is a driving factor toward perceptions of higher incidences of illnesses, such as cancer, heart disease, and other sicknesses amongst those employed in this line of work in Roraima, Brazil. The aim of this research study was therefore to examine male firefighter concerns relative to their health and identify how perceptions of health related risks are impacted by socio-cultural elements for male firefighters in Roraima, Brazil. These data will further our understanding of the epidemiological pathology of the socio-cultural and physiological factors that contribute to increased incidences of specific illnesses amongst firefighters.

MATERIALS AND METHODS

In order to address the aims of this study, we determined that a quantitative research design using data codified as numbers would be most appropriate (Joyce et al., 2006) since the quantitative analyses of the data would enable correlations between the research variables to be examined, whilst the specifications of the questions would provide a direct indication of the actual perceptions of the participants and will allow for real time relational inferences to be measured (Joyce et al., 2006). The analytical depth of the survey is dependent upon the type and number of questions asked and whether they are open- or closed-ended questions. The distinguishing elements of survey research is that it has the ability to access internal states that cannot be measured through direct observation and within this specific component, the researcher is able to explore why specific epidemiological deficiencies occur in populaces of firefighters.

Survey Design

The survey was created using an Internet based survey website called Survey Monkey, chosen due to the simplicity of producing surveys using this service as well as the cheap cost of membership. The survey contained questions regarding key variables which were selected to denote epidemiological elements relative to firefighters in the State of Roraima, Brazil. The questionnaire length was guided by the time frame of the entire research, expected number of respondents, and the budgetary limitations. Reviewing existing instruments for data collection allows researchers to select a current version that meets good validity and reliability scores. The questionnaire presented in Appendix A was used to ensure the ability of the question to establish the correlations or presence of the variables.

Sample Population

To ensure that the results are accurately reflective of the representative sample, a randomized sample was selected to make a close representation of the larger population (Lasky, 2006). In this study, random sampling was ensured by randomly selecting volunteers from a list of everyone in the target population (Lasky, 2006), therefore ensuringas a mixed response as possible that is bias-free (Joyce et al., 2006). There are a total of 502 firefighters in Boa Vista, State of Roraima, Brazil; 423 males and 79 females. Although women comprise approximately 15% of firefighters in Roraima, this figure is only about 3.7% of paid firefighters worldwide (Lefrancois, 2011). We therefore decided to limit our study to male firefighters. Approximately 450 surveys were prepared with the intent of including all the male firefighters in the survey, but only 255 indicated their willingness to participate in the research. The participants were adults at least 18 years of age with the oldest participants being 50 and the respondents were asked over 30 questions to gather data for inclusion in the research. All participants were included in the study under the terms that they were partaking in the exercise on the basis of voluntary informed consent.
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consent without being coerced. The surveys were administered through face-to-face interviews during a lecture on men’s health in the fire department. This allowed the respondents to provide information instantaneously and anonymously because the data collected is distinguished by numbers to maintain this anonymity. The questionnaire instructions were explicit and the interview details were thoroughly explained in order to establish the rapport necessary to conduct a smooth interview.

Ethical Considerations

The study was conducted to comply with the code of ethics. This project is approved by the Committee on Ethics in Research: (number: 494.365) 12/11/2013. Informed consent was obtained from all participants, and the welfare and interest of all respondents taken into consideration throughout the study. Participant privacy was respected and subjective data interpretations avoided to ensure integrity of participant / researcher relationship. The collection, treatment and disclosure of data or information was performed according to necessary mandates and careful consideration given to research ethical implications with regard to economic, political, communal, and psychological consequences of work.

