FIREFIGHTER OCCUPATIONAL CANCER RISK ADJUSTMENT

By

BENJAMIN CAFFEE

Bachelor of Science Fire Administration

Columbia Southern University

Orange Beach, Alabama

2015

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment of
the requirements for
the Degree of
MASTER OF SCIENCE May, 2018

FIREFIGHTER OCCUPATIONAL CANCER RISK ADJUSTMENT

Thesis Approved:

Dr. Hao-Che Wu

Thesis Adviser

Dr. Marten Brienen

Dr. Haley Murphy

ACKNOWLEDGEMENTS

First, I would like to thank my wife and children. Without their support none of this would have been possible.

Next, I would like to thank my advisor and chair Dr. Wu. You went well above what I expected from an advisor and for that I am grateful. I would also like to thank the other members of my thesis committee Dr. Brienen and Dr. Murphy. I would not have made it through this process without the guidance and assistance all of you have given me.

Lastly, I would like to thank all of the professors I have had throughout my time in the Fire and Emergency Management program. All of you went above and beyond what was required of you and for that I am grateful to all of you.

Name: BENJAMIN CAFFEE

Date of Degree: MAY, 2018

Title of Study: FIREFIGHTER OCCUPATIONAL CANCER RISK PERCEPTION

Major Field: FIRE AND EMERGENCY MANAGEMENT ADMINISTRATION

Abstract: Recent research has shown that firefighters are at a higher risk for cancer diagnosis than the general population, potentially due to increased carcinogen exposure while performing their job duties. Experts have offered six hazard adjustments that may assist in reducing the level of exposure to these carcinogens. This study was conducted in order to better understand what motivates or deters firefighters from engaging in these hazard adjustments. The sample was firefighters that had attended or were otherwise associated with the Alabama Fire College. Sample size was 358 individuals. Results show that firefighters have a high perception of their occupational cancer risk. Also, that response efficacy, self-efficacy, and cost of engaging in the behavior were much more reliable predictors of hazard adjustment intentions as well as actually completing the hazard adjustment than risk perception, hazard salience, and hazard exposure. A new concept of peer perception was used in this study, which has previously not been mentioned in Protective Motivation Theory studies, which was also found to affect firefighter's intention and actual completion of hazard adjustment. The findings of this study will assist fire service leaders in adapting both education programs and policies and procedures to better protect firefighters from occupational cancer.

TABLE OF CONTENTS

Chapter Page

LIST OF TABLES

Table Page

LIST OF FIGURES

Figure Page

CHAPTER I

Introduction

Members of the fire service face many hazards during the course of completing their duties. To add to the complexity of mitigating these hazards, the fire service operates in a unique environment where it may be perceived that the greater the risk accepted by the firefighter, the less risk there will be to the public (De Lisi, 2005; Pessemier, 2008). While firefighters face a diverse number of risks when providing emergency services to the public, a newly discovered problem is growing, cancer. Firefighters are regularly exposed to carcinogens during firefighting activities which is theorized to cause higher incidents of cancer in firefighters (Daniels et al., 2014; LeMasters et al., 2006; Pukkala et al., 2014). In a meta-analysis of 32 studies, LeMasters et al. (2006) found that firefighters were more prone to diagnoses of ten different cancers when compared against the general population. Daniels et al. (2014) found that overall, firefighters had a 14% higher morbidity rate to cancer than the general public did and that there was a significantly higher morbidity rate in seven specific cancers. Other studies have also documented the higher cancer diagnosis and morbidity rates in firefighters as compared to the general population (Ma, Fleming, Lee, Trapido, & Gerace, 2006; Pukkala et al., 2014).

Experts have offered six protective actions firefighters can take which may reduce the level of exposure they face while fulfilling their duties: (1) gross decontamination (decon) of personnel and personal protective equipment (PPE) immediately after firefighting activities, (2) placing contaminated PPE in areas other than the passenger compartment, (3) thoroughly washing and cleaning PPE after firefighting activities, (4) showering within an hour after firefighting activities, (5) working out within 24 hours of firefighting activities, and (6) wearing self-contained breathing apparatus (SCBA) until the completion of overhaul activities (Fent et al., 2015; Firefighter Cancer support Network, 2013; National Fallen Firefighters Foundation, 2015). While these actions are believed to reduce the amount of carcinogen exposure firefighters face, many of them clash with traditional fire service culture. With this topic of study only in its infancy, this project seeks to examine the ways in which firefighters perceive their occupational cancer risks as well as what affects their intention to adopt cancer hazard adjustment activities and the actual completion of the cancer hazard adjustments.

CHAPTER II

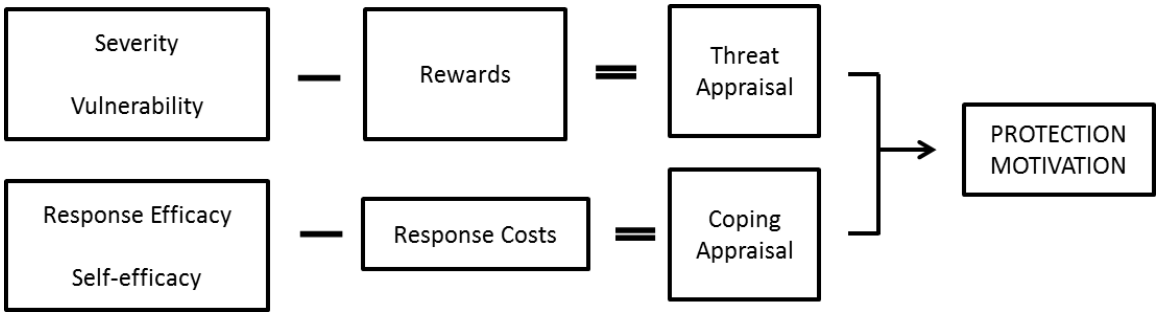
Review of Literature

Theoretical Framework

Protective Motivation Theory (PMT) originally proposed by Rogers (1975), then later modified by Rogers (1983) is used as the theoretical framework for this project. The theory suggests protective motivations are affected by two factors, the individual's threat appraisal and the individual's coping appraisal. The threat appraisal is the portion of the theory where an individual takes into consideration the severity of the threat as well as their level of vulnerability to the proposed threat (Norman, Boer, & Seydel, 2005; Rogers, 1983). The theory also discusses that in the threat appraisal, in addition to severity of the threat and vulnerability to the threat, individuals consider the rewards of the proposed hazard adjustment which can be intrinsic (beneficial to the individual themselves) or extrinsic (which is socially beneficial for the individual) (Norman et al., 2005). Coping appraisal includes multiple factors; response efficacy, self-efficacy, and the cost of the response to the threat. Response efficacy is the individual's perception of how well the hazard adjustment will protect them; self-efficacy is the individual's perception of how well they will be able to properly perform the hazard adjustment and lastly, individuals consider the potential costs to them if they choose to adopt the hazard adjustment (Norman et al., 2005; Rogers, 1983). Generally, in order for an individual

to make the hazard adjustment the perceived severity of and vulnerability to the threat must outweigh the rewards related to engaging or not engaging in the suggested behavior. Next, the individual's perception of response efficacy and self-efficacy must be greater than the potential costs of taking the behavior before the hazard adjustment is completed (Norman et al., 2005). Figure 1 is a visual diagram of the PMT Model. In a meta-analysis of 65 studies using PMT, Floyd, Prentice-Dunn, and Rogers (2000) found that both threat appraisal and coping appraisal variables were linked to hazard adjustment intention and actual hazard adjustments; however, coping appraisal variables were much more closely related than were threat appraisal variables. They also concluded that self-efficacy and response efficacy variables may be the most important areas to focus on to create the highest potential for increasing hazard adjustment intention and actual hazard adjustments.

Figure 1: Protective Motivation Theory Model (Rogers, 1975, 1983)



Threat Appraisal

Risk Perception. Risk is typically considered the portion of an activity or technology that could result in a negative or undesired outcome at some point in the future (Chauncey, 1969; Hermansson, 2012). Considering this definition, risk perception is measured by assessing the probability or likelihood of the occurrence of a threat in

disaster or risk literature (Huang, Lindell, & Prater, 2016; Lindell & Perry, 2012; Lindell & Whitney, 2000; Wu, Greer, Murphy, & Chang, 2017). Although Maddux and Rogers (1983) PMT article did not use the term risk perception, the ways in which they measure threat appraisal is exactly how recent risk related studies measure risk perception (e.g. Lindell & Perry, 2012)[1]. On the other hand, measuring risk perception can be an ambiguous process due to the difficulty in defining risk, predicting the probability of a negative effect occurring, as well as how the risk will be perceived and categorized by particular individuals (Sjoberg, 1999; Slovic, 1992). Sjoberg (1999) highlights that individuals not only examine risks but also that the perceived risk is weighed against the potential benefit of an activity. They also note that hazard adjustments were more closely linked to perceived severity rather than to the potential for a negative outcome. Fischhoff, Slovic, Lichtenstein, Read, and Combs (1978) found that individuals will accept higher levels of risk when they perceive the outcome of the action will be of greater benefit than the risk. Chauncey (1969) noted that individuals are more likely to accept greater levels of risk when the activity is voluntary rather than mandated. Wildavsky and Dake (1990) noted that individual risk perception is also affected by how well the perceived risk supports the individual's chosen lifestyle. Pidgeon (1998) points out the importance of social framing when measuring risk and risk perceptions as well as social framing's importance in the development and implementation of risk management plans and regulations. Studies which directly relate to this project have found risk perception can have an effect on hazard adjustments and intentions but findings are not consistent. Lindell and Whitney (2000) note that there was no significant correlation of risk

[1] Maddux and Rogers (1983) asked their study subject to report the probability of occurrence of a threat event.

perceptions to either hazard adjustment adoption intentions or actual hazard adjustments in their California household earthquake survey study. While Wu, Greer, Murphy, et al. (2017) found positive correlations between risk perception and hazard adjustment intentions but not with actual hazard adjustment adoption in their Oklahoma student survey study. Lastly, Wang et al. (2016) found positive correlations between risk perception and hazard adjustment but the correlation was not nearly as strong as it was with response attributes, such as self-efficacy and response efficacy in their influenza outbreak study.

