

WELL-BEING AND READINESS TO CHANGE AMONG CAREER FIREFIGHTERS

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A Thesis

Presented to

the Faculty of the College of Science

Morehead State University

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In Partial Fulfillment

of the Requirements for the Degree

Master of Arts

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by

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## WELL-BEING AND READINESS TO CHANGE AMONG CAREER FIREFIGHTERS

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Low fitness levels and obesity among firefighters have become growing problems in the United States. Firefighters need to be in good physical and mental shape to successfully perform in their job. While there are many physical issues that can arise for firefighters due to their extended-duration shifts, physical demands, and sleep deprivation, there are also issues in mental health due to on-the-job stressors such as horrific images from calls in which they respond. Therefore, it is important to look at wellness in a holistic way when it comes to first responders, in this case specifically firefighters. Assessing readiness for change among the areas of wellness and well-being can assist health educators in guiding the design of interventions to overcome wellness deficiencies. The purpose of the study was to assess the sense of well-being and readiness to change among career firefighters. A link to an online survey created in Google Forms was sent via email from the Chief of Health and Safety to the firefighters. Approval was

received for subjects to participate in this study and approval for the study was obtained from Institutional Review Board at Morehead State University. Questions on the survey covered topics such as general demographics, physical activity, nutrition, stress, and sleep. IBM SPSS 24 was used to analyze the data from participants responses to the survey by analysis of variance (ANOVA), chi-square, frequency, and descriptive statistical tests. Statistical findings suggest that careers firefighters are a rather homogenous group in regards to demographics. The average BMI for the group was 30.84 kg/m<sup>2</sup> placing them in the Class I Obesity category. Relationship status played a significant role in mental health among firefighters as those who were married felt depressed less often and felt they were better able to cope and handle life stressors. Results also suggested that sleep played a role in mental health as those who reported greater quantity and quality of sleep reported being less stressed, anxious, or depressed. The majority of participants were in the preparation stage or higher on the Transtheoretical Model for physical activity and nutrition which means they at least identified with the need to change. Findings from the survey suggest that majority of participants were interested in their well-being, but there were still areas that had room for improvement.

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## **Chapter 1: Introduction**

Firefighting is a very physical career and can lead to potential physically strenuous or dangerous situations. In the United States we rely on firefighters every day, not only to respond to fires, but to respond to car accidents, entrapments, and hazardous spills as well. Firefighters need to be in good physical and mental condition to be able to do their job. The National Fire Protection Association (NFPA) is global nonprofit organization that is devoted to eliminating death, injury, property, and economic loss due to fire, electrical, and related hazards (NFPA, 2018a). The most updated numbers from the NFPA in 2015 (NFPA, 2017) revealed that there were 1,160,450 local firefighters in the United States. Of those firefighters, 345,600 or 30% were career firefighters and 814,850 or 70% were volunteer firefighters. There were 29,727 fire departments responsible for protecting the United States in 2015. A total of 2,651 of those 29,727 departments were comprised of all career firefighters. Approximately 50.7% of firefighters were between 30 to 49 years old. Out of the total 1,160,450 firefighters, only 85,100 or 7.3% were female. Based on the 345,600 career firefighters, only 12,850 or 3.7% were female (NFPA, 2017).

Fire departments have a set of eligibility requirements for all of their applicants. In Lexington, Kentucky, these requirements include applicants must be at least 19 years of age by the close of the application date, but cannot be 35 years of age by the closing date. They must possess a high school diploma or equivalent and must be eligible to obtain certification as an emergency medical technician (EMT) and paramedic. Applicants must have a clean work history and driving record. Their criminal record will be obtained and they must be able to pass a drug test. Applicants must display “excellent moral character with respect to sobriety, honesty,

maturity, loyalty, trustworthiness, reliability, discretion, and associates” and must also undergo a polygraph examination, medical examination, psychological examination, and physical agility testing in order to be eligible for hire (Lexington-Fayette Urban County Government, 2018).

Unfortunately, low fitness levels and obesity among firefighters have become growing problems in the United States (Poston et al., 2011; Soteriades, Smith, Tsismenakis, Baur, & Kales, 2011). Even though fitness levels have become a problem, the National Fire Protection Association only mandates that weight and body composition are measured annually and an annual fitness evaluation should be conducted as part of an individualized program (NFPA, 2018b) as there is no mandatory fitness test once hired. Not only may firefighters suffer from chronic illness due to poor physical fitness levels (Soteriades et al., 2011), but they also may suffer from higher levels of mental and emotional distress due to the images of horrific calls to which they may respond (Pignataro, 2013). Because of the physical and psychological stress, it is important to look at wellness in a holistic way when it comes to first responders, in this case firefighters. Assessing readiness for change among the areas of wellness and sense of well-being can assist health educators in guiding the design of interventions to overcome wellness deficiencies.

Heart attacks and motor vehicle collisions are the leading causes of death among firefighters in the United States. According to the United States Fire Administration (2017), 89 firefighters died while on duty in 2016. Out of those 89 firefighters, 43 died due to stress or overexertion. Furthermore, 39 firefighters died due to heart attacks and four died due to strokes. The 10-year average percent of fatalities caused by stress or overexertion was 54.6%, more than half of total deaths. Vehicle crashes accounted for the next highest number of on-duty firefighter

deaths with 19 deaths. One firefighter took his life in 2016 (U.S. Fire Administration, 2017).

Sleep is an important factor that can play a role in both stress-related health issues as well as motor vehicle collisions. Due to the hectic schedule of firefighters, sleep disorders are often seen in this population and therefore should also be considered when looking at the well-being of firefighters (Barger, 2016).

Research has been conducted on the health status of firefighters in general and has shown firefighters face increased health risks, but it is also important to know how firefighters view their own health status. The purpose of this study was to identify the sense of well-being and readiness to change among career firefighters. This study assessed multiple areas of wellness including physical activity, nutrition, stress, anxiety, depression, and sleep.

### **Operational Definitions**

Body Mass Index (BMI): A measure relating height and weight; reported as kg/m<sup>2</sup>. BMI is separated into the categories of underweight, normal weight, overweight, and obese.

Overweight: BMI ranging from 25.0 kg/m<sup>2</sup> to 29.9 kg/m<sup>2</sup>.

Class I Obesity: BMI 30 kg/m<sup>2</sup> to 34.9 kg/m<sup>2</sup>.

Class II Obesity: BMI 35 kg/m<sup>2</sup> to 39.9 kg/m<sup>2</sup>.

Class III Obesity: BMI  $\geq$  40 kg/m<sup>2</sup>.

Career Firefighter: A sworn firefighter whose full-time job is a firefighter for the department. The term firefighter in this study refers to sworn firefighters who work in a combined metro and rural fire department, but are not considered wildland firefighters who primarily fight wildfires.

Wellness and Well-being: Wellness often refers to the physical state of health, while well-being refers to the state of being happy and healthy. For this study they were used interchangeably.