Data Description

The qualitative data from the questionnaire was entered into a specifically designed Microsoft Excel spreadsheet. Statistical analysis was conducted using SPPSv21 (Chicago, Illinois, USA). Responses from the participant’s questionnaires were coded to represent the primary variables to reach conclusive determinations that will provide coherent answers to the research question (Miller, 2007). Descriptive analyses were conducted to gauge the hypothetical relationships that would answer various research questions (Joyce et al., 2006), in order to gain a holistic view of the epidemiological impacts regarding firefighters and determine its coherence with the conceptual framework advanced by the theoretical findings (Neves, 2008). Cronbach’s alpha correlational analyses were conducted to examine relationships between the variables (Lasky, 2006). Statistical significance of correlations were examined using Spearman’s rank and chi-square tests. Student’s t-test was used to examine the relationship of age with the various variables. Significance was set at the p<0.05 level.

RESULTS & DISCUSSION

Results

A total of 255 participants were included in the study population (Table 1). The mean age of the study population was 29.35 ± 7.24 years, with a range of 18-50 years and a median of 28 years (Table 1). The most common age group was 21–30, which accounted for half of the participants (n = 134; 53%). In terms of ethnic minority, the greatest majority of participants (n = 106; 41%) identified themselves as ‘other’ or white (n = 91; 36%). The diversity of the modern world allows for numerous cultures and subcultures to develop within established social constructs and this is visibly paralleled in the phenomenal cultural integration of the firefighter subculture.

With respect to marital status, the firefighters surveyed were most commonly single (n = 103; 40%) or married (n = 94; 37%). A smaller number were cohabiting (n = 49; 19%) or divorced (n = 9; 4%). None of the firefighters surveyed indicated that they were widowed. The overwhelming majority of respondents resided in Boa Vista, State of Roraima, Brazil (n = 239; 94%), with 6% (n = 15) indicating that they lived in the rural urban fringes and one participant indicating they lived in the rural countryside. The vast majority of participants (n = 117; 46%) indicated that they did not have any children. Approximately one-third (n = 73; 29%) indicated that they had only one child; 34 respondents (13.3%) had 2 children, whilst 31 respondents (12.2%) had 3 or more children. The surveyed firefighters most commonly stated their religion as evangelical (n = 104; 40.8%) or Catholic / Christian (n = 98; 38.4%), a small minority were Spiritualists (n = 9; 3.5%) and 16.5% (n = 42) stated their religion as ‘other’ (Table 1). The surveyed firefighters most commonly earned one to three times the minimum wage (n = 100; 39%); whilst 27% (n = 68) earned five to seven times the minimum wage and 23% (n = 60) earned three-five times the minimum wage (Table 1). As may be expected, age was positively correlated with earnings (Cronbach’s alpha = 0.533).
Unhealthy Habits: An overwhelming 97% (n = 247) of respondents indicated that they did not smoke (Table 2). Of those who did smoke, four stated they smoked 0-10 cigarettes per day, two smoked 10-15 cigarettes per day and two smoked 15-20 cigarettes per day. Approximately one-third of respondents regularly consumed alcohol, with 5% (n = 13) sometimes consuming more than three drinks in a week and 3% (n = 8) regularly consuming more than three drinks in a week. Habitual consumption of alcoholic beverages is typically thought to be an accoutrement to cigarette smoking. Although numbers were small, a positive correlation was observed between smoking cigarettes and drinking alcoholic beverages (0.057) and between smoking and consuming more than three alcoholic beverages per week (0.093). Firefighters who were evangelical or spiritualists were less likely to consume alcohol (p = 0.002).

Healthy habits: Most (89.2%; n = 227) exercised for more than 2 ½ hours per week, with 20 of these (8%) stating that they did this most of the time. Most ate fruit and vegetables more than five times per week (74.1%; n = 189), with 40 (15.7%) of these stating that they did this most of the time. Similarly, the vast majority ate meat (white or red) more than five times per week (n = 229; 88.8%) with 22 (8.6%) of these stating that they did this most of the time (Table 2). There was no significant relationship between partaking in exercise and eating more than five portions of fruit and vegetables or meat per week. However, firefighters who ate fruit and vegetables five times per week were significantly more likely to eat meat 5 times per week (p = 0.002). Firefighters with more children were significantly less likely to exercise regularly (p = 0.002), whilst single people (p = 0.026) and people on a lower income (p = 0.045) were significantly more likely to exercise.