Hazard Salience. While hazard salience is not mentioned specifically in PMT, studies on natural hazard adjustments have found a positive correlation between hazard salience and hazard adjustments (Jackson, 1981; O'Brien & Mileti, 1992; Russell, Goltz, & Bourque, 1995; Wu, Greer, Murphy, et al., 2017). Prater & Lindell (2000) found hazard salience to correlate more strongly with hazard adjustment than risk perceptions. Additionally, Dooley, Catalano, Mishra, and Serxner (1992) noted an increase in hazard salience following experiencing a hazard but that the level of hazard salience decreases the further the experience was in the past. Jackson (1981) noted that while their sample had a low overall hazard salience the individuals with higher earthquake hazard salience were much more likely to take earthquake hazard adjustments. Lastly, Russell et al. (1995) found that there was an increase in hazard salience after a seismic event and that the increased salience was a significant predictor for taking hazard adjustment activities. In addition, while hazard salience and risk perception both correlate to hazard adjustment; Wu, Greer, Murphy, et al. (2017) found that hazard salience have stronger

positively correlation with their student subjects' actual earthquake adjustment activities than other variables such as risk perception.

Hazard exposure. While PMT did not include hazard exposure variables in the theory, there is a large body of research that suggests that hazard exposure is positively correlated with hazard adjustment adoption (Jackson, 1981; Lindell & Hwang, 2008; Lindell & Prater, 2000; Perry & Lindell, 2008; Wu, Greer, Murphy, et al., 2017). Jackson (1981) found that previous hazard exposure was significantly correlated to future hazard risk perceptions as well as taking hazard adjustments; although it is noted that previous experience can be measured in many ways and could prove an ambiguous topic. Russell et al. (1995) also noted that previous hazard experience was a significant predictor of hazard adjustments after earthquakes. Lindell and Hwang (2008) found in a multi-hazard study that hazard experience had a direct effect on taking hazard adjustments confirming earlier findings by Lindell and Prater (2000) concerning seismic hazard adjustment adoption. Perry and Lindell (2008), in a multi hazard study, found that risk perception was not a significant predictor of hazard adjustment activities but previous hazard experience was in all three hazard types examined in the study. More recently, one study found that people who live in an earthquake prone area are more likely to purchase earthquake insurance which shows exposure to a hazard may increase hazard adjustments (Wu, Greer, & Murphy, 2017).

Coping Appraisal

PMT introduced three types of coping appraisal components that may have effects on hazard adjustment. These coping appraisal components include perceived response

efficacy, self-efficacy, and response costs (Rogers, 1975, 1983). Response efficacy has been operationalized by asking study participants to rate the hazard adjustment activities' effectiveness to protect oneself (Rogers, 1983). Self-efficacy is defined as a person's belief of his/her capability of adopting hazard adjustments (Maddux & Rogers, 1983). Finally, response cost is any monetary, personal, or time cost associated with hazard adjustment adoption (Floyd, Prentice-Dunn, & Rogers, 2000). Recently, this approach has been used to study households' intention or actual adoption of earthquake, influenza, and water contamination hazard adjustment actives (Lindell et al., 2017; Lindell & Whitney, 2000; Wang et al., 2016; Wu, Greer, Murphy, et al., 2017)

Response efficacy. As mentioned earlier, response efficacy is an individual's perception of how well a hazard adjustment activity could protect them from hazards. Lindell and Whitney (2000) found that efficacy attributes of seismic hazard adjustment had strong correlations to intended hazard adjustments and actual hazard adjustments. Similarly, Wu, Greer, Murphy, et al. (2017) found that response efficacy variables, such as how well the action would protect the individual, had strong correlations to hazard adjustment intentions in a seismic hazard study. Another study considering contaminated drinking water hazard adjustments found that higher levels of belief in the effectiveness of the hazard adjustment's ability to protect the individual resulted in a higher intention to complete the hazard adjustment (Lindell et al., 2017). Lastly, in a study considering protective actions against an influenza outbreak, Wang et al. (2016) found that individual hazard adjustments were significantly affected by their perception of the efficacy of the hazard adjustment.

Self-efficacy. Self-efficacy is related to the individual's perception of their ability to complete the hazard adjustment such as whether it requires special knowledge or skills. Perry and Lindell (2008) in a multi-hazard hazard adjustment study found that one's responsibility to protect one's self was a significant predictor for hazard adjustments. In a similar study considering seismic hazard adjustments Wu, Greer, Murphy, et al. (2017) found that individuals perceiving the hazard adjustment to require special knowledge or skill actually had positive correlations with multiple hazard adjustment items. While the findings in the aforementioned seem reasonable, they may be difficult to apply in a workplace as unique as the fire service. According to Maglio, Scott, Davis, Allen, and Taylor (2016) and Harrison, Yang, et al. (2017) peers' perception might affect one's behavior. Therefore, in this study a variable not considered in previous studies is included, that is whether the respondent's peers would frown upon the action. This variable is considered due to the direct affect it can have on an individual, in particular the effect it can have on someone in an organizational culture such as the fire service.

Response cost. Response cost as stated earlier relates the cost to the individual of implementing the hazard adjustment such as effort, costs, or usefulness. Wang et al. (2016) found with influenza hazard adjustments variables such as cost, time restraints, and tools required did not negatively correlate with hazard adjustments; however they did find that being useful for other purposes did have an effect on hazard adjustments. In their study on seismic hazard adjustments Wu, Greer, Murphy, et al. (2017) found that variables useful for other purposes, require a lot of effort and cost a lot of money are all correlated with seismic hazard adjustment items. Conversely, Lindell and Whitney (2000) found that variables such as costs, time and effort requirements, and required cooperation

from others did not significantly correlate to hazard adjustment intention or actual hazard adjustments. Lastly, Lindell et al. (2017) found that while variables such as cost money, require special skills or tools, and require effort did correlate with hazard adjustment intention, the correlation was not as strong as response efficacy variables such as effective protection to the participant.

Demographic Variables

Demographic variables have also been found to affect risk perception and hazard adjustments. For instance, men have a tendency to rate risks and risky activities lower than women do (Brody, 1984; Flynn, Slovic, & Mertz, 1994; Gutteling & Wiegman, 1993). In many studies white males had lower risk perceptions than any other demographic (Finucane, Slovic, Mertz, Flynn, & Satterfield, 2000; Flynn et al., 1994; Gustafsod, 1998) although Finucane et al. (2000) relates this to sociopolitical factors that are particular to white males rather than biological factors. The importance of these factors can be highlighted by examining the demographics of the United States fire service. According to DataUSA (2015), there were approximately 279,292 career firefighters in the U.S., of these 94.9% were male. DataUSA (2015) also reports that 86.3% of career firefighters were Caucasian, 8.3% were African American, and the remainder are other races. Therefore the U.S. career fire service, because of individual demographics, could be predisposed to have a lower risk perception according to previous research which suggests white males have a lower risk perception (Finucane, Slovic, Mertz, Flynn, & Satterfield, 2000; Flynn et al., 1994; Gustafsod, 1998).

While interesting, the effect many demographic variables have on risk perception and hazard adjustment are unchangeable and therefore not as useful as others. Education level however may be one of the most useful, yet controversial. Many studies have reported individuals with higher levels of education have higher levels of risk perception (Rodríguez-Garzón, Martínez-Fiestas, Delgado-Padial, & Lucas-Ruiz, 2016; Zare Sakhvidi et al., 2014) while other studies report a negative correlation with higher education (Breakwell, 2014; Leiter, Zanaletti, & Argentero, 2009). Lastly, Sjöberg (2004) failed to identify a significant correlation between education and risk perception.

Occupational Risk Perception

Occupational risk perception studies highlight that individuals are aware that there job duties can and does expose them to certain levels of risk (Mullen, 2004; Sanne, 2008; Zare Sakhvidi et al., 2014). Mullen (2004) found that workers felt pressure to accept higher levels of risk because they perceived management preferred performance above safety and also the significant role that culture and safety attitude had on individual worker risk perceptions and hazard adjustments. Honkasalo (1992) noted that due to the time sensitive nature of their jobs, underwater welders felt increased pressure to accept higher levels of risk. Sanne (2008) reported similar results in Swedish rail workers, due to the time sensitive nature and the public safety aspect of their job they were more willing to accept increased levels of risk. Studies that consider firefighter risk perceptions in particular find that although firefighters are becoming more aware of the long-term medical hazards they face such as cancer, most considered these risks as inherent risk of performing their job that are unavoidable (Anderson, Harrison, Yang, Wendorf Muhamad, & Morgan, 2017; Jahnke, Poston, Jitnarin, & Haddock, 2012).