### **Delimitations/Limitations/Assumptions**

Delimitations included that the study sample only came from one fire department in Kentucky as well as only male participants were included for statistical analysis. Another delimitation was that the created wellness survey only asked a few questions about four main topics; physical activity, nutrition, sleep, and mental health. There was homogeneity of subjects would could have acted as a limitation. The fact that many career firefighters also have a second job, due to their schedules of working for 24 hours and then being off for 48 hours, could act as a limitation. It was not asked if the participants had a second job, nor was there a way to control for the physical activity performed during the second job. Other limitations included a sample size of less than 25% of total potential participants and that data was self-reported which could have lead to self-report bias. Assumptions included that all participants truthfully responded to the questions on the survey and did not feel pressured to answer any question in any specific way.

## **Chapter 2: Literature Review**

The overall health picture of an American firefighter is not necessarily what most would imagine. While Americans rely on these brave men and women each and every day, firefighters as a whole tend to suffer from higher rates of obesity, cardiovascular disease, and substandard fitness as compared to the general population (Poston et al., 2011). Even though firefighters face increased health risks, their fitness and health status may be the most important factors to

ensuring they are able to perform their job safely. Among 41 male occupations in the United States, firefighters are ranked third in obesity prevalence according to the 1997-2002 National Health Interview Surveys (NHISs). Firefighters hold this ranking despite the fact that they are also marked as one of the most active occupation groups and met the recommended goal leisure-time physical activity set by Healthy People 2010 (Choi et al., 2011). Analytical measures revealed five main themes of importance to firefighters in relation to obesity. These themes include fire station eating culture, night calls and sleep interruption, supervisor leadership and physical fitness, sedentary work, and finally age and generational influences (Dobson et al., 2013).

Several studies have noted the prevalence of overweight and obesity among firefighters to be 73% to 88% (Poston et al., 2011; Poston, Jitnarin, Haddock, Jahnke, & Tuley, 2012). Compare that to the 70.7% of the general U.S. population aged 20 and over who fall into the overweight or obese categories according to the CDC, and firefighters appear to be more likely than the rest of Americans to be overweight or obese (CDC, 2017). Other studies have noted that the general adult population in the United States gains on average 0.2 to 0.8kg per year, whereas firefighters have been shown to gain between 0.52 kg and 1.55 kg per year (Poston et al., 2012). A study conducted by Poston et al. (2012) looked into the impact of a health surveillance assessment on participant behavior and body composition. Researchers found that firefighters who reported not making any health changes experienced an average weight gain of  $0.64\text{kg} \pm 3.1\text{kg}$  over a nine month period as compared to those who reported trying to lose weight or having the intention to lose weight. Those who were trying to lose weight or had the intention of losing weight, ended up with an average weight gain of 1.6kg in the nine month period.

Firefighters who actually implemented healthier changes to try and lose weight lost an average of 1.3kg over the nine month period. Differences among the groups were found to be statistically significant based on  $\alpha = .05$ . Analysis showed that those who reported making changes in response to the results from their baseline assessment were significantly associated with weight change (Poston et al., 2012). The overall picture of a firefighter's work structure could influence this increased risk of obesity due to non-traditional work schedules including 10 or more 24-hr workdays per month, frequent nighttime emergency calls causing sleep disruptions, and the close-knit aspect of the firehouse with sharing meals, training, and participating in physical activity together (Dobson et al., 2013).

Another health aspect in which firefighters tend to struggle with is cardiovascular disease (CVD) risk. Cardiovascular disease has been the leading cause of firefighter line-of-duty deaths accounting for about 45% of all on-duty deaths (Poston et al., 2011; Soteriades et al., 2011). This on-duty mortality due to CVD is higher than that of other professions including police officers at 22%, other emergency medical service providers at 11%, and 15% for all occupations (Poston et al., 2011). Of these fatalities related to CVD, about 90% of them are caused by coronary heart disease (CHD). Also, for every on-duty fatal event related to heart disease, it is estimated that another 17 nonfatal line-of-duty cardiovascular events occur in the US fire service (Soteriades et al., 2011). Firefighters are exposed to numerous strenuous situations which can trigger cardiovascular events, especially in those with underlying disease. Fire suppression, which is considered mitigating and extinguishing fires, is only representative of approximately 1% to 5% of annual professional time among firefighters, but has been shown to account for

more than 30% of on-duty CHD deaths. In other words, fire suppression has a relative risk of 10 to 100 times higher than nonemergency duties (Soteriades et al., 2011).

Another aspect of CVD risk includes hypertension. The Joint National Committee (JNC) is a regulatory body on the management of hypertension and according to Soteriades et al. (2011) the NFPA and other jurisdictions have suggested that for active duty, blood pressure up to 160 to 180/100 is acceptable (Soteriades et al., 2011). A scheme was developed for evaluating and managing emergency responders' blood pressure within the JNC framework (Soteriades et al., 2011; Kales et al., 2009). For firefighters with normal blood pressure ( $< 120/80$  mm Hg) it is recommended they be on unrestricted duty, participate in population-based wellness programs, and should follow up in 12-24 months based on their overall CVD risk profile. Firefighters who have pre-hypertension, systolic blood pressure of 120-139 mm Hg or diastolic 80-89 mm Hg, should be on unrestricted duty, participate in population-based wellness programs and individual education, and should follow up in 6-12 months based on overall CVD risk profile. For those firefighters whose blood pressure falls within the stage 1 hypertension category, systolic 140-150 mm Hg or diastolic 90-99 mm Hg, should be placed on time-limited clearance for duty, participate in population-based wellness program, individual education, and hypertension treatment and evaluation with follow-up of time based clearance within 6-12 months based on overall CVD risk profile. Controlled blood pressure should be expected at follow-up and if control improves, annual follow-up is again recommended. Finally, those firefighters whose blood pressure falls into stage 2 hypertension, pressure greater than or equal to 160/100 mm Hg, should be placed on restricted to modified duty until blood pressure reaches stage 1 or lower. This excludes participating in physical exertion related duties. It is also recommended that these

firefighters participate in population-based wellness programs, individual education, and clinical management of hypertension and evaluations for end-organ damage including an echocardiogram. Follow-up includes time-limited clearance after adequate blood pressure control and entails the steps for stage 1 follow-up (Soteriades et al., 2011; Kales et al., 2009).

It is important to note that guidelines for hypertension have recently changed. According to the American Heart Association (2017), current blood pressure categories for the general population are more restrictive compared to previous guidelines. Normal blood pressure is defined as systolic of  $<120$  mm Hg and diastolic of  $<80$  mm Hg. Elevated blood pressure is defined as systolic of 120-129 mm Hg and diastolic of  $<80$  mm Hg. High blood pressure (hypertension) stage 1 is systolic blood pressure of 130-139 mm Hg or diastolic of 80-89 mm Hg. High blood pressure (hypertension) stage 2 is defined as systolic pressure of  $\geq 140$  mm Hg or diastolic of  $\geq 90$  mm Hg. Lastly, a hypertensive crisis is considered systolic blood pressure higher than 180 mm Hg and/or diastolic pressure of greater than 120 mm Hg. If blood pressure falls into the hypertensive crisis category, a doctor should be consulted immediately (American Heart Association, 2017).