Medical Visits and examinations: The vast majority of respondents (n = 200; 78%) indicated that they had attended a medical appointment within the last six months to one year (Table 3). The overwhelming
The majority of respondents (n = 170; 67%) had never visited a urologist. Of the 84 respondents who had visited a urologist, 16% (n = 42) had done so six months to one year ago; 8% (20) one to two years ago; 3% two to three years ago and 6% (14) more than three years ago. Those with a higher income were significantly less likely to have had a medical appointment recently (p = 0.021) or to have visited a urologist (p < 0.001), whilst those who were married or cohabiting (p = 0.014) and those with more children (p = 0.001) were more likely to have seen a urologist. There was a negative correlation between age and medical visits (Cronbach’s alpha = −0.0872).

### Table 2: Unhealthy and healthy habits

<table>
<thead>
<tr>
<th>Habit</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Smoke</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>7 (2.7)</td>
</tr>
<tr>
<td>No</td>
<td>247 (96.9)</td>
</tr>
<tr>
<td>Regularly consume alcohol</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>98 (38.4)</td>
</tr>
<tr>
<td>No</td>
<td>156 (61.2)</td>
</tr>
<tr>
<td>&gt;3 drinks/week</td>
<td></td>
</tr>
<tr>
<td>Did not answer</td>
<td>33 (12.9)</td>
</tr>
<tr>
<td>Yes</td>
<td>13 (5.1)</td>
</tr>
<tr>
<td>No</td>
<td>201 (78.8)</td>
</tr>
<tr>
<td>Most of the time</td>
<td>8 (3.1)</td>
</tr>
<tr>
<td>Exercise for 2 ½ hours/week</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>207 (81.2)</td>
</tr>
<tr>
<td>No</td>
<td>27 (10.6)</td>
</tr>
<tr>
<td>Most of the time</td>
<td>20 (7.8)</td>
</tr>
<tr>
<td>Eat fruits and vegetables &gt; 5 times/week</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>149 (58.4)</td>
</tr>
<tr>
<td>No</td>
<td>66 (25.9)</td>
</tr>
<tr>
<td>Most of the time</td>
<td>40 (15.7)</td>
</tr>
<tr>
<td>Eat meat (white or red) &gt; 5 times/week</td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>207 (81.2)</td>
</tr>
<tr>
<td>No</td>
<td>25 (9.8)</td>
</tr>
<tr>
<td>Most of the time</td>
<td>22 (8.6)</td>
</tr>
</tbody>
</table>

The vast majority (n = 232; 91%) of the surveyed firefighters had had their blood pressure checked within the past six months, whilst 72% (n = 184) had had their blood cholesterol tested and 78% (n = 198) had had their blood glucose tested (Table 3). A total of 174 firefighters (68%) had had all three tests done. Only 15 (5.9%) firefighters had had none of these tests performed in the last 6 months. In contrast, 80% (n = 203) firefighters stated they had not had their testosterone levels tested within the past six months. A positive correlation was found between testosterone testing and age (0.032) and a negative correlation was observed between testosterone testing and ethnicity (−0.045) and religion (−0.060). However, there was no significant difference observed in the mean age of those who had had their testosterone levels tested (28.9 ± 7.64); and those who had not (29.46 ± 7.18; p = 0.641). There was a trend towards firefighters who were married being more likely to have had their cholesterol monitored (p = 0.053), although this was not observed for any of the other blood tests (testosterone (p = 0.308); blood glucose (p = 0.403); blood pressure (p = 0.364). Firefighters with a higher income were significantly more likely to have had their blood pressure monitored in the last 6 months (p = 0/0.025), but there was no significance for glucose, cholesterol or testosterone monitoring.