Fire Service Culture

While organizational culture is not directly mentioned in PMT, some variables that are used in the coping appraisal for this study pertain to fire service culture. The fire service is steeped in tradition, many of which can be traced back to its origin. Most occupations struggle to balance risk with the desired amount of production however, as previously discussed, the increased acceptance of risk by firefighters can be perceived as the desired outcome, greater public safety. While all fire service traditions are not a negative thing, some are being identified as problematic (De Lisi, 2005). One problem in particular is being dirty after a fire and dirty PPE as a badge of experience and honor. For many years, firefighters with dirty PPE have been viewed as seasoned veterans that are skilled and capable on the fire ground (Fent et al., 2015). This view can also have an effect on showering after a fire and working out after a fire (Firefighter Cancer support Network, 2013; National Fallen Firefighters Foundation, 2015). This traditional view however, is in direct contrast with the suggested hazard adjustment of gross decontamination on the scene as well as washing PPE. Another problem is proper use of PPE and SCBA. Fent et al. (2015) noted that firefighters are exposed to carcinogens through inhalation and absorption through the skin. When firefighters do not wear their SCBA through the completion of overhaul activities, they are exposed to higher levels of carcinogens. PPE has also been shown to continue gassing off carcinogens after a fire which if not cleaned will continue to expose firefighters to carcinogens, such as in vehicle cabs and dormitories (Fent et al., 2015). Recent studies of Florida firefighters found that while firefighters had a positive perception about cleaning PPE and its ability to protect them from cancer and other health hazards, many were unlikely to complete the

hazard adjustment regularly, they note this could be due to concerns of time constraints and functioning in wet PPE (Harrison, Wendorf, Muhamad, et al., 2017). Additionally, studies have shown that peer pressure from senior department members (organizational culture) is a major factor in newer firefighter's decision to implement the suggested hazard adjustments (Maglio et al., 2016). These studies highlight the importance of educational and culture change initiatives in the fire service. These can strongly contribute to an improved operational culture that in that end will serve to better protect firefighters from the cancer epidemic.

CHAPTER III

Methodology

Research Hypothesis and Questions

Based on the previous sections, this study intends to use PMT theory to examine firefighters' intention and actual adoption of firefighting related cancer hazard adjustment actives. As stated earlier, unlike the traditional PMT theory studies (Floyd et al., 2000; Maddux & Rogers, 1983; Rogers, 1975, 1983), this study will introduce a new self-efficacy variable that is related to fire service culture; peer perception. In addition, this study would like to examine the association between fire service/individual demographics and hazard adjustment. The research hypotheses (RHs) and questions (RQs) are:

RH 1: Coping appraisal variables are better predictors of hazard adjustment intention compared to threat appraisal variables.

RH 2: Coping appraisal variables are better predictors of actual hazard adjustment adoption compared to threat appraisal variables.

RQ1: Does fire service demographics have effects on firefighter's adjustment intention?

RQ2: Does individual demographics have effects on firefighter's adjustment intention?

RQ3: Does previous cancer experience have an effect on firefighter's adjustment intention?

RQ 4: Do fire service and individual demographics have significant correlations with hazard adjustment intentions and actual hazard adjustments?

Sample

This study was conducted in cooperation with the Alabama Fire College (AFC). The sample was firefighters that have attended certification courses or were otherwise affiliated with the AFC. The AFC offers certification and non-certification courses to both career and volunteer firefighters across Alabama and the rest of the country. The internet survey was developed using the service Survey Monkey which was modeled considering previous surveys used by Lindell and Whitney (2000) and Wu, Greer, Murphy, et al. (2017) and distributed using Dillman (2011) methods. An email was sent out by the AFC to all individuals that were on their email list on 11/28/2017 informing them about the survey, describing the importance of the study, and providing them a link to take the survey. A second email was sent to the same list of individuals on 12/12/17 reminding them if they have not completed the survey they will have two more weeks to complete the survey and their participation would be highly appreciated. A similar second reminder was sent on 12/18/17. Finally, on 12/26/2017 the survey was closed. In

total, the email was opened by 1,539 individuals and 358 responses were received making the response rate 23%[2]

Measures

The survey instrument consisted of 27 items. Respondents were asked to rate their threat appraisal in five items. To consider hazard salience, respondents were asked how often do you think about occupational cancer risk (*1=Never, 2=Annually, 3=Monthly, 4=Weekly, 5=Daily*)? Risk perception, hazard exposure and hazard adjustment questions were mostly asked using 5-point Likert scales. Risk perception were measured using three questions: how concerned they were with being diagnosed with cancer (*1=Not concerned to 5=Extremely concerned*); what do you think is the likelihood you will be diagnosed with cancer (*1=Not likely to 5=Extremely likely*); what do you think is the likelihood of cancer being caused by firefighting activities (*0=Not caused by firefighting, 100=Absolutely caused by firefighting activities)*? Lastly, respondents were asked to rate each of the following job aspects for their potential to expose them to cancer causing carcinogens, Interior structural firefighting, exterior structural firefighting, hazardous materials mitigation, extinguishing vehicle fires, and wildland firefighting (*1=No exposure, 5= extreme exposure*). These questions were used to measure respondent's hazard exposure level.

Six survey items were used to consider coping appraisals. These questions asked respondents to rate their perceptions considering the six protective actions measured in this survey, (1) gross decontamination after a fire, (2) placing contaminated PPE in

[2] Dillman (2011) proposed four waves survey approach for physical mail survey maligning. Since this study uses electronic survey, the author skipped the second wave-post card notification and only sent out email notices three times.

compartments other than the passenger cab, (3) washing PPE after a fire, (4) showering within an hour of firefighting activities, (5) working out within 24 hours of firefighting activities, and (6) wearing self-contained breathing apparatus until the completion of overhaul activities. In order to measure response efficacy, respondents were asked, how effectively they felt the six protective actions would protect them, (*1=Not at all, 5=To a great extent*). Next, to measure self-efficacy, respondents were asked to consider whether they felt if the six protective actions would require specialized knowledge or skills to complete (*1=Not at all, 5=To a great extent*). In a second self-efficacy measurement respondents were asked to consider if any of the six protective actions would be frowned upon by their peers (*1=Not at all, 5=To a great extent*). In order measure response cost, respondents were asked whether each of the six protective actions would require a lot of effort to complete (*1=Not at all, 5=To a great extent*). To again measure response cost, respondents were asked if they felt the six protective actions would cost a lot of money (1=*Not at all, 5=To a great extent*). A third response cost item asked respondents to rate if they thought the six protective actions would be useful for purposes other than preventing occupational cancer (*1=Not at all, 5=To a great extent*).

In order to measure individual's intention to complete each of the six protective actions respondents were asked if each of the actions would be something they are likely to do (*1=Not at all, 5=To a great extent*). In order to measure the actual protective actions taken individuals were asked if they take any of the six protective actions to reduce the risk of occupational cancer after firefighting activities (*1=Never, 2=Sometime, 3=Always).*

Respondents were also asked to answer questions about the fire department they are affiliated with such as, what type of department they are affiliated with (*1=Career, 0=Volunteer*), how many years of service they had (*1 = 0-5 years, 2 = 6-10 years, 3 = 11-15 years, 4 = 16-20 years, 5 = 21 or more years*), their current rank (*1=Firefighter, 2=Apparatus operator, 3=Lieutenant, 4=Captain, 5=Battalion chief, 6=Chief officer*), the number of calls for service annually their department responds to (*1=0-499 calls, 2=500-1499 calls, 3=1500-2499 calls, 4=2500-4999 calls, 5=5000 or more calls*), and the number of fire-related responses their department responds to including structure, dumpster, vehicle, and wildland annually (*1=0-49 calls, 2=50-99 calls, 3=100-149 calls, 4=150-199 calls, 5=200 or more calls*).

Lastly, respondents were asked several individual demographic questions such as, age (*1 = 18-24 years old, 2 = 25-34 years old, 3 = 35-44 years old, 4 = 45-54 years old, 5 = 55 or older*), sex (*1=male, 0=female*), marital status (*1=married, 2=divorced, 3=single, 4=widowed*), a second marital status variable was recoded for the correlation table *(1=married, 0=single, widowed, or divorced),* number of children they have (*1=1, 2=2, 3=3, 4=4, 5=5, 6=6 or more*), highest level of education (*1=GED, 2=high school diploma, 3=some college, 4=associate degree, 5=bachelor degree, 6=graduate school*), and household income (*1=$24,999 or less, 2=$25,000-$49,999, 3=$50,000-$74,999, 4=$75,000 or more*). Finally respondents were asked about their previous cancer experience (*1=myself, 2=coworker, 3= none*).

Descriptive Statistics

Individual Demographics. The majority of the sample was male (97.8%). The most common age groups were 45-54 years old (Mode = 3, SD = 1.08, n = 314). The majority of the sample, 87.3%, was married. (Mode = 1, SD = .60, n = 314). The most common number of children reported was 2 children (Mode = 3, SD = 1.19, n = 312). The largest majority reporting having an associate's degree or above (Mode = 4, SD = 1.1, n = 313). Lastly, the majority of the sample reported household earnings of 75,000.00 or more (Mode = 4, SD = .79, n = 305).

Fire Service Demographics. The majority of the sample was affiliated with a career fire department (Mode = 1, SD = .39, n = 314). The most commonly reported number of years in the fire service was the 21 or more (Mode = 5, SD = 1.35, n = 314). The most commonly reported rank was firefighter (Mode = 1, SD 1.75, n = 313) however, there was a fair representation from all ranks, Firefighter 20.4%, Apparatus Operator 12%, Lieutenant 11.5%, Captain 19.8%, Battalion Chief 10.1%, Chief Officer 13.7%. The number of calls for service by the respondent's organization was primarily on the upper end of the scale (Mode = 5, SD = 1.46, n = 313). Lastly, the number of fire related calls was also on the high end of the scale as well (Mode = 5, SD = 1.6, n = 312).

Threat Appraisal Variables

Threat appraisal variables include hazard salience, risk perception, and hazard exposure. First, how often do you think about occupational cancer risk (Mean = 3.54, SD = 1.06, n = 349). Next, respondents concern for occupational cancer was high (Mean = 3.86, SD = 1.09, n = 346) with the most common response being extremely concerned.

Respondents perception of their likelihood of being diagnosed with cancer was high (Mean = 3.52, SD = 1, n = 347). Respondent's perception that a cancer diagnosis would be caused by their occupation was high as well (Mean = 73.66, SD = 20.8, n = 312). Perceived hazard exposure variables show that (1) interior structural firefighting was rated as the highest level of exposure by respondents (Mean = 4.5, SD = .86, n = 349), (2) exterior structural firefighting (Mean = 3.65, SD = .96, n = 348), (3) hazardous materials mitigation (Mean 3.81= , SD = 1.2, n = 349), (4) extinguishing vehicle fires (Mean = 4.22, SD = .93, n = 348), (5) wildland firefighting (Mean = 2.91, SD = 1.11, n = 347).