Another aspect in the picture of health of firefighters is sleep deprivation. As previously noted, according to the United States Fire Administration, the top two causes of on-duty firefighter deaths are stress or overexertion, which lead to heart attacks and strokes, and vehicle crashes. Majority of firefighters work 24-hour extended-duration shifts. These shifts can cause acute sleep deprivation, chronic sleep deficiency, and circadian misalignment. This loss of sleep can be a major concern with firefighters as more than half of them report sleep disturbances. Many additional firefighters suffer from sleep disorders that have not been diagnosed. These

sleep disorders and lack of quality sleep hours are associated with increased risk of crashes, injuries, and adverse mental and physical health outcomes which can include increased risk of vehicle crashes and heart attacks (Barger et al., 2016). The increased risks for vehicle crashes and heart attacks are associated with the top two causes of on-duty firefighter deaths.

Something else to consider in regards to sleep adequacy and quality of sleep is the sleeping quarters that most firefighters are provided. The close proximity of the provided sleep quarters can affect the firefighters' sleep quality as their coworkers sleep can impact others (Barger et al., 2016). For example, if one firefighter is snoring in a common sleeping area, other firefighters may have difficulty getting adequate, quality sleep.

Firefighters also deal with great amounts of stress and trauma from horrific scenes they experience such as children who have died due to abuse or trauma, bodies that are unrecognizable due to being mangled from car accidents, charred victims they could not get to in time, or even one of their own who may have been severely injured or killed. Firefighters share a unique bond and become a family due to their extended shifts, living accommodations at the firehouse, and sights they experience. Several studies have found factors that place firefighters at increased risk for Post-Traumatic Stress Disorder (PTSD) (Pignataro, 2013; Kales, Tsismenakis, Zhang, & Soteriades, 2009). These factors include joining the fire service at a young age, being unmarried, having a supervisory rank within the department, feeling little control over one's life, and most importantly experiencing a stressful event following a traumatic event (Pignataro, 2013). Not only are these firefighters dealing with major stressors on the job, but outside stressors such as relationships, family, finances, and children can also have an impact (Pignataro, 2013). Mental health providers also face challenges to treating firefighters due to the

stigma of seeking help which often causes firefighters to distrust the provider (McKenna, 2017). A recent study conducted by McKenna (2017), found that the stigma against mental health among the fire service is a combination of self and cultural stigma with every participant reporting at least one incidence where there was a strong stigma against mental health in their department. Therefore, it is important that mental health and behavioral health also be taken into consideration when looking at the health status of firefighters.

While it is important to get an overview of firefighter wellness, it is also important to look at where firefighters are in regards to the Transtheoretical Model and stages of change. The Transtheoretical Model or Stages of Change Model was developed by James Prochaska, Ph.D. The model operates on the assumption that behavior change among individuals occurs through various stages with different constructs being applied during different stages. The six stages that individuals can progress through include pre-contemplation, contemplation, preparation, action, maintenance, and termination (Boston University School of Public Health, 2016; Prochaska & Velicer, 1997). Some individuals will eventually reach a relapse stage as well. In the pre-contemplation stage, individuals do not plan to take action in the foreseeable future. These individuals do not see their behavior as problematic. In contemplation, people intend to start making healthy behavior changes in the foreseeable future which is defined as within the next six months. These individuals realize their behavior may be problematic. Individuals in the preparation stage are ready to take action within the next 30 days and start to make small changes to changing their behaviors. In the action stage, people have changed their behavior within the last six months and intend to continue to move forward with their behavior change. Those in the maintenance stage have sustained their behavior for more than six months and

intend to continue to maintain their changes. Finally, in the termination stage, people have no desire to return to their previous unhealthy behavior and are sure they will not relapse. This stage is often not obtained and people tend to stay in the maintenance stage. Individuals are able to enter or exit the circle of the stages of change at any stage (Boston University School of Public Health, 2016). It is important to know in what stage a target audience lies to help develop successful program planning with more targeted interventions.

The overall picture of the health of firefighters is plagued with increased health risks related to obesity, cardiovascular disease, poor fitness standards, and sleep deficiency. Many studies on the health of firefighters look at one specific area of health as well as are mainly conducted in the Midwest to Western parts of the United States. Health and fitness issues among the fire service have not been adequately assessed (Posten et al., 2011). Therefore the purpose of this study is not only to allow other fire departments to potentially compare their firefighters to career firefighters in a southern Midwest mid-sized city, but the study will also provide data to better gain support for needed wellness programs among firefighters.

### **Chapter 3: Methods**

A wellness survey adapted from The Kentucky Cabinet for Health and Family Services Wellness & Health Promotion Branch and The Kentucky Chamber of Commerce employee survey found in the Guide for Worksite Wellness (Kentucky Cabinet for Health and Family Services, 2009) was used. Approval to use and adapt the employee survey was obtained from the Chamber of Commerce. Adjustments to the survey included the addition of questions on physical activity and mental health, as well as elimination of a question on tobacco use. Interest areas on group and individual physical activity and nutrition were kept the same. The survey

was created using Google forms. A link to the online adapted wellness survey was sent to 562 sworn, career firefighters in Lexington, Kentucky via an email from the Chief of Health and Safety for the department. The survey was not expected to take any longer than 15 minutes to complete and responses were anonymous. Questions on the survey covered topics such as general demographics, physical activity, nutrition, stress, sleep, and areas of wellness interest such as individual physical activity, group physical activity, and nutrition (refer to Appendix A). The firefighters were given three weeks to complete the survey. Reminder emails were sent out the Monday of the second and third weeks.

The protocol for the protection of human subjects for this study was approved by the Morehead State University Institutional Review Board (IRB). Results from the survey were analyzed using IBM SPSS 24 to determine the overall sense of well-being and readiness to change among career firefighters. Data was analyzed using descriptive, frequency, chi-square, and ANOVA tests to determine significant relationships among demographic differences and well-being and readiness to change. Significance was set at  $\alpha = .05$ . Demographic variables included gender, age, years of employment on the department, relationship status, race, and ethnicity. BMI was calculated using an online BMI calculator (National Heart, Lung, and Blood Institute, 2018). Self-reported height and weight were provided by the participants.

#### **Chapter 4: Results**

Out of 562 possible participants, 117 male sworn firefighters, or 20.8%, completed a survey on their wellness and readiness to change. Of the 117 firefighters who completed the survey, 111 were male. Due to a small number of female firefighters who participated in the study ( $n = 6$ ), only male firefighters were included in the statistical analysis due to the inability to

examine the potential moderating gender impact. Therefore, statistical analyses were conducted based on n = 111. The majority of the participants were 30-49 years of age (82.8%), married (87.4%), white (92.8%), not Hispanic (86.5%), and have been on the department longer than 5 years, see table 1 below and Appendix B.