The vast majority of the responding firefighters had not had digital rectal exam (n = 247; 97%). Of the 8 firefighters who had had a previous rectal exam, 4 indicated it to be a painful experience (50%), 3
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indicated that it was not painful (37.5%) and one did not answer. The majority of firefighters (n = 246; 96%) had not had a skin cancer examination in the past year. However, most (n = 221; 87%) had visited a dentist in the past year. The overwhelming trend for this series of questions demonstrated that there is strong epidemiological evidence to support increased instances of cancer since the firefighters in this survey mostly stated they did not have such exams (Goldammer, 2000). Firefighters who were married (p = 0.019) or who had more children (p = 0.03) were more likely to have had a skin cancer examination. The vast majority (77%; n = 196) of the firefighters surveyed reported that they did not see a doctor unless they were sick. Firefighters with a higher income (p = 0.046) and those who were married (p < 0.001) or who had more children (p = 0.035) were more likely to have a check-up without being sick. Firefighters who had a skin cancer examination in the past year were significantly older (35.6 ± 2.85 vs 29.08 ± 0.45; p = 0.008), as were those who had a check-up without being sick (31.98 ± 0.8 vs 28.26 ± 0.52; p < 0.001), whilst a similar, non-significant trend was identified for colon cancer examinations (34.14 ± 2.7 vs 29.13 ± 0.46; p = 0.070). In contrast, those who had a recent dentist check-up were younger (28.9 ± 0.49 vs 32.14 ± 1.14; p = 0.014).

**Table 3: Medical examinations and visits**

<table>
<thead>
<tr>
<th>N (%)</th>
<th>Visited a urologist</th>
<th>Satisfied with sexual frequency</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>6 months–1 year ago</td>
<td>200 (78.4)</td>
<td>1 (0.4)</td>
<td></td>
</tr>
<tr>
<td>1–2 years ago</td>
<td>23 (9.0)</td>
<td>84 (32.9)</td>
<td>3 (1.2)</td>
</tr>
<tr>
<td>2–3 years ago</td>
<td>3 (1.2)</td>
<td>170 (66.7)</td>
<td>20 (7.8)</td>
</tr>
<tr>
<td>3+ years ago</td>
<td>2 (0.8)</td>
<td>12</td>
<td></td>
</tr>
<tr>
<td>I do not remember</td>
<td>27 (10.6)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In the last 6 months have had the following checked:

| Blood pressure | 232 (91.0) | 158 (62.0) | 5 (2.0) |
| Yes | 23 (9.0) | 42 (16.5) | 73 (28.6) |
| No | | 20 (7.8) | 133 (52.0) |

| Blood cholesterol | 184 (72.1) | 14 (5.5) | 8 (3.1) |
| Yes | 71 (27.8) | 14 (5.5) | 3 (1.2) |
| No | | I do not remember | |

| Blood glucose | 1 (0.3) | 198 (77.6) | 2 (0.8) |
| Did not answer | 56 (22.0) | 7 (2.7) | 38 (14.9) |
| Yes | | 246 (96.5) | 17 (6.7) |

| Hormone levels (testosterone) | | | |
| Did not answer | 2 (0.5) | 8 (3.1) | 1 (0.3) |
| Yes | 50 (19.6) | 247 (96.7) | 28 (11.0) |
| No | 203 (79.6) | | 226 (88.6) |

| Have had skin cancer examination in the past year | 9 (3.5) | 220 (86.3) | 74 (29.0) |
| Yes | 245 (96.1) | 35 (13.7) | 180 (70.6) |
| No | | | |