Coping Appraisal Variables

Individuals were asked multiple questions about their perceptions of the six protective actions discussed earlier below are the descriptive concerning the coping appraisal variables: (1) Gross decontamination after a fire would protect me effectively (Mean = 3.6, SD = 1, n = 319), require special knowledge or skills N = 317 (Mean = 1.5, SD = .84), be frowned upon by my peers (Mean = 1.97, SD = 1.1, n = 319), require a lot of effort (Mean = 1.6, SD = .83, n = 318), cost a lot of money (Mean = 1.9, SD =1.01, n= 318), also be useful for other purposes (Mean = 3.6, SD = 1.11, n = 319). (2) Placing contaminated PPE in compartments other than the passenger cab would protect me effectively (Mean = 3.84, SD = 1.01, n = 312), require special knowledge or skills (Mean = 1.29, SD = .66, n = 316), be frowned upon by my peers (Mean = 1.93, SD = 1.13, n = 316), require a lot of effort (Mean = 1.6, SD = .93, n = 317), cost a lot of money (Mean = 1.53, SD = .98, n = 315), also be useful for other purposes (Mean = 3.1, SD = 1.37, n = 317). (3) Washing PPE after a fire would protect me effectively (Mean = 4.48, SD = .79, n = 319), require special knowledge or skills (Mean = 1.88, SD = 1.02, n = 318), be

frowned upon by my peers (Mean = 1.75, SD = 1.04, n = 317), require a lot of effort (Mean = 2.37, SD = 1.19, n = 319), cost a lot of money (Mean = 2.26, SD = 1.26, n = 316), also be useful for other purposes (Mean = 3.77, SD = 1.11, n = 318). (4) Showering within an hour of firefighting activities would protect me effectively (Mean = 4.41, SD = .83, n = 319), require special knowledge or skills (Mean = 1.15, SD = .5, n = 319), be frowned upon by my peers (Mean = 1.4, SD = .88, n = 318), require a lot of effort (Mean = 1.41, SD = .72, n = 317), cost a lot of money (Mean = 1.23, SD = .57, n = 317), also be useful for other purposes (Mean = 4.04, SD = 1.17, n = 317). (5) Working out within 24 hours of firefighting activities would protect me effectively (Mean = 2.78, SD = 1.21, n = 316), require special knowledge or skills (Mean = 1.53, SD = .82, n = 317), be frowned upon by my peers (Mean = 1.61, SD = .95, n = 312), require a lot of effort (Mean = 2.69, SD = 1.29, n = 316), cost a lot of money (Mean = 1.49, SD = .76, n = 315), also be useful for other purposes (Mean = 3.76, SD = 1.31, n = 313). (6) Wearing self-contained breathing apparatus (SCBA) until the completion of overhaul activities would protect me effectively (Mean = 4.72, SD = .61, n = 316), require special knowledge or skills (Mean = 2.03, SD = 1.23, n = 318), be frowned upon by my peers (Mean = 2.19, SD = 1.27, n = 318), require a lot of effort (Mean = 2.47, SD =1.31, n = 318), cost a lot of money (Mean = 1.77, SD = 1.12, n = 318), also be useful for other purposes (Mean = 3.8, SD = 1.23, n = 317).

Hazard Adjustment Completion Frequency Variable

Each respondent was asked the frequency they completed each suggested hazard adjustment; never, sometime, or always. (1) Gross decon (Mode = 2, SD = .69, n = 338), (2) Place contaminated PPE out of cab (Mode = 1, SD = .75, n = 338), (3) Wash PPE

(Mode = 2, SD = .61, n = 338), (4) Shower within an hour of firefighting activities (Mode = 2, SD = .58, n = 338), (5) Workout within 24 hours of firefighting activities (Mode = 2, SD = .55, n = 338), (6) Wear SCBA though the completion of overhaul (Mode = 2, SD = .63, n = 338).

Combined Variables

A hazard adjustment intention index was created by combining the variables measuring the frequency of completing the six hazard adjustment items. The *Chronbach's Alpha* for these variables was .70.

A hazard exposure index was created by combining the hazard exposure variables, the *Chronbach's Alpha* for these variables was .76.

CHAPTER IV

Findings

Results

RH1 *(Coping appraisal variables are better predictors of hazard adjustment intention comparing to threat appraisal variables)*: The results show that RH1 is confirmed (Table 1). Most of the coping appraisal variables are significant predictors of the hazard adjustment intention items with few exceptions in all six models; on the other hand, threat appraisal variables only have limited predictability in these models. For example, in table 1, the first regression analysis shows that the overall model of gross decontamination adjustment intention is significant ($F_{(11, 291)}$ =8.69; $p < .05$; *Adj* R^2 =.22) and most of the significant predictors are coping appraisal variables (*protect me effectively*, *require a lot of effort*, *be frowned upon by peers*, *also be useful for other purposes*). Only one threat appraisal variable *the likelihood of cancer diagnoses* is a significant predictor of the intention of gross decontamination adjustment. Among the coping appraisal variables, the coefficients of variable *protect me effectively* are higher than all other coping appraisal variables in all six models. In addition, the coefficients of variables *require a lot of effort* and *also be useful for other purposes* are significant predictors across all six models.

Table 1: Regression Analysis of Fire Cancer Hazard Adjustment Intentions RH 1			Gross decon is something I'm likely to do	Contaminated PPE out of cab be something I'm likely to do	Washing PPE something I'm likely to do	Showering within 1 hour be something I'm likely to do	Workout within 24 hours after firefighting activities	Wearing SCBA through overhaul be something I'm likely to do
Constant			1.95*	.92*	2.00*	1.79*	1.16*	.07
Threat Appraisal	Hazard Salience	How often do you think about occupational cancer?	.08	.04	-.02	.01	.02	.07
	Risk Perception	Occupational cancer concern	.06	.16*	.06	.09	-.08	.11
	Risk Perception	Likelihood of cancer diagnoses	-.14*	-.15*	.05	-.02	.08	-.06
	Risk Perception	Likelihood of cancer being caused by firefighting	.00	-.00	-.00	-.00	.00	-.00
	Hazard Exposure	Hazard exposure index	.15	.17	-.09	.01	.01	.03
Coping Appraisal	Perceived response efficacy	Protect me effectively	.28*	.36*	.46*	.39*	.29*	.58*
	Self-efficacy	Require special knowledge or skills	.11	.13	.11	.31*	.14	.21*
	Self-efficacy	Be frowned upon by peers	-.10*	-.19*	-.04	-.15*	-.11	-.03
	Response costs	Require a lot of effort	-.23*	-.16*	-.15*	-.28*	-.15*	-.20*
	Response costs	Cost a lot of money	-.02	.03	-.12*	-.20*	-.02	-.08
	Response costs	Also be useful for other purposes	.16*	.22*	.13*	.25*	.28*	.20*
Statistics			$F(11, 291)=8.69$ $p<.05$ $Adj\ R^2=.22$	$F(11, 283)=14.08$ $p<.05$ $Adj\ R^2=.33$	$F(11, 291)=5.81$ $p<.05$ $Adj\ R^2=.15$	$F(11, 290)=14.01$ $p<.05$ $Adj\ R^2=.32$	$F(11, 283)=13.60$ $p<.05$ $Adj\ R^2=.32$	$F(11, 290)=14.79$ $p<.05$ $Adj\ R^2=.34$
**** indicates the coefficient is significant at .05 level***								

RH2 *(Coping appraisal variables are better predictors of actual hazard adjustment adoption comparing to threat appraisal variable.)*: Table 2 shows that this hypothesis is also confirmed. While the regression model for actual adjustments produced fewer significant results than the hazard adjustment intention model did, coping appraisal variables were much more significant predictors of actual hazard adjustments (see table 2). For example, the only significant threat appraisal variable was in the model for *washing PPE, (likelihood of cancer diagnosis being caused by firefighting)* but was a weak predictor, however, coping appraisal variable *protect me effectively* produced significant results in all six models. Also, the regression model for *wearing SCBA through the completion of overhaul* produced significant results in five of the six coping appraisal variables and none of the threat appraisal variables *(F (11, 292)=8.54, p< .05, Adj R2 =.22)* with *frowned upon by peers* being the only non-significant coping appraisal predictor.