<b>Table 1: Demographics</b>					
<b>Age in years</b>	<b>Percent of Population (n =111)</b>	<b>Years of Employment in years</b>	<b>Percent of Population (n = 111)</b>	<b>Relationship Status</b>	<b>Percent of Population (n = 111)</b>
<b>20-29</b>	7.2%	<1	-----	Single (never married)	6.3%
<b>30-39</b>	45%	1-5	21.6%	Married or in a domestic partnership	87.4%
<b>40-49</b>	37.8%	<b>5-10</b>	22.5%	<b>Divorced</b>	5.4%
<b>50-59</b>	9%	<b>10-15</b>	23.4%	<b>Widowed</b>	-----
<b>60+</b>	-----	<b>15-20</b>	15.3%	<b>Separated</b>	0.9%
<b>I prefer not to answer</b>	1%	<b>20-25</b>	12.6%	<b>I prefer not to answer</b>	-----
		<b>25+</b>	3.6%		
		<b>I prefer not to answer</b>	1%		

<b>Table 1: Demographics Continued</b>			
<b>Race</b>	<b>Percentage of Population (n = 111)</b>	<b>Ethnicity</b>	<b>Percentage of Population (n = 111)</b>
<b>White</b>	92.8%	<b>Hispanic or Latino</b>	2.7%
<b>Black or African American</b>	-----	<b>Not Hispanic or Latino</b>	86.5%
<b>Asian</b>	-----	<b>I prefer not to answer</b>	7.2%
<b>American Indian and Alaskan Native</b>	-----		<b>*Four participants (3.6%) did not provide an answer to the ethnicity question accounting for the less than 100%</b>
<b>Native Hawaiian and Other Pacific Islander</b>	0.9%		
<b>Other</b>	0.9%		
<b>I prefer not to answer</b>	5.4%		

*Note.* Dashed lines indicate no responses from participants for the category.

The BMI data supported previous research that firefighters are dealing with issues of overweight and obesity as the average BMI of this participant population was 30.84 kg/m<sup>2</sup> or Class I Obesity (refer to Appendix A). Based on ANOVA analysis, no significant differences ( $p > .05$ ) were found between BMI and age, years of employment, relationship status, race, or ethnicity.

Participants were asked a question about the importance of physical activity. According to ANOVA statistical tests there were no significant differences ( $p > .05$ ) in regards to physical activity being a priority to the participant based on age, years of employment with the department, relationship status, race, or ethnicity. Chi-square tests were also run on other questions about physical activity. There were no significant associations between questions relating to physical activity (“*current level of physical activity* or *when do you get most of your*

*physical activity each day*”), age, years of employment, relationship status, race or ethnicity.

There was also no significance found between “*current level of physical activity or when do you get most of your physical activity each day*” and calculated BMI. Participants’ intake of fruits and vegetables, high fat foods, and whole grains were assessed (Table 2). There were significant associations found in regards to intake of fruits and vegetables meaning there was a difference in the intake of fruits and vegetables based on age, years of employment, race, and ethnicity. No significant differences ( $p > .05$ ) were found between intake of high fat foods or intake of whole grains with age, years of employment, relationship status, race, or ethnicity (refer to Appendix D).

**Table 2: Chi-Square Analysis Nutrition**

<b>Variable</b>	<b>df</b>	<b>Sample Size (N)</b>	<b>Pearson chi-square</b>	<b>P-Value</b>
<b>Intake of Fruits and Vegetables x Age</b>	16	111	42.59	<.001
<b>Intake of Fruits and Vegetables x Years of Employment</b>	24	111	52.67	.001
<b>Intake of Fruits and Vegetables x Race</b>	12	111	33.39	.001
<b>Intake of Fruits and Vegetables x Ethnicity</b>	8	107	22.06	.005

*Note.* Significant at  $p < 0.05$

Quantity and quality of sleep were assessed and analyzed against the same demographic variables, age, years of employment, relationship status, race, and ethnicity. ANOVA tests concluded that there were no significant differences ( $p > .05$ ) between age, years of employment, relationship status, race, and ethnicity with the number of hours of sleep, the quality of sleep, and the difference in quality of sleep while on-duty versus off-duty. Stress, anxiety, and depression

were also assessed using ANOVA analyses to provide a well-rounded picture of the wellness of male career firefighters in Kentucky. Significant differences ( $p < .05$ ) were found between relationship status and how often the participant felt depressed in the past 30 days, as well as relationship status and feeling like they were able to cope with life stressors (Table 3). Due to limited responses, for post-hoc analysis the answer “*I prefer not to answer*” for age and years of employment was recoded as system missing. The response “*separated*” for relationship status was recoded to be combined with divorced. Tukey post-hoc analysis revealed that married participants felt significantly less depressed in the past 30 days compared to those who were divorced or separated (Table 3). Post-hoc analysis also revealed that respondents who were married felt they were significantly better able to cope and handle life stressors compared to those who were divorced or separated (Table 3).

<b>Table 3: Relationship Status and Mental Health Post-Hoc Analysis</b>				
<b>Variable</b>	<b>P-Value</b>	<b>Group</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>How often did you feel depressed in the past 30 days x Relationship status</b>	<b>.005</b>			
		<b>Married</b>	4.15	1.08
		<b>Divorced/Separated</b>	3.43	1.13
<b>I feel I am able to cope and handle my life stressors X Relationship status</b>	<b>.031</b>			
		<b>Married</b>	1.57	0.63
		<b>Divorced/Separated</b>	2.29	0.05

*Note.* Groups in Table 3 are based on reported relationship status.

Descriptive statistics showed that the average response to “*how often have you felt nervous or anxious in the past 30 days*” and “*how often you have felt depressed in the past 30 days*” was a little of the time with a mean of 4.08 and mean of 4.36 respectively. The average response for how often have you felt stressed during the past 30 days was “*some of the time*” with a mean of 3.27. Finally, the average response to “*I feel I am able to cope and handle my life stressors*” fell between strongly agree and somewhat agree with a mean of 1.61. There was no significant difference found when BMI category was analyzed against mental health variables on stress, anxiety, and depression.

Participants were also asked about their interests in receiving information or participating in various activities related to individual physical activity, group physical activity, and nutrition. Based on years of employment with the department, there were significant differences found in regards to interest in point of decision prompts to help participants be active and forming clubs for particular physical activities with significance values of .02 and .03 respectively. In both instances, those who had been employed with the department for fewer years showed greater interest based on a Likert scale ranging from 1-5 with five representing greater interest (Table 4). No significant differences were found between relationship status, race, and ethnicity for all areas of interest (please refer to Appendix C). For all the areas of interest, average scores ranged from 2.45 to 3.72 based on a Likert-style scale from 1 to 5 with 1 being very low interest and 5 being very high interest.

**Table 4: Areas of Interest and Years of Employment**

<b>Variable</b>	<b>P-Value</b>	<b>Group</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>Point of Decision Prompt to Help be More Active x Years of Employment</b>	<b>.021</b>			
		<b>1-5 years of employment</b>	3.17	1.13
		<b>5-10 years of employment</b>	2.08	0.91
<b>Forming Clubs for Particular Physical Activities x Years of Employment</b>	<b>.031</b>			
		<b>1-5 years of employment</b>	3.25	1.42
		<b>5-10 years of employment</b>	2.20	1.00

*Note.* Groups in Table 4 are based on participants' response to the number of years they have been employed with the department.

One-way ANOVA tests were also conducted among variables from the survey. A significant difference between groups was found when comparing the time that the participant was engaged in physical activity and how often they felt depressed in the past 30 days as those who engaged in physical activity after work felt less depressed than those who did not participate in physical activity or only participated on their off days (Table 5).