**Perceptions of Personal Health:** The overwhelming majority of firefighters (n = 220; 86%) stated that they were satisfied with the level of their sexual activity, while 8% (n = 20) indicated they were not satisfied and 5% (n = 12) said they were satisfied with the level of their sexual activity ‘Most of the time’. There was no difference in age in those who were satisfied with their sexual activity and those who were not. Half of surveyed firefighters reported their sexual frequency as 2–3 times per week (n = 133; 52%), with one third (n = 73; 29%) averaging 1-2 times per week (Table 3) No respondents reported to never engage in sexual activity. The vast majority (77%; n = 196) of the firefighters surveyed reported that they...
regularly examined their genitalia whilst 11% (n = 28) of respondents admitted that they had contracted a Sexually Transmitted Disease (STD) in their past. There was no relationship between having had an STD and regularly examining genitalia. Married / co-habiting firefighters were significantly more likely to report that they had ever had an STD (p = 0.033), as were those with more children (p = 0.004). Those who had had an STD were significantly older than those who had never had an STD (34.54 ± 7.26 vs 28.74 ± 6.99; p < 0.001).

Stress was not indicated as a major concern, with only 25% (n = 63) stating that they encountered stress ‘Most of the time’ and 7% (n = 18) stating that stress was a factor (Table 4). Cancer was the greatest concern of the surveyed firefighters, with 37% (n = 95) of respondents indicating that this was the source of their anxiety. The next largest concern was a physical disability such as an accident or stroke (30%; n = 77), followed by HIV (23%; n = 59). Heart attacks, erectile dysfunction, Alzheimer’s disease and cerebral infarction were concerns of only a small number of firefighters, whilst none of the firefighters indicated that Parkinson’s disease was a concern. People who were fearful of physical disability (mean age 30.4) and cancer (mean age 29.2 years) were marginally older than those who were fearful of HIV (mean age 28.5), though this was not significant. However, whilst 13% of firefighters who were afraid of physical disability were aged over 40, only 7% of those who were afraid of cancer were aged over 40 and just 5% of those afraid of HIV were aged over 40.

In terms of anxiety about medical tests, digital rectal exam was the greatest concern (31%; n = 79), followed by dental exam (29%; n = 74) and endoscopy (14%; n = 36). The majority of firefighters (51%; n = 131) stated that they consulted doctors to gain health information while the next greatest source was magazines (30%; n = 77).

**Table 4: Health concerns**

<table>
<thead>
<tr>
<th></th>
<th>N (%)</th>
<th>Which exam makes you more anxious</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Feel generally happy and not stressed</td>
<td></td>
<td>Did not answer</td>
<td>1 (0.4)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Yes</td>
<td>173 (67.8)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>18 (7.1)</td>
</tr>
<tr>
<td>Most of the time</td>
<td>63 (24.7)</td>
<td>Dental check-up</td>
<td>7 (2.7)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital rectal examination</td>
<td>79 (30.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hernia examination</td>
<td>13 (5.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Colonoscopy</td>
<td>36 (14.1)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Endoscopy</td>
<td>46 (18.0)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>What are you afraid of regarding your health</th>
<th>N (%)</th>
<th>Where do you search for health information?</th>
<th>N (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did not answer</td>
<td>5 (2.0)</td>
<td>Doctor</td>
<td>131 (51.4)</td>
</tr>
<tr>
<td>HIV</td>
<td>95 (37.2)</td>
<td>Friends</td>
<td>10 (3.9)</td>
</tr>
<tr>
<td>Cancer</td>
<td>59 (23.1)</td>
<td>Internet</td>
<td>77 (30.2)</td>
</tr>
<tr>
<td>Heart attack</td>
<td>10 (3.9)</td>
<td>Magazines</td>
<td>4 (1.6)</td>
</tr>
<tr>
<td>Erectile dysfunction (impotence)</td>
<td>5 (2.0)</td>
<td>Books</td>
<td>3 (1.8)</td>
</tr>
<tr>
<td>Cerebral infarction (stroke)</td>
<td>3 (1.2)</td>
<td>Family</td>
<td>9 (3.5)</td>
</tr>
<tr>
<td>Alzheimer’s disease</td>
<td>1 (0.4)</td>
<td>Health campaigns</td>
<td>6 (2.6)</td>
</tr>
<tr>
<td>Parkinson’s disease</td>
<td>0 (0)</td>
<td>I do not search for inform</td>
<td>15 (5.9)</td>
</tr>
<tr>
<td>Physical disability</td>
<td>77 (30.2)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Discussion**