RQ 1 (*Does fire service demographics have effects on firefighter's adjustment intention)*: There were five variables that represented fire service demographics which were compared to the hazard adjustment intention index. (1) Type of department: an independent sample T-test was conducted to determine if there was a difference between career and volunteer firefighters hazard adjustment intentions. There was a significant difference in the mean scores for career firefighters (M= 3.66, SD= .71) and volunteer firefighters (M= 3.45, SD= .72) intention to complete hazard adjustments ($t_{(312)} = 2.05$, $p < .05$). (2) Years in the service: a one-way ANOVA test was conducted to determine if number of years of fire service experience affected hazard adjustment intentions. Years of fire service experience did not have a significant effect on hazard adjustment

Table 2: Regression Analysis of Fire Cancer Actual Hazard Adjustment RH 2			Gross decon is something I'm likely to do	Contaminated PPE out of cab be something I'm likely to do	Washing PPE something I'm likely to do	Showering within 1 hour be something I'm likely to do	Workout within 24 hours after firefighting activities	Wearing SCBA through overhaul be something I'm likely to do
Constant			1.49*	1.61*	2.12*	1.62*	1.36*	1.22*
Threat Appraisal	Hazard Salience	How often do you think about occupational cancer?	.03	.01	.02	.01	-.00	.06
	Risk Perception	Occupational cancer concern	.01	.05	.00	-.01	-.04	.03
	Risk Perception	Likelihood of cancer diagnoses	-.03	-.08	.04	.00	.05	-.03
	Risk Perception	Likelihood of cancer being caused by firefighting	-.00	-.00	-.00*	-.00	.00	-.00
	Hazard Exposure	Hazard exposure index	.02	-.05	-.08	-.05	-.02	-.01
Coping Appraisal	Perceived response efficacy	Protect me effectively	.09*	.13*	.24*	.21*	.13*	.17*
	Self-efficacy	Require special knowledge or skills	.10	.18*	-.03	.16*	.12*	.14*
	Self-efficacy	Be frowned upon by peers	-.06	-.09*	-.05	.01	-.01	-.03
	Response costs	Require a lot of effort	-.12*	-.09	-.05	-.15*	-.05	-.14*
	Response costs	Cost a lot of money	-.04	-.08	-.05	-.03	-.06	-.08*
	Response costs	Also be useful for other purposes	.11*	.07*	-.03	.04	.03	.09*
Statistics			$F(11, 291)=3.09$ $p<.05$ $Adj\ R^2=.07$	$F(11, 285)=3.91$ $p<.05$ $Adj\ R^2=.10$	$F(11, 291)=5.10$ $p<.05$ $Adj\ R^2=.13$	$F(11, 290)=4.27$ $p<.05$ $Adj\ R^2=.11$	$F(11, 283)=4.56$ $p<.05$ $Adj\ R^2=.12$	$F(11, 292)=8.54$ $p<.05$ $Adj\ R^2=.22$
**** indicates the coefficient is significant at .05 level***								

intentions for the five conditions ($F_{(4, 309)} = 2.07$, *ns*). (3) Rank: a one-way ANOVA test was conducted to determine if rank affected hazard adjustment intentions. Rank did not have a significant effect on hazard adjustment intentions for the six conditions ($F_{(5, 307)} = .57$, *ns*). (4) Number of total responses: a one-way ANOVA test was conducted to determine if number of department calls for service affected hazard adjustment intentions. Number of department calls for service had a significant effect on hazard adjustment intentions ($F_{(4, 308)} = 3.27$, $p < .05$). Table 3 shows that the departments that responded to between, 2,500 to 4,999 calls annually had the highest intention to complete hazard adjustments. (5) Number of fire responses: a one-way ANOVA test was conducted to determine if number of department fire calls affected hazard adjustment intentions. The number of department fire calls did not have a significant effect on hazard adjustment intentions ($F_{(4, 307)} = 1.35$, *ns*).

Table 3: ANOVA results comparing Number of Total Responses to Hazard Adjustment Intention

Number of responses	Mean	SD	N
0-499	3.56	.72	49
500-1499	3.59	.66	41
1500-2499	3.47	.73	47
2500-4999	3.89	.59	69
5000 or more	3.57	.76	107
Total	3.63	.71	313

RQ 2 (*Does individual demographics have effects on firefighter's adjustment intention)*: Six demographic variables were analyzed to measure their effect on hazard adjustment intentions. (1) Age: a one-way ANOVA test was conducted to determine if individual age affected hazard adjustment intentions. Individual age did not have a

significant effect on hazard adjustment intentions for the five conditions ($F_{(4, 309)} = 1.12$, *ns*). (2) Sex: an independent sample T-test was conducted to determine if there was a difference between male and female firefighter's hazard adjustment intentions. Sex did not have a significant effect on hazard adjustment intentions ($t_{(312)} = -1.11$, *ns*). (3) Marital Status: a one-way ANOVA test was conducted to determine if marital status affected hazard adjustment intentions. Marital status did not have a significant effect on hazard adjustment intentions for the four conditions ($F_{(3, 310)} = 1.39$, *ns*). (4) Number of children: a one-way ANOVA test was conducted to determine if number of children affected hazard adjustment intentions. Number of children did not have a significant effect on hazard adjustment intentions for the six conditions ($F_{(5, 306)} = 1.37$, *ns*). (5) Education Level: a one-way ANOVA test was conducted to determine if education level affected hazard adjustment intentions. Education level did not have a significant effect on hazard adjustment intentions for the six conditions ($F_{(5, 307)} = .54$, *ns*). (6) Household Income: a one-way ANOVA test was conducted to determine if household income affected hazard adjustment intentions. Household income did not have a significant effect on hazard adjustment intentions for the four conditions ($F_{(3, 301)} = .86$, *ns*).

RQ 3 (*Does previous cancer experience have an effect on firefighter's adjustment intention)*: A one-way ANOVA test was conducted to determine if previous cancer experience affected hazard adjustment intentions. Previous cancer experience did have a significant effect on hazard adjustment intentions ($F_{(2, 311)} = 3.25$, $p < .05$). Table 4 shows that people have higher intention adopting hazard adjustment if their coworkers were diagnosed with cancer.

Table 4: Previous Cancer Experience and Hazard Adjustment Intention

Previous Cancer Experience	Mean	SD	N
Myself	3.55	.83	25
Coworker	3.70	.70	200
None	3.47	.68	89
Total	3.62	.71	214

RQ 4 *(Do fire service and individual demographics have significant correlations with hazard adjustment intentions and actual hazard adjustments?)*: Table 5 shows fire department and individual demographic variables both produced some significant correlations with the hazard adjustment intentions and actual hazard adjustments and the six hazard adjustments. Type of department was negatively correlated with placing contaminate PPE out of the passenger cab (r = -.15, p < .05) and positively coordinated with gross decon (r = .15, p < .05), washing PPE (r = .13, p < .05), showering within an hour (r = .12, p < .05), and workout within 24 hours (r = .17, p < .05). Years in the fire service correlated negatively with workout within 24 hours (r = -.18, p < .05). Rank correlated negatively with Showering within an hour (r = -.13, p < .05) and working out within 24 hours (r = -.24, p < .05) and positively with contaminated PPE out of the passenger cab. Calls for service by the department correlated positively with washing PPE (r = .13, p < .05), showering within an hour (r = .12, p < .05), and workout within 24 hours (r = .14, p < .05) and negatively with contaminated gear out of the compartment (r = -.16, p < .05). Number of fire related calls correlated positively with workout within 24 hours (r = .15, p < .05) and negatively with contaminate PPE out of the passenger cab (r

= -.13, $p < .05$) and wearing SCBA through overhaul ($r = -.17$, $p < .05$). Age correlated positively with PPE out of cab ($r = .18$, $p < .05$) and negatively with workout within 24 hours ($r = -.18$, $p < .05$). Number of children correlated negatively with workout within 24 hours ($r = -.14$, $p < .05$). Lastly, household income correlated positively with washing PPE ($r = .18$, $p < .05$).

Actual completion of adjustments produced a lower amount of significant correlations. Type of department produced negative a correlation with contaminate PPE out of cab ($r = -.11$, $p < .05$) and positive correlations with washing PPE ($r = .14$, $p < .05$) and workout within 24 hours ($r = .15$, $p < .05$). Years in the fire service produced a negative correlation to work out within 24 hours ($r = -.14$, $p < .05$). Rank produced a negative correlation to work out within 24 hours ($r = -.15$, $p < .05$). Calls for service produced a positive correlation to work out within 24 hours ($r = .21$, $p < .05$) and showering within an hour ($r = .12$, $p < .05$). Number of fire related calls produced a positive correlation for work out within 24 hours ($r = .17$, $p < .05$) and a negative correlation for wearing SCBA through overhaul ($r = -.14$, $p < .05$). Age produced a negative correlation for work out within 24 hours ($r = -.15$, $p < .05$). Number of children produced a negative correlation for work out within 24 hours ($r = -.13$, $p < .05$). Lastly, Household income correlated positively to Washing PPE ($r = .20$, $p < .05$).

Table 5:Correlations of Fire Service and Individual Demographic Variables with Hazard Adjustment Intentions and Actual Hazard Adjustments	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
1. Gross Decon	-	**.34**	**.34**	**.28**	.05	**.30**	.09	-.02	-.01	.05	.04	-.01	.02	**-.11**	-.11	.07	.08
2. Contaminated PPE out of cab	**.34**	-	**.18**	**.20**	-.04	**.27**	**-.11**	.09	.11	-.05	-.04	.09	-.01	-.06	-.01	-.07	-.06
3. Washing PPE	**.43**	**.26**	-	**.32**	-.07	**.30**	**.14**	.01	.02	.11	.02	-.02	.08	.02	.02	.08	**.20**
4. Showering within an hour	**.38**	**.24**	**.45**	-	.06	**.22**	.05	-.05	-.03	**.12**	.07	-.02	.06	.09	-.02	.02	.03
5. Workout within 24 hours	**.14**	.07	.08	**.22**	-	.09	**.15**	**-.14**	**-.15**	**.21**	**.17**	**-.15**	.03	-.02	**-.13**	.00	-.04
6. Wearing SCBA through overhaul	**.44**	**.30**	**.37**	**.36**	**.14**	-	.03	.01	.11	-.08	**-.14**	.05	-.06	-.02	.04	.03	-.05
7. Type of department	**.15**	**-.15**	**.13**	**.12**	**.17**	.04	-	-.02	**-.24**	**.65**	**.41**	**-.14**	.04	**.11**	.04	**.16**	**.23**
8. Years in the fire service	-.02	.09	.01	-.09	**-.18**	.05	-.02	-	**.57**	-.06	.01	**.73**	.09	**.23**	**.26**	**.15**	**.43**
9. Rank	-.01	**.15**	-.06	**-.13**	**-.24**	.06	**-.24**	**.57**	-	**-.31**	**-.18**	**.50**	-.05	.06	.05	**.18**	**.22**
10. Calls for service by the department	.04	**-.16**	**.13**	**.12**	**.14**	-.11	**.65**	-.06	**-.31**	-	**.67**	**-.16**	.08	.10	.00	**.18**	**.23**
11. Number of fire related calls	-.07	**-.13**	-.04	.02	**.15**	**-.17**	**.41**	.01	**-.18**	**.67**	-	.00	.08	.05	-.02	.05	.11
12. Age	-.01	**.18**	-.07	-.07	**-.18**	.01	**-.14**	**.73**	**.50**	**-.16**	.00	-	.04	**.24**	**.24**	.08	**.30**
13. Sex	-.02	-.10	-.03	-.02	-.04	-.05	.04	.09	-.05	.08	.08	.04	-	**.20**	**.17**	.06	.10
14. Marital Status	-.02	-.07	.03	.07	-.04	.05	**.11**	**.23**	.06	.10	.05	**.24**	**.20**	-	**.35**	.09	**.35**
15. Number of children	-.01	-.03	-.01	-.04	**-.14**	.07	.04	**.26**	.05	.00	-.02	**.24**	**.17**	**.35**	-	-.02	**.21**
16. Education	.11	.05	.08	.04	.01	.01	**.16**	**.15**	**.18**	**.18**	.05	.08	.06	.09	-.02	-	**.32**
17. Household Income	.06	.00	**.18**	.01	-.09	-.02	**.23**	**.43**	**.22**	**.23**	.11	**.30**	.10	**.35**	**.21**	**.32**	-

Bold correlation is significant at .05 level or less (2-tailed)

The bottom correlations represent intention to complete the protective actions while the top correlations represent the actual completion of the protective actions.