<b>Table 5: Depression and Physical Activity</b>				
<b>Variable</b>	<b>P-Value</b>	<b>Group</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>How often did you feel depressed in the past 30 days x When do you get most of your physical activity each day</b>	<b>.033</b>			
		<b>After Work</b>	4.48	0.77
		<b>None of the above. I am not physically active or am only active on my off days</b>	3.73	1.10
<i>Note.</i> Groups in Table 5 are based on participants' responses to when they get most of their physical activity.				

Significant differences were found when comparing the number of hours of sleep the participant got in a night and stress, anxiety, and depression. However, due to the limited responses ( $n = 1$ ) for participants getting 8-9 hours of sleep, for this analysis 8-9 hours of sleep was combined with 7-8 hours of sleep in order to run post-hoc analysis (Table 6).

<b>Table 6: Amount of Sleep and Mental Health</b>				
<b>Variable</b>	<b>P-Value</b>	<b>Group</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>How often did you feel nervous or anxious in the past 30 days x number of hours of sleep per night</b>	<b>.003</b>			
<i>*There was a significant difference between Group 1 and Group 2 and Group 1 and Group 3.</i>		<b>Group 1: reported &lt;5 hours of sleep</b>	3.61	1.37
		<b>Group 2: reported 6-7 hours of sleep</b>	4.23	0.91
		<b>Group 3: reported 7-9 hours of sleep</b>	5.00	0.00

<b>Table 6: Amount of Sleep and Mental Health</b>				
<b>Variable</b>	<b>P-Value</b>	<b>Group</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>How often did you feel depressed in the past 30 days x number of hours of sleep per night</b>	<b>.024</b>			
<i>*There was a significant difference between Group 1 and Group 2</i>		<b>Group 1: reported &lt;5 hours of sleep</b>	4.03	1.02
		<b>Group 2: reported 6-7 hours of sleep</b>	4.48	0.78
<b>How often did you feel stressed in the past 30 days x number of hours of sleep per night</b>	<b>.000</b>			
<i>*There was a significant difference between Group 1 and Group 2 and Group 1 and 3.</i>		<b>Group 1: reported &lt;5 hours of sleep</b>	2.67	0.92
		<b>Group 2: reported 6-7 hours of sleep</b>	3.52	0.73
		<b>Group 3: reported 7-9 hours of sleep</b>	3.60	1.14
<b>I feel I am about to cope and handle life stressors x number of hours of sleep per night</b>	<b>.000</b>			
<i>*There was a significant difference between Group 1 and Group 2 and Group 1 and Group 3.</i>		<b>Group 1: reported &lt;5 hours of sleep</b>	2.03	0.81
		<b>Group 2: reported 6-7 hours of sleep</b>	1.47	0.58
		<b>Group 3: reported 7-9 hours of sleep</b>	1.00	0.00
<i>Note.</i> Groups in Table 6 are based on reported hours of sleep each the participants get on average per night.				

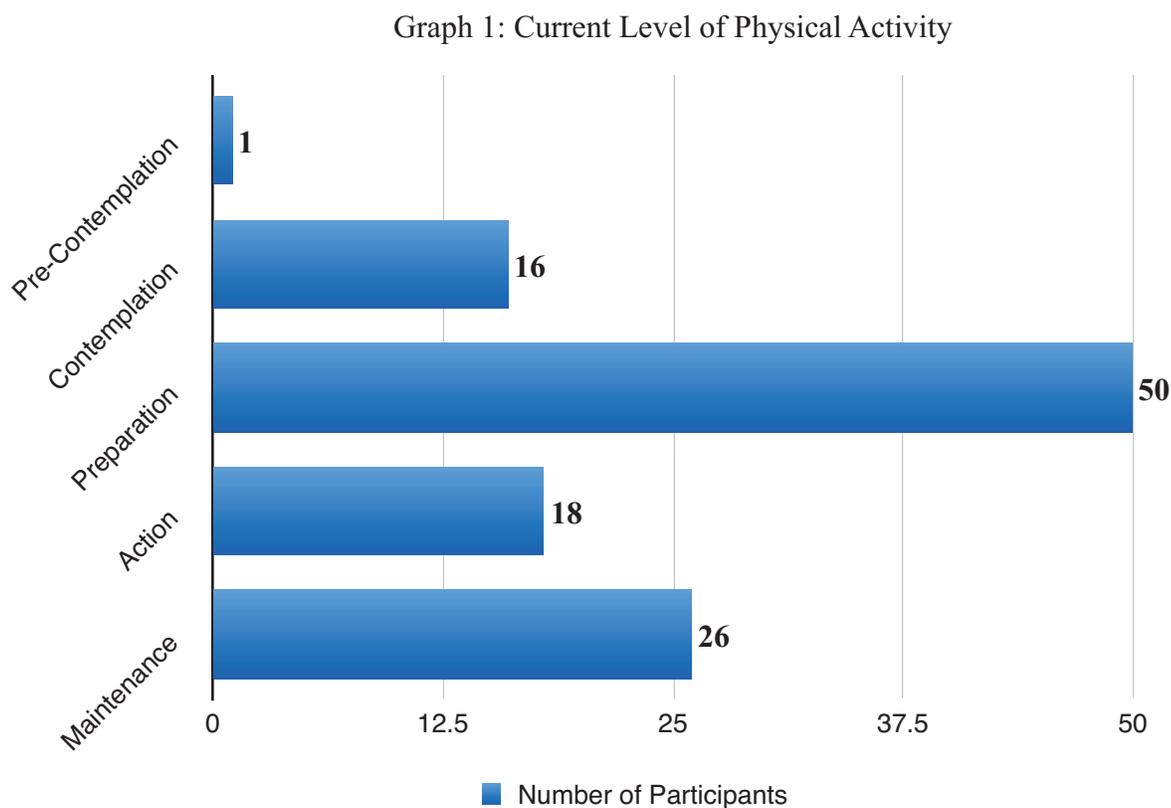
As can be seen by the data in the table above, the greater number of hours the participants got on average of sleep per night, the less anxiety, depression, and stress they felt. Also they were better able to handle life stressors. Additional sleep questions addressed the quality of sleep and if participants felt the sleep they got on average was quality sleep. Significant differences were found in regards to quality of sleep and all questions on stress, anxiety, and depression (Table 7). The data in this table also indicates the the more a participant agreed that the sleep they got was quality sleep, the less anxious, depressed, or stressed they felt. Respondents stated they were also better able to handle life stressors if the sleep they got was quality sleep.