The survey administered to the cohort of firefighters in the State of Roraima, Brazil revealed specific details regarding the epidemiology of health patterns for male firefighters in Boa Vista. Previous studies have found that the likelihood of potentially severe injuries and incidence of work-related illnesses were significant predictors of overall levels of risk perception towards firefighting and that the higher the level of perceived potential injury, the greater the perception of risk associated with the job (Newman, 2011). Risk perception has important implications for environmental hazard management. Understanding
perception of risk within this occupational group may help to improve the production and implementation of risk management strategies.

Research into how firefighters, as an occupational group, formulate judgments regarding professional risk is invaluable to the development of safety communications (Newman, 2011). The perception of risk to firefighters informs decisions as fundamental as deciding to become a firefighter and their perceptions are extremely important when considering the epidemiological factors impacting risk management strategies (Creswell, 2009). Understanding the influence these factors have in the decision-making process will aid policy makers by illuminating where they need to improve communication, directing programs for further education or training, and anticipating responses to events (Newman, 2011). Environmental disasters such as fires can be extremely stressful and it is known that stress negatively contributes to health outcomes for conditions such as PTSD, cancer, and cardiovascular disease. Acknowledgement of the potential health risks is imperative to the provisioning of appropriate services and long-term employee follow-up if recommended (Newman, 2011).

The findings of this epidemiologic research support the hypothesis that the hazardous nature of firefighter work is a driving factor in the epidemiology that contributes to perceptions of higher incidences of illnesses, such as cancer, heart disease, and other sicknesses amongst those employed in this line of work in Roraima, Brazil. For firefighters, the physical and biologic exposure to burning chemicals often precedes the disease, making the association between the exposed population and the disease or injury of a sufficient magnitude to support an individual presumption of probable causation (Goldammer, 2000). The firefighter’s activities within the community that safeguard their health, such as attending doctor’s appointments or other social events typically will result in the interactions that include the service individual’s family (Griswold, 2008). However, the admitted lack of participation in these activities, as found in this study, is demonstrative of how the occupational stereotype of the impervious, heroic firefighter is perpetuated (Hebdige, 1999). As a firefighter, the individual is required to willingly exchange their life to save a victim, even if they are a total stranger, at any given moment (Rew, 2011). This places the firefighter in a heralded position among members of the society as a whole, transcending the boundaries of the smaller subculture of firefighters to become an idioculture of the larger social structure (Newman, 2011). The firefighter’s willingness to put their own safety in jeopardy for the benefit of another applies functionality to the profession and dons the firefighter with the qualities of a hero within both cultural and social constructs of the greater societal edifices (Lefrancois, 2011). Within this study it was notable that firefighters who were married or had a larger number of children, were more likely to have visited a medical professional or had medical examinations, compared to those who were single or had no / few children. Those who were older were also more likely to have medical examinations. These findings suggest a higher awareness of risk in these subgroups of firefighters, which may be accounted for by both a longer exposure to risk leading to a heightened awareness, but also to firefighters with dependents (wives and children) being more aware of the consequences of illness. In addition however, it should be noted that current guidelines will not dictate the need for some of the aforementioned tests in some groups, for example heart tests or rectal exam may be more relevant in the older age group than in younger firefighters. Moreover, the overall population in this study is young, with less than 10% of firefighters surveyed being over the age of 40. As such, it must be considered that the lack of testing in many firefighters may not be due to a lack of awareness, but rather due to current guidelines dictating that such tests are not required.