Discussion

Both regression models show strong support for past findings using PMT in that coping appraisal variables were much stronger predictors of both hazard adjustment intentions and actual hazard adjustments than threat appraisal variables were (Floyd et al., 2000). While overall the risk perceptions of the sample were high, similar to other firefighter cancer risk perception studies (Harrison, Yang, et al., 2017), they proved to be poor predictors of hazard adjustment intentions and even poorer predictors of actual hazard adjustments, which is a similar finding to Wu, Greer, Murphy, et al., (2017). Hazard salience also measured high in this study; however, these findings contradict those found in Russell et al., (1995). In the current study, hazard salience was not a significant predictor in adjustment intentions or actual adjustment models. In addition, although individuals had high ratings for many of the activities potential for exposure, the findings suggested that hazard exposure index was not a significant predictor in any of the regression models, which differs from previous research (Jackson, 1981; Lindell & Hwang, 2008; Lindell & Prater, 2000; Perry & Lindell, 2008; Russell et al., 1995). As mentioned in Jackson (1981), this result might be due to the ambiguity of how researchers measuring hazard exposure in different studies.

In this study, response efficacy *(protect me effectively)* was the only variable that significantly predicted both adjustment intentions and actual adjustment of every hazard adjustment. Self-efficacy variables *(require special knowledge or skills and be frowned upon by my peers)* also produced several significant results in both regression models confirming Floyd et al. (2000) claims that response efficacy and self-efficacy appear to be the most important aspects to concentrate on in order to change behavior which also

coincides with previous research (Lindell et al., 2017; Lindell & Whitney, 2000; Wang et al., 2016; Wu, Greer, Murphy, et al., 2017). Another important consideration specific to this study is the use of the new self-efficacy variable that was related to fire service organizational culture *(be frowned upon by my peers)* which proved to be a significant predictor in at least some of the regression models and confirms Maglio et al. (2016) and Harrison, Wendorf Muhamad, et al. (2017) findings that peer pressure can have an effect on taking suggested hazard adjustments, however future research should be conducted to confirm this. This could not only prove a valuable addition to coping appraisal evaluation for the fire service but any type of organization which has strong peer cultures. Lastly the cost variable with the most significant result was *require a lot of effort*. This variable was a significant predictor in all hazard adjustment intention models and half of the actual adjustment models, confirming previous research (Lindell et al., 2017; Wu, Greer, Murphy, et al., 2017). Also *be useful for other purposes* produced significant results in all of the intention models as well as two of the actual adjustment models which also coincides with previous research (Lindell et al., 2017; Wang et al., 2016; Wu, Greer, Murphy, et al., 2017).

The analysis for research questions one, two, and three only produced three significant results. The first and possibly most significant is that career firefighters had a greater intention to complete the suggested hazard adjustment than did volunteer firefighters. This can also be seen in the correlations as well except for *contaminated PPE out of cab,* which is interesting. This could be due to tradition that career firefighters have typically kept their PPE in the cab with them or possibly due to the fact that many volunteers may keep PPE in the trunk or storage spaces of their personal vehicles. Either

way, the importance of this is the need for more training in the volunteer fire service on the implementation of the hazard adjustments and their effectiveness. The second significant result was number of responses. Respondents that reported their organization responded to between 2500-4999 calls annually had the highest intention to complete the hazard adjustment. One possible explanation for this is that these individuals have enough regular exposure to the hazardous activities yet they have enough time at the station not making responses for education and training on the suggested hazard adjustments, however the fact that number of fire responses did not produce significant results may refute that theory. Lastly, previous cancer experience produced significant results for hazard adjustment intention which supports previous research (Lindell & Hwang, 2008; Lindell & Perry, 2012; Lindell & Prater, 2000; Russell et al., 1995; Wu, Greer, Murphy, et al., 2017) but contradicts the regression model in this study. This could possibly be due to the differences in measuring experience or exposure noted earlier (Jackson, 1981). Although fire service leaders are not able to directly control this variable, this finding could support the theory that efforts similar to that of the Boston Fire Department, making education efforts personal by sharing real life cases of cancer victims in the fire service, could be an effective educational tool. The fact that all other fire service and personal demographic variables did not produce significant results which differs from previous research (Brody, 1984; Flynn et al., 1994; Gutteling & Wiegman, 1993) could be due to the narrowness of the sample. Education however producing no significant results was similar to previous findings by Sjöberg (2004).

The correlations of fire service and personal demographics with adjustment intentions and actual adjustments produced several expected results however there were

two that warrant discussion. The first, previously mentioned, was that volunteer firefighters were more likely to place contaminated PPE outside of the cab. This finding was the only significant negative correlation for type of department in both intention and actual adjustment correlations. This could be due to the fact that career firefighters have nowhere on the apparatus to store the PPE or that volunteer firefighters could be storing their PPE in personal vehicle cargo areas. Either way future research should consider storage solutions for career and volunteer firefighters to combat the exposure of contaminated PPE in the cab. The other is in both correlation tables age, rank, and years in the fire service had negative correlations with working out within 24 hours of firefighting activities. This could be due to age and physical ability or a lack of education or belief in the hazard adjustment.

CHAPTER V

Conclusion

Conclusion and Implications

Multiple studies have clearly shown that firefighters are being diagnosed with cancer at higher rates than the general population. This study is an attempt to understand what motivates firefighters to take the suggested hazard adjustments that have been set forth by experts. Unfortunately, even though firefighters are well informed about their increased cancer risk, several studies, including this one, find that firefighters do not always take the suggested hazard adjustment (Harrison, Wendorf Muhamad, et al., 2017). One major finding of this study which coincides with current literature is the importance of response and self-efficacy. Fire service organizations should begin to focus exposure reducing training efforts on the effectiveness of the hazard adjustment, as well as on finding and teaching effective ways individuals can carry them out. One way this could be accomplished is by fire service leaders partnering with the research community and identifying the most effective hazard adjustments, such as cleaning PPE and determine the most effective and efficient method of completing this hazard adjustment. The risk perception results of this study confirms along with Harrison, Yang, et al. (2017) that firefighters are well informed at the awareness level of their cancer risk. However, care

must be taken to not create the culture of fatalism discussed by Harrison, Yang, et al. (2017) which can be caused by an oversaturation of awareness and a lack of hazard adjustments, in other words if firefighters perceive they are going to get cancer no matter when there will be a tendency to not complete the hazard adjustments. Previous studies have clearly shown that firefighters have expressed the view that many risks they face are just inherent risks of doing their job and are unpreventable. The fire service, as a whole must collaborate with researchers in order to discover, through field research, the most effective means of reducing exposure to carcinogens, as well as the most efficient means of completing these activities. Once these have been identified the data needs to be presented to firefighters in a way that will increase response and self-efficacy. For instance by researchers and experts explaining the findings in layman's terms similar to how Underwriters Laboratories and National Institute for Occupational Safety and Health have done in recent fire behavior and fire attack research. To date educational programs have offered little in the way of explanation when compared to other protective measures such as hazardous materials decontamination procedures. The time has come for educational programs to become a much more formal effort possibly even certification level programs similar to technical rescue or hazardous materials response.

Another major finding in this study that coincides with previous research on the topic is the importance of peer perception and pressure. As mentioned earlier the fire service is ripe with traditions but these traditions and the traditional view of what makes a good firefighter can stand in the way of safety. As noted by Harrison, Wendorf Muhamad, et al. (2017) and Maglio et al. (2016) and confirmed in this study, the perception of what a firefighter's peer feels about a hazard adjustment can have an effect

on the intention and decision to complete the adjustment. This is one of the first applications of PMT to firefighters as well as the first inclusion of a peer perception variable into PMT studies. Peer perception could prove to be an important addition to PMT when applying it to cases where protective actions could be influenced by peer perceptions but further study will be required to confirm this. These findings also highlight the importance for fire service administrators and officers to create a cultural norm of safety. These hazard adjustments should be something that takes place at every incident that has the potential for exposure and should be mandated by incident commanders and company officers. Chief officers and administrators should ensure that formal training programs as well as policies and procedures are in place so they may be enforced by line officers. The changes necessary to convince firefighters to always take hazard adjustments is not going take place overnight, however changes such as tailboard riding, seatbelts, and wearing SCBA did not either, but these changes have saved firefighters lives. In conclusion, fire service leaders should use the results of this and other studies to continue evolving firefighter safety and health initiatives to further protect the future of the fire service.