<b>Table 7: Quality of Sleep and Mental Health</b>				
<b>Variable</b>	<b>P-Value</b>	<b>Group</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>How often did you feel nervous or anxious in the past 30 days x I feel the sleep I get is quality sleep</b>	<b>.014</b>			
<i>*There was a significant difference between Group 1 and Group 5</i>		<b>Group 1: Strongly Agree</b>	4.78	0.44
		<b>Group 5: Strongly Disagree</b>	3.33	1.32
<b>How often did you feel depressed in the past 30 days x I feel the sleep I get is quality sleep</b>	<b>.003</b>			
<i>*There was a significant difference between Group 1 and Group 5; and Group 2 and Group 5</i>		<b>Group 1: Strongly Agree</b>	4.78	0.44
		<b>Group 2: Somewhat Agree</b>	4.63	0.73
		<b>Group 5: Strongly Disagree</b>	3.56	1.13

<b>Table 7: Quality of Sleep and Mental Health</b>				
<b>Variable</b>	<b>P-Value</b>	<b>Group</b>	<b>Mean</b>	<b>Standard Deviation</b>
<b>How often did you feel stressed in the past 30 days x I feel the sleep I get is quality sleep</b>	<b>.039</b>			
<b>I feel I am about to cope and handle life stressors x I feel the sleep I get is quality sleep</b>	<b>.001</b>			
<i>*There was a significant difference between Group 1 and Group 5; Group 2 and Group 5; and Group 3 and Group 5.</i>		<b>Group 1: Strongly Agree</b>	1.11	0.33
		<b>Group 2: Somewhat Agree</b>	1.46	0.56
		<b>Group 3: Neither agree or disagree</b>	1.52	0.75
		<b>Group 5: Strongly Disagree</b>	2.33	0.87
<i>Note.</i> Groups in table 7 are based on participant response in regards to feeling that the sleep they get is quality sleep.				

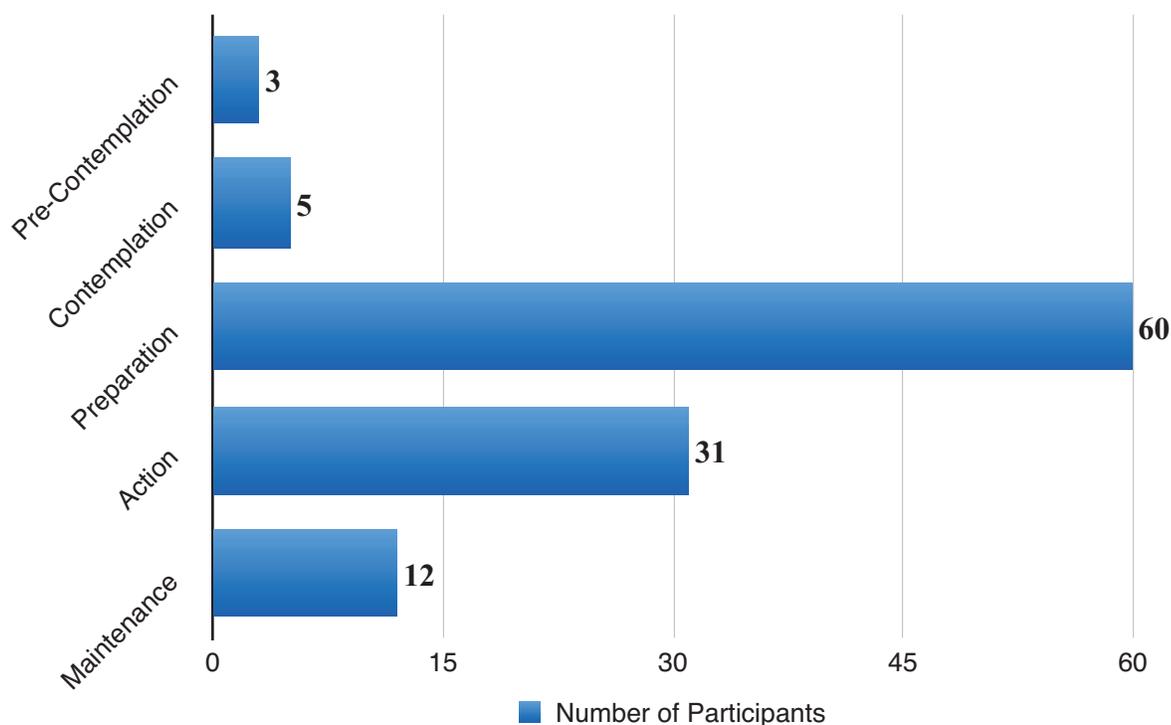
There were questions in this survey that correspond to stages in the Transtheoretical Model. One was the question about current level of physical activity and the three questions about nutrition. For the question that asked about current level of physical activity, the response “*I don’t exercise or walk regularly now, and I don’t plan to start in the near future*” corresponded to the pre-contemplation stage. “*I don’t exercise or walk regularly, but I’ve been thinking about starting*” corresponded to the contemplation stage. “*I’m doing moderate or vigorous physical activities for at least 30 minutes on some days, but fewer than five days a week*” corresponded to

preparation. *“I’ve been doing moderate or vigorous physical activities for at least 30 minutes in a day, on five or more days a week, and have been doing it for the last one to six months”* corresponded to the action stage. Finally, *“I’ve been doing moderate or vigorous physical activities for at least 30 minutes in a day, on five or more days a week, and have been doing it for seven months or longer”* corresponded to maintenance. Results can be seen in Graph 1. Results from the question on participants’ current level of physical activity indicate that the majority of participants fell within the preparation stage in the Transtheoretical Model.