Obesity, or a dietary intake that is high in meat, fat, or overall caloric intake could contribute increased gastric or colorectal cancer risk, although concomitant elevations in health outcomes that are more strongly related to these factors, such as ischaemic heart disease, diabetes mellitus, hypertension and stroke, were not found in previous studies (Hulett et al., 2008). Information on alcohol consumption within the fire service is sparse and inconsistent. Some studies suggest that firefighter behaviors may differ from the general population, although it is not clear that any perceived behavioral difference is sufficient to explain disparities in alcohol-related health outcomes (Griswold, 2008). In a previous study, the information on non-malignant and potentially alcohol-related mortality was at conflict; there was...
excess mortality from cirrhosis and other chronic liver disease, but fewer than expected alcoholism deaths (Griswold, 2008). Alternate explanations for increased cirrhosis mortality may be exposures to chemical toxins or infectious disease, which may also account for excess acute renal dysfunction, a disease that is more common among those with chronic liver disease (Griswold, 2008). In our study alcohol consumption and smoking were both low, whilst the majority of firefighters exercised regularly and had a nutritional diet in terms of fruit, vegetables and meat intake. These findings indicate a high regard for health amongst the firefighter population.

Limitations of the Study

The first limitation presents in that only male firefighters from Roraima, Brazil were surveyed for this study. This prevents the results and impressions from being generalized across wide populaeces without conducting further corroborative studies in populations of firefighters from other demographic backgrounds and nations. In addition, the small sample group may prevent the determinations from being generalizable in that the sample group may or may not be representative of the wider population of firefighters. The size of the sample group will warrant further research.

Another limitation is that the data collected was gathered from a survey and the participants were limited in the range of their responses according to the options presented in the study. Experimenter bias, sampling bias, and subject bias are primary sources of impartiality that may interfere with accurate experimental results (Siarnicki and Gist, 2010). The expectations of experimenters can cause biased observations based on these expectations, which is called experimenter bias (Siarnicki and Gist, 2010).

This type of bias can influence research because it is based on what the researcher wants to happen instead of what is actually happening and can cause researchers to incorrect findings because they will draw assumptions based on their expectations instead of actual happenings based on the research. Subject bias occurs when subjects know they are being studied and therefore perform according to what they think the researchers are expecting (Siarnicki and Gist, 2010). However, all questionnaires and interviews contained the same questions worded in the same manner to maintain construct validity and ensure that the methods are repeatable.

Conclusion

In summary, this study has provided further epidemiological evidence of male firefighter concerns relative to their health and their perceptions of health related risks. The findings of this study support the hypothesis that the hazardous nature of firefighter work is a driving factor in the epidemiology that contributes to perceptions of higher incidences of many diseases amongst those employed in this line of work in Roraima, Brazil. These findings point to a need for appropriate health service models which address trends within the community, including the need for increased testing for diseases firefighters are noted to be at high risk for, such as testicular cancer, myeloma and non-Hodgkin's lymphoma, and prostate cancer, and offer a basis for healthy public policy adjustments, including dietary changes and health practices. As such, this work should be used to inform the development of a set of guidance for firefighters which defines appropriate medical appointments and tests according to their age and perceived risk (for example, estimated exposure to toxins or carcinogens), together with improved distribution of health materials and more regular psychological evaluation to ensure that appropriate support is provided.

REFERENCES


Appendix A
SURVEY QUESTIONNAIRE FOR THE EPIDEMIOLOGY STUDY OF FIREMEN'S HEALTH (RR) - 2013

1. How old are you?

2. What is your marital status?
   (1) Married
   (2) Single
   (3) Cohabitating
   (4) Divorced
   (5) Widowed

3. How many children do you have in total?
   (1) None
   (2) 1
   (3) 2
   (4) 3
   (5) 4
   (6) 5
   (7) More than 5

4. Where do you live?
   (1) Boa Vista
   (2) Rural-urban fringe
   (3) Countryside/rural area

5. What is your ethnicity
   (1) White
   (2) Afro-Brazilian
   (3) Brazilian Indian
   (4) Asian
   (5) Other

6. Are you currently employed?
   (1) Yes
   (2) No

7. What is your monthly household income? (based on the minimal wage)?
   (1) 1 salary
   (2) 1–3 salary
   (3) 3–5 salary
   (4) 5–7 salary
   (5) More than 10 salary
8. What is your religion?
   (1) Catholic/Christian
   (2) Evangelical
   (3) Spiritualist
   (4) Other