Limitations

The sample was firefighters that had previously attended or are in some way affiliated with the AFC. As with any self-reporting study one limitation is accurate reporting. Although everyone that responded was informed that the study was for firefighters only, one cannot know for sure if that were the case. Another limitation to this study was the narrowness of the sample. A large majority of the sample was male career firefighters with 21 or more years of experience in the fire service. Future studies

should seek to equalize the sample by obtaining more female and volunteer firefighter participants. Future studies may benefit from attempting to oversample to achieve a more diversified sample.

REFERENCES

Anderson, D. A., Harrison, T. R., Yang, F., Wendorf Muhamad, J., & Morgan, S. E. (2017). Firefighter perceptions of cancer risk: Results of a qualitative study. *American journal of industrial medicine, 60*(7), 644-650.

Breakwell, G. M. (2014). *The psychology of risk*: Cambridge University Press.

Brody, C. J. (1984). Differences by sex in support for nuclear power. *Social forces, 63*(1), 209-228.

Chauncey, S. (1969). Social Benefit versus Technological Risk. *Science, 165*(3899), 1232-1238.

Daniels, R. D., Kubale, T. L., Yiin, J. H., Dahm, M. M., Hales, T. R., Baris, D., Pinkerton, L. E. (2014). Mortality and cancer incidence in a pooled cohort of US firefighters from San Francisco, Chicago and Philadelphia (1950–2009). *Occup Environ Med, 71*(6), 388-397.

DataUSA. (2015, Dec, 5). Firefighters. Retrieved from https://datausa.io/profile/soc/332011/#demographics

De Lisi, S. M. (2005). Organizational culture in the fire service. *Fire Engineering, 158*(8), 119.

Dillman, D. A. (2011). *Mail and Internet surveys: The tailored design method--2007 Update with new Internet, visual, and mixed-mode guide*: John Wiley & Sons.

Dooley, D., Catalano, R., Mishra, S., & Serxner, S. (1992). Earthquake preparedness: Predictors in a community survey. *Journal of applied social psychology, 22*(6), 451-470.

Fent, K. W., Evans, D. E., Booher, D., Pleil, J. D., Stiegel, M. A., Horn, G. P., & Dalton, J. (2015). Volatile organic compounds off-gassing from firefighters' personal protective equipment ensembles after use. *Journal of occupational and environmental hygiene*, *12*(6), 404-414.

Finucane, M. L., Slovic, P., Mertz, C. K., Flynn, J., & Satterfield, T. A. (2000). Gender, race, and perceived risk: the 'white male' effect. *Health, Risk & Society, 2*(2), 159-172. doi:10.1080/13698570050077390

Firefighter Cancer Support Network. (2013, Sep, 8). Taking action against cancer in the fire service. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0ahUKEwiazYqstr7XAhWo44MKHQvvDEMQFggoMAA&url=https%3A%2F%2Ffirefightercancersupport.org%2Fwp-content%2Fuploads%2F2013%2F08%2FTaking-Action-against-Cancer-in-the-Fire-Service.pdf&usg=AOvVaw0JCUne8gr5Ddu1FUMG_R4d

Fischhoff, B., Slovic, P., Lichtenstein, S., Read, S., & Combs, B. (1978). How safe is safe enough? A psychometric study of attitudes towards technological risks and benefits. *Policy sciences*, *9*(2), 127-152.

Floyd, D. L., Prentice-Dunn, S., & Rogers, R. W. (2000). A meta-analysis of research on protection motivation theory. *Journal of applied social psychology, 30*(2), 407-429.

Flynn, J., Slovic, P., & Mertz, C. K. (1994). Gender, race, and perception of environmental health risks. *Risk analysis*, *14*(6), 1101-1108.

Gustafsod, P. E. (1998). Gender Differences in risk perception: Theoretical and methodological erspectives. *Risk analysis, 18*(6), 805-811.

Gutteling, J. M., & Wiegman, O. (1993). Gender-specific reactions to environmental hazards in the Netherlands. *Sex roles, 28*(7), 433-447.

Harrison, T. R., Wendorf Muhamad, J., Yang, F., Morgan, S. E., Talavera, E., Caban-Martinez, A., & Kobetz, E. (2017). Firefighter attitudes, norms, beliefs, barriers, and behaviors toward post-fire decontamination processes in an era of increased cancer risk. *Journal of occupational and environmental hygiene*(just-accepted), 00-00.

Harrison, T. R., Yang, F., Anderson, D., Morgan, S. E., Wendorf Muhamad, J., Talavera, E., Kobetz, E. (2017). Resilience, culture change, and cancer risk reduction in a fire rescue organization: Clean gear as the new badge of honor. *Journal of Contingencies and Crisis Management, 25*(3), 171-181.

Hermansson, H. (2012). Defending the conception of "Objective Risk". *Risk analysis, 32*(1), 16-24.

Honkasalo, A. (1992). Finnish divers' view of occupational risks and risk taking. *Applied ergonomics, 23*(3), 202-206.

Huang, S.-K., Lindell, M. K., & Prater, C. S. (2016). Who leaves and who stays? A review and statistical meta-analysis of hurricane evacuation studies. *Environment and Behavior, 48*(8), 991-1029.

Jackson, E. L. (1981). Response to earthquake hazard: The west coast of North America. *Environment and Behavior, 13*(4), 387-416.

Jahnke, S. A., Poston, W. S., Jitnarin, N., & Haddock, C. K. (2012). Health concerns of the US fire service: perspectives from the firehouse. *American Journal of Health Promotion, 27*(2), 111-118.

Leiter, M. P., Zanaletti, W., & Argentero, P. (2009). Occupational risk perception, safety training, and injury prevention: Testing a model in the Italian printing industry. *Journal of occupational health psychology, 14*(1), 1.

LeMasters, G. K., Genaidy, A. M., Succop, P., Deddens, J., Sobeih, T., Barriera-Viruet, H., Lockey, J. (2006). Cancer risk among firefighters: a review and meta-analysis of 32 studies. *Journal of occupational and environmental medicine, 48*(11), 1189-1202.

Lindell, M. K., & Hwang, S. N. (2008). Households' perceived personal risk and responses in a multihazard environment. *Risk analysis, 28*(2), 539-556.

Lindell, M. K., Mumpower, J. L., Huang, S.-K., Wu, H.-C., Samuelson, C. D., & Wei, H.-L. (2017). Perceptions of protective actions for a water contamination emergency. *Journal of Risk Research, 20*(7), 887-908.

Lindell, M. K., & Perry, R. W. (2012). The protective action decision model: theoretical modifications and additional evidence. *Risk analysis, 32*(4), 616-632.

Lindell, M. K., & Prater, C. S. (2000). Household adoption of seismic hazard adjustments: A comparison of residents in two states. *International Journal of Mass Emergencies and Disasters, 18*(2), 317-338.

Lindell, M. K., & Whitney, D. J. (2000). Correlates of household seismic hazard adjustment adoption. *Risk analysis, 20*(1), 13-26.

Ma, F., Fleming, L. E., Lee, D. J., Trapido, E., & Gerace, T. A. (2006). Cancer incidence in Florida professional firefighters, 1981 to 1999. *Journal of occupational and environmental medicine, 48*(9), 883-888.

Maddux, J. E., & Rogers, R. W. (1983). Protection motivation and self-efficacy: A revised theory of fear appeals and attitude change. *Journal of experimental social psychology, 19*(5), 469-479.

Maglio, M. A., Scott, C., Davis, A. L., Allen, J., & Taylor, J. A. (2016). Situational pressures that influence firefighters' decision making about personal protective equipment: A qualitative analysis. *American journal of health behavior, 40*(5), 555-567.

Mullen, J. (2004). Investigating factors that influence individual safety behavior at work. *Journal of safety research, 35*(3), 275-285.

National Fallen Firefighters Foundation. (2015, Dec, 5). Occupational Cancer in the Fire Service. Retrieved from https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&cad=rja&uact=8&ved=0ahUKEwi-5PvvrezVAhXCPCYKHV7NCm0QFggoMAA&url=http%3A%2F%2Fwww.everyonegoeshome.com%2Fwp-content%2Fuploads%2Fsites%2F2%2F2016%2F03%2FCancer-Alliance-January-2015.pdf&usg=AFQjCNHDWQ0uQjcplisV_xJ-k2RLDIa5CQ

Norman, P., Boer, H., & Seydel, E. R. (2005). Protection motivation theory.

O'Brien, P. W., & Mileti, D. S. (1992). Citizen participation in emergency response following the Loma Prieta earthquake. *International Journal of Mass Emergencies and Disasters, 10*(1), 71-89.

Perry, R. W., & Lindell, M. K. (2008). Volcanic risk perception and adjustment in a multi-hazard environment. *Journal of Volcanology and Geothermal Research, 172*(3-4), 170-178.

Pessemier, W. (2008). Developing a safety culture in the fire service. *INTERNATIONAL FIRE SERVICE*, 7.

Pidgeon, N. (1998). Risk assessment, risk values and the social science programme: why we do need risk perception research. *Reliability Engineering & System Safety, 59*(1), 5-15. doi:https://doi.org/10.1016/S0951-8320(97)00114-2

Pukkala, E., Martinsen, J. I., Weiderpass, E., Kjaerheim, K., Lynge, E., Tryggvadottir, L., Demers, P. A. (2014). Cancer incidence among firefighters: 45 years of follow-up in five Nordic countries. *Occup Environ Med, 71*(6), 398-404.

Rodríguez-Garzón, I., Martínez-Fiestas, M., Delgado-Padial, A., & Lucas-Ruiz, V. (2016). Perception of occupational risk of firefighters in Quito (Ecuador). *Fire Technology, 52*(3), 753-773.

Rogers, R. W. (1975). A protection motivation theory of fear appeals and attitude change1. *The journal of psychology, 91*(1), 93-114.

Rogers, R. W. (1983). Cognitive and psychological processes in fear appeals and attitude change: A revised theory of protection motivation. *Social psychophysiology: A sourcebook*, 153-176.

Russell, L. A., Goltz, J. D., & Bourque, L. B. (1995). Preparedness and hazard mitigation actions before and after two earthquakes. *Environment and Behavior, 27*(6), 744-770.

Sanne, J. M. (2008). Framing risks in a safety-critical and hazardous job: risk-taking as responsibility in railway maintenance. *Journal of Risk Research, 11*(5), 645-658.

Sjoberg, L. (1999). Consequences of perceived risk: Demand for mitigation. *Journal of Risk Research, 2*(2), 129-149. doi:10.1080/136698799376899

Sjöberg, L. (2004). Explaining individual risk perception: the case of nuclear waste. *Risk Management, 6*(1), 51-64.

Slovic, P. (1992). Perception of risk: Reflections on the psychometric paradigm.

Wang, F., Wei, J., Huang, S.-K., Lindell, M. K., Ge, Y., & Wei, H.-L. (2016). Public reactions to the 2013 Chinese H7N9 Influenza outbreak: perceptions of risk, stakeholders, and protective actions. *Journal of Risk Research,* 1-25.

Wildavsky, A., & Dake, K. (1990). Theories of risk perception: Who fears what and why? *Daedalus*, 41-60.

Wu, H.-C., Greer, A., & Murphy, H. (2017). Perceived Stakeholders' Trustworthiness of Earthquake Information: A Case of Induced Seismic Activities in Oklahoma. In *Taiwan Urban and Regional Planning Conference*. Taipei, Taiwan.

Wu, H.-C., Greer, A., Murphy, H. C., & Chang, R. (2017). Preparing for the new normal: Students and earthquake hazard adjustments in Oklahoma. *International journal of disaster risk reduction, 25*, 312-323.

Zare Sakhvidi, M. J., Mirzaei Aliabadi, M., Sakhvidi, F. Z., Halvani, G., Morowatisharifabad, M. A., Tezerjani, H. D., & Firoozichahak, A. (2014).

Occupational cancer risk perception in Iranian workers. *Archives of environmental & occupational health, 69*(3), 167-171.

APPENDICES

First, we would like to ask you a few questions about firefighting occupational cancer issues.

1. Have you been informed about increased risk of cancer to firefighters through any of the following (Please mark all that apply)?

Trade Journals	Your department administration	IAFF
Textbooks	Coworkers	IAFC
Alabama Fire College	Information from other departments	NFFF
Other (Please Specify_____)		

2. Do you think your supervisors are properly informed about occupational cancer risks you may face?

Nothing known				Know precisely
1	2	3	4	5

3. How often do you think about occupational cancer risk?

Daily	Weekly	Monthly	Yearly	Never
1	2	3	4	5

4. How concerned are you about being diagnosed with cancer?

Not concerned				Extremely concerned
1	2	3	4	5

5. What do you think is the likelihood you would be diagnosed with cancer?

Not likely				Extremely likely
1	2	3	4	5

6. Please rate the following firefighting job aspects with regard for their potential to expose you to cancer causing carcinogens?

a. Interior Structural Firefighting

No exposure				Extreme exposure
1	2	3	4	5

b. Exterior Structural Firefighting

No exposure				Extreme exposure
1	2	3	4	5

c. Hazardous Materials Mitigation

No exposure				Extreme exposure
1	2	3	4	5

d. Extinguishing Vehicle Fires

No exposure				Extreme exposure
1	2	3	4	5

e. Wildland Firefighting

No exposure				Extreme exposure
1	2	3	4	5

This next section asks you to report your adoption of activities that could lessen the risk of occupational cancer.

7. Do you take any of the following actions to reduce the risk of occupational cancer after firefighting activities?

a. Gross decontamination after firefighting activities including washing the neck and face areas with wipes

Always	Sometimes	Never
1	2	3

b. Place contaminated personal protective equipment in compartments separate from the personnel cab

Always	Sometimes	Never
1	2	3

c. Wash your personal protective equipment after a fire

Always	Sometimes	Never
1	2	3

d. Shower within an hour after firefighting activities

Always	Sometimes	Never
1	2	3

e. Workout within 24 hours of firefighting activities

Always	Sometimes	Never
1	2	3

f. Wear self-contained breathing apparatus until the completion of overhaul activities

Always	Sometimes	Never
1	2	3

Now, we would like to know what you think about each of the activities listed above

8. Gross decontamination after firefighting activities including washing the neck and face areas with wipes would…

	Not at all				To a great extent
a. protect me very effectively……..	1	2	3	4	5
b. cost a lot of money……..….	1	2	3	4	5
c. require specialized knowledge and skills……	1	2	3	4	5
d. require a lot of effort……...	1	2	3	4	5
e. also be useful for purposes other than preventing occupational cancer….	1	2	3	4	5
f. be something I am likely to do…….....	1	2	3	4	5
g. be frowned upon by my peers……..	1	2	3	4	5

9. Placing contaminated personal protective equipment in compartments separate from the personnel cab would….

	Not at all				To a great extent
a. protect me very effectively……..	1	2	3	4	5
b. cost a lot of money……..….	1	2	3	4	5
c. require specialized knowledge and skills……	1	2	3	4	5
d. require a lot of effort……...	1	2	3	4	5
e. also be useful for purposes other than preventing occupational cancer….	1	2	3	4	5
f. be something I am likely to do…….....	1	2	3	4	5
g. be frowned upon by my peers……..	1	2	3	4	5

10. Washing your personal protective equipment after a fire would….

	Not at all				To a great extent
a. protect me very effectively……..	1	2	3	4	5
b. cost a lot of money……..….	1	2	3	4	5
c. require specialized knowledge and skills……	1	2	3	4	5
d. require a lot of effort……...	1	2	3	4	5
e. also be useful for purposes other than preventing occupational cancer….	1	2	3	4	5
f. be something I am likely to do…….....	1	2	3	4	5
g. be frowned upon by my peers……..	1	2	3	4	5

11. Showering within an hour after firefighting activities would…

	Not at all				To a great extent
a. protect me very effectively……..	1	2	3	4	5
b. cost a lot of money…….	1	2	3	4	5
c. require specialized knowledge and skills……	1	2	3	4	5
d. require a lot of effort……...	1	2	3	4	5
e. also be useful for purposes other than preventing occupational cancer….	1	2	3	4	5
f. be something I am likely to do……...	1	2	3	4	5
g. be frowned upon by my peers……..	1	2	3	4	5

12. Working out within 24 hours of firefighting activities would…

	Not at all				To a great extent
a. protect me very effectively……..	1	2	3	4	5
b. cost a lot of money…….	1	2	3	4	5
c. require specialized knowledge and skills……	1	2	3	4	5
d. require a lot of effort……...	1	2	3	4	5
e. also be useful for purposes other than preventing occupational cancer….	1	2	3	4	5
f. be something I am likely to do……...	1	2	3	4	5
g. be frowned upon by my peers……..	1	2	3	4	5

13. Wearing self-contained breathing apparatus until the completion of overhaul activities would…

	Not at all				To a great extent
a. protect me very effectively……..	1	2	3	4	5
b. cost a lot of money…….	1	2	3	4	5
c. require specialized knowledge and skills……	1	2	3	4	5
d. require a lot of effort……...	1	2	3	4	5
e. also be useful for purposes other than preventing occupational cancer….	1	2	3	4	5
f. be something I am likely to do……...	1	2	3	4	5
g. be frowned upon by my peers……..	1	2	3	4	5

14. If you were diagnosed with cancer what do you think the likelihood is of it being caused by participating in firefighting activities 0 % (not caused by firefighting activities) 100 % (absolutely caused by firefighting activity exposure)? _____

15. Have you or any of your fellow firefighters ever been diagnosed with cancer?
- o Myself
- o Coworker
- o None

16. What type of fire department are you affiliated with?
- o Career
- o Volunteer

17. How many years have you been in the fire service?
- o 0-5
- o 6-10
- o 11-15
- o 16-20
- o 21 or more

18. What is your current rank?
- o Firefighter
- o Apparatus Operator
- o Lieutenant
- o Captain

- Battalion Chief
- Chief Officer

19. Approximately how many calls for service does your department respond to annually?
    - 0-499
    - 500-1499
    - 1500-2499
    - 2500-4999
    - 5000 or more

20. Approximately how many fire related calls (structure, dumpster, vehicle, wildland) does your department respond to annually?
    - 0-49
    - 50-99
    - 100-149
    - 150-199
    - 200 or more

21. What is your age?
    - 18-24
    - 25-34
    - 35-44
    - 45-54
    - 55 and up

22. What is your sex?
    - Male
    - Female

23. What is your marital status?
    - Married
    - Divorced
    - Single
    - Widowed

24. Number of children you have
    - 0
    - 1
    - 2
    - 3
    - 4
    - 5
    - 6 or more

25. Highest level of education?
    - GED
    - High school diploma
    - Some college
    - Associates degree
    - Bachelor's degree
    - Graduate school

26. What is your household income?

- 0-24,999
- 25,000-49,999
- 50,000-74,999
- 75,000- or more

Do you have any further comments you would like to make?

_____

VITA

Benjamin Caffee

Candidate for the Degree of

Master of Science

Thesis: FIREFIGHTER OCCUPATIONAL CANCER RISK PERCEPTION

Major Field: Fire and Emergency Management Administration

Biographical:

Education:

Completed the requirements for the Master of Science in Fire and Emergency Management at Oklahoma State University, Stillwater, Oklahoma in May, 2018.

Completed the requirements for the Bachelor of Science Fire Administration Columbia Southern University, Orange Beach, Alabama in 2015

Experience:

Fire Lieutenant Gardendale Fire Department
Instructor Alabama Fire College

Professional Memberships:

International Association of Firefighters