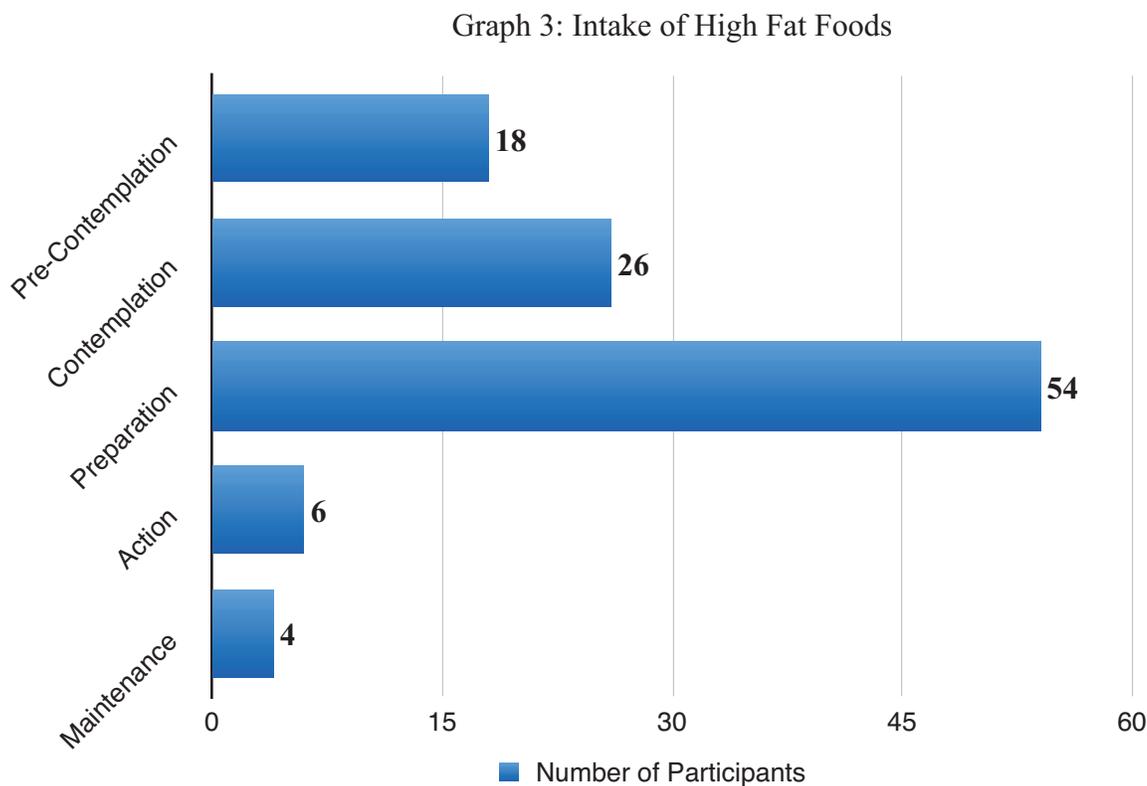


The first question on nutrition asked about current intake of fruits and vegetables. Participants' results and corresponding stage of change can be seen in Graph 2: Intake of Fruits and Vegetables. The response *"I don't eat fruits and vegetables regularly now, and I don't plan to start in the near future"* corresponded to the pre-contemplation stage. *"I don't eat fruits and vegetables regularly, but I've been thinking about starting"* corresponded to the contemplation stage. *"I'm eating some fruits and vegetables a day (total of two servings or less)"* corresponded to preparation. *"I've been eating fruits and vegetables every day (total of three or more servings), for the last one to six months"* corresponded to the action stage. Finally, *"I've been eating five or more servings of fruits and vegetables every day, for more than six months"* corresponded to the maintenance stage. Again, the majority of participants fell in the preparation stage. In regards to intake of fruit and vegetables, only approximately 7% were not yet to the preparation stage.

Graph 2: Intake of Fruits and Vegetables.



The next nutrition question asked about intake of high fat foods. Responses to stages of changes were as follows. *“I don’t worry about the fat content of the food I eat and I don’t plan to in the near future”* corresponded to the pre-contemplation stage. *“I eat high fat foods daily, but i’ve been thinking about trying to reduce my intake”* corresponded to contemplation. *“I limit my intake of high fat foods to one-three times/week”* corresponded to the preparation stage. *“I eat high fat foods less than once/week and have been for the past six months”* corresponded to the action stage. *“I eat high fat foods less than once/week and have been for more than six months”* corresponded to maintenance. The results for participants’ stages of change can be found below in Graph 3: Intake of High Fat Foods.



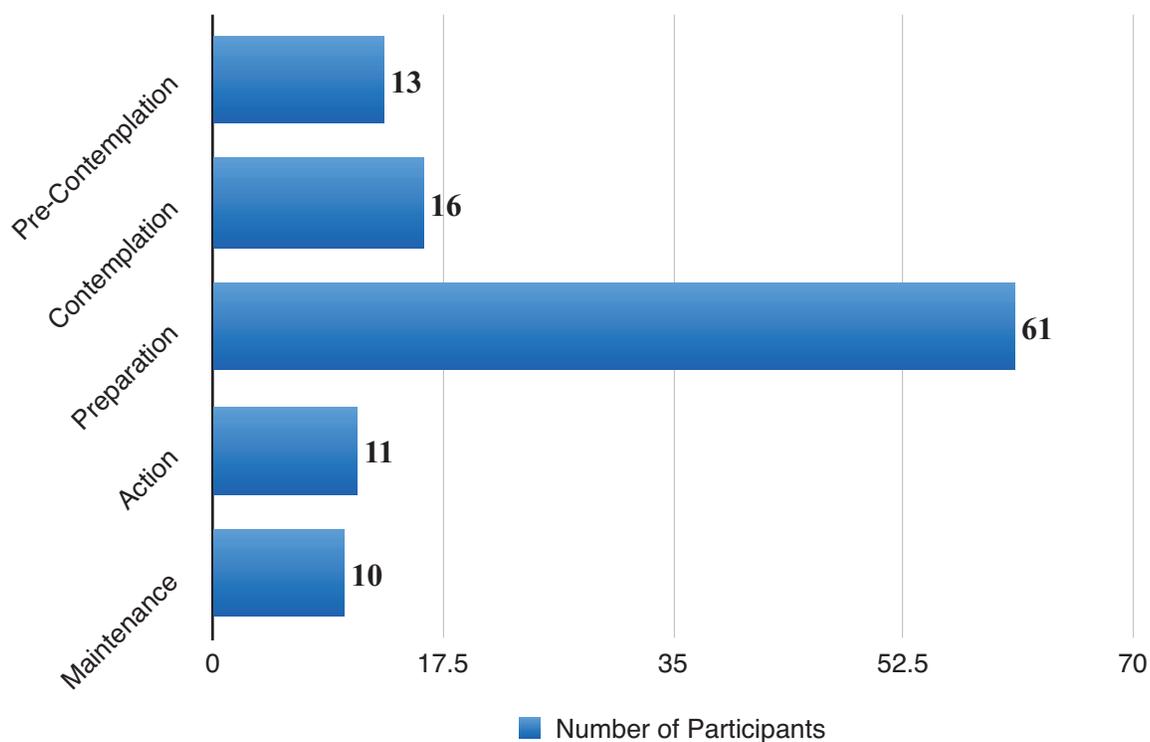
Similarly to the previous two questions that correspond to a stage of change, majority of participants fell into the preparation category for intake of high fat foods as well. However,

unlike the previous two questions, approximately 40% were not yet to the preparation stage.

This was the largest percentage of the population that were staged lower than preparation.

The last nutrition question that corresponded to readiness to change asked about intake of whole grains. The response *“I don’t cook, eat or purchase whole-grain foods now, and I don’t plan to start in the near future”* corresponded to the pre-contemplation stage. *“I don’t cook, eat or purchase whole-grain foods regularly, but I’ve been thinking about starting”* corresponded to the contemplation stage. *“I’m cooking, eating or purchasing whole-grain foods three-four times a week”* corresponded to preparation, where the majority of participants were staged. *“I’ve been cooking, eating or purchasing whole-grain foods every day, for the past one to six months”* corresponded to the action stage. Finally, *“I’ve been cooking, eating or purchasing at least three servings of whole-grain foods every day, for seven months or longer”* corresponded to maintenance. See Graph 4: Intake of Whole Grains for the results.

Graph 4: Intake of Whole Grains



The participants who were not in the preparation stage were fairly evenly spread among the other stages. The Transtheoretical Model stage in which the respondents' attitudes fall, can play a large and important role in program planning to better build a more successful program for the intended audience.

## **Chapter 5: Discussion**

With the growing problem of overweight and obesity among firefighters, wellness programs are likely to be more necessary among first responders. Prior to implementation of a wellness program, it is good to know the characteristics of the target population to be able to create a more successful program. This study analyzed the well-being characteristics of career firefighters. The demographic information obtained in the study would be beneficial when designing a wellness program and knowing the background of the target audience to implement more pinpointed interventions. The average BMI for the department was found to be 30.84 kg/m<sup>2</sup> which is classified as Class I Obesity. An aspect to consider when looking at BMI as an indicator of health is that a higher BMI is generally associated with greater risk for chronic disease. Therefore, due to the average BMI falling into the obese category, program planning should entail activities to decrease body weight and to prevent chronic disease. Another important consideration with BMI is that it does not take into account the difference in weight between muscle and fat. Only five of the firefighters had a BMI that fell within the normal range of 18.5 kg/m<sup>2</sup> and 24.9 kg/m<sup>2</sup>. Due to muscle weighing more than fat, it is possible that some of the firefighters are in good shape and have a healthy body composition but it is just not reflected in their BMI. Different indicators of body composition that measure body fat and lean body

mass may be more reliable with this population. These include skin-fold measurements, hydrostatic weighing, or circumference measurements.

Another important aspect to consider for program planning are differences between participants such as demographics, nutrition, physical activity, and mental health. Since there were no significant differences between participants in regards to physical activity, sleep, intake of high fat foods, and intake of whole grains, a more standardized, or group approach may be feasible. One potential reason for there not being any significant differences could be due to the nature of firefighters' schedules. Since they generally work 24 hours on-duty then 48 hours off, firefighters spend a lot of time together, share meals together, sleep in common areas, and possibly participate in physical activity with others at the firehouse. This is an important aspect to consider when looking at the total sense of well-being among firefighters; they tend to be more homogenous than heterogeneous.

The significant differences found between relationship status and both feelings of depression and ability to handle life stressors may relate back to the social support first responders receive from those outside of the department. As mentioned by Pignataro et al. (2013), firefighters have to deal with witnessing major trauma and job-related stressors and then they have to go home to the basic life stressors of the world. Having social support through various relationships for help with everyday stressors such as kids, money, and housing can really help firefighters, and other first responders, manage their stress and maintain good mental health. This study supported this as participants who were married reported to be less anxious, depressed, or stressed than their divorced or separated counterparts. Previous research also supports that there is a negative mental health stigma, especially among first responders

(McKenna, 2017). This brings to light the potential limitation of self-reported data, especially on topics where there may be a negative stigma such as mental health.

Previous research supports that firefighters often experience sleep deprivation which is associated with adverse mental health outcomes (Barger et al., 2015). This study found that there were significant differences between sleep and mental health factors. Those participants who reported greater amounts of sleep and better quality sleep were less likely to be anxious, depressed, or stressed and were more likely to be able to handle their daily life stressors. This supported previous research on how sleep deprivation can have negative effects on mental health. Many of the significant findings from this research are interconnected to create the total wellbeing of the participant.

Certain questions in the wellness survey were assessed in regards to readiness to change. For all of the questions, majority of participants were at least in the preparation stage, if not action or maintenance. This demonstrated that the firefighters at least had some interest in participating in wellness activities in areas such as physical activity, nutrition, sleep, and stress management. This categorization of the participants based on stage in the Transtheoretical Model would be helpful in program planning and being able to design interventions based on what stage the target audience is at in order to be more successful. Being able to implement more directed, successful interventions can not only lead to better outcomes for participants, but also a more cost-effective program. In addition to the majority of participants being in the preparation stage or beyond when it come to physical activity and nutrition, results from the areas of interest in physical activity and nutrition related information hovered around the neutral level. Mean scores ranged from 2.45 to 3.72 based on a Likert-style scale from 1 to 5 with 1

being very low interest and 5 being very high interest. Some responses leaned more towards higher interest in the activities. By knowing this information as well, program developers may be able to more easily engage with those who are in the contemplation stages.

### **Conclusions and Recommendations**

The total picture of wellness of a first responder involves many interconnected variables. Sworn, career firefighters are a rather homogenous population that seems to be interested in starting to improve or already working to improve their overall sense of well-being. This homogeneity can limit the external validity of the study because it only looked at a select group of firefighters from one department in a southern Midwest mid-sized city. Considerations for future research include further analyzing sense of depression, stress, and anxiety. Ideally, in regards to these aspects of wellness, it would also be important to analyze if the firefighters felt they were able to be open with mental health issues without being looked at in a negative fashion by others as this can drastically affect the truthfulness of responses. Another idea for further research would be to start some of the group physical activities, individual physical activities, and nutrition activities that firefighters reported being most interested in to see if the addition of the activities affects readiness to change among the firefighters. Research would involve looking to see if firefighters progress further through the stages in the Transtheoretical model. One recommendation based on these results is to find grants to financially be able to put exercise equipment in each firehouse to promote physical activity. Another would be to find a design for the sleeping quarters that would promote the best quality sleep possible. Options may include higher wall dividers between beds or creating more, smaller rooms that maybe two or three individuals could sleep in instead of one large open area. A final recommendation would be to

ensure each of the firefighters has some form of social support. This may include having support groups or events that also include their families. Overall, the picture of wellness of career firefighters in a southern Midwest mid-sized city looks to be promising.

## References

- American Heart Association. (2017). Understanding blood pressure readings. Retrieved from [http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/KnowYourNumbers/Understanding-Blood-Pressure-Readings\\_UCM\\_301764\\_Article.jsp](http://www.heart.org/HEARTORG/Conditions/HighBloodPressure/KnowYourNumbers/Understanding-Blood-Pressure-Readings_UCM_301764_Article.jsp).
- Barger, L .K., O'Brien, C. S., Rajaratnam, S. M. W., Qadri, S., Sullivan, J. P., Wang, W., . . . Lockley, S. W. (2016). Implementing a sleep health education and sleep disorders screening program in fire departments. *Journal of Occupational and Environmental Medicine*, 58(6), 601-609. doi: 10.1097/JOM.0000000000000709.
- Boston University School of Public Health. (2016). Behavior change models: The transtheoretical model (stages of change). Retrieved from <http://sphweb.bumc.bu.edu/otlt/MPH-Modules/SB/BehavioralChangeTheories/BehavioralChangeTheories6.html>.
- CDC. (2017). National center for health statistics: Overweight and obesity. Retrieved from <https://www.cdc.gov/nchs/fastats/obesity-overweight.htm>.
- Choi, B., Schnall, P., Dobson, M., Istael, L., Landsbergis, P., Galassetti, P., . . . Baker, D. (2011). Exploring occupational and behavioral risk factors for obesity in firefighters: A theoretical framework and study design. *Safety and Health at Work*, 2(4), 301-312. doi: 10.5491/SHAW.2011.2.4.301.
- Dobson, M., Choi, B., Schnall, P. L., Wigger, E., Garcia-Rivas, J., Israel, L., & Baker, D. B. (2013). Exploring occupational and health behavioral causes of firefighter obesity: A qualitative study. *American Journal of Industrial Medicine*, 56, 776-790.

- Kales, S. N., Tsismenakis, A. J., Zhang, C., & Soteriades, E. S. (2009). Blood pressure in firefighters, police officers, and other emergency responders. *American Journal of Hypertension*, 22(1), 11-20. doi: 10.1038/ajh.2008.296.
- Kentucky Cabinet for Health and Family Services. (2009). Investing in a healthy bottom line: A guide for worksite wellness. Retrieved from <https://www.kychamber.com/sites/default/files/worksitewellness.pdf>.
- Lexington-Fayette Urban County Government. (2018). Lexington fire department: Eligibility requirements. Retrieved from <https://www.lexingtonky.gov/eligibility-requirements>.
- McKenna, C. L. (2017). The impact of mental health stigma in the fire service. *Fire