9. When was your last medical appointment?
   (1) 6 months–1 year ago
   (2) 1–2 years ago
   (3) 2–3 years ago
   (4) 3+ years ago
   (5) I do not remember

10. Do you smoke?
    (1) Yes
    (2) No

11. If you answered YES to the previous question, please inform how many cigarettes you smoke per day:
    (1) 0–10
    (2) 10–15
    (3) 15–20
    (4) 20–25
    (5) 25 or more

12. Do you usually consume alcohol?
    (1) Yes
    (2) No

13. Do you have more than three drinks?
    (1) Yes
    (2) No
    (3) Most of the time

14. Have you ever visited a urologist?
    (1) Yes
    (2) No

15. If you answered YES to the previous question, when did you last visit your doctor?
    (1) 6 months–1 year ago
Research Article

(2) 1–2 years ago
(3) 2–3 years ago
(4) 3+ years ago
(5) I do not remember

16. Have you had your blood pressure checked in the last six months?
   (1) Yes
   (2) No

17. Have you had your blood cholesterol check in the last six months?
   (1) Yes
   (2) No

18. Have you had your blood glucose checked in the last six months?
   (1) Yes
   (2) No

19. Have you had your hormone levels (testosterone) checked in the last six months?
   (1) Yes
   (2) No

20. Have you had a digital rectal exam?
   (1) Yes
   (2) No

21. If you answered YES to the previous question, do you think that is a painful exam?
   (1) Yes
   (2) No

22. Have you ever had a colon cancer examination?
   (1) Yes
   (2) No

23. Have you had a skin cancer examination in the past year?
   (1) Yes
   (2) No

24. Have you visited a dentist in the past year?
   (1) Yes
   (2) No
Research Article

25. Do you always have a check-up with a doctor without being sick?

   (1) Yes
   (2) No

26. On average, do you exercise for 2½ hours per week? (for example, 30 minutes a day, five days a week)

   (1) Yes
   (2) No
   (3) Most of the time

27. Do you eat fruits and vegetables more than five times a week?

   (1) Yes
   (2) No
   (3) Most of the time

28. Do you eat meat (white or red) more than five times a week?

   (1) Yes
   (2) No
   (3) Most of the time

29. Are you satisfied with your level of sexual activity?

   (1) Yes
   (2) No
   (3) Most of the time

30. What is your sexual frequency per week?

   (1) 1–2
   (2) 3–4
   (3) 5–6
   (4) 6 or more
   (5) Never

31. Do you regularly examine your genitalia (penis and testicles)?

   (1) Yes
   (2) No
   (3) Most of the time

32. Have you ever had a sexually-transmitted disease?

   (1) Yes
   (2) No

33. Are you generally happy, not feeling much stressed?
34. What are you afraid of regarding your health?

(1) Cancer
(2) HIV
(3) Heart attack
(4) Erectile dysfunction (impotence)
(5) Cerebral infarction (stroke)
(6) Alzheimer’s disease
(7) Parkinson’s disease
(8) Physical disability (accident/stroke)

35. Which exam makes you more anxious?

(1) Dental check-up
(2) Digital rectal examination
(3) Hernia examination
(4) Colonoscopy
(5) Endoscopy

36. Where do you search for health information?

(1) Doctor
(2) Friends
(3) Internet
(4) Magazines
(5) Books
(6) Family
(7) Health campaigns
(8) I do not search for information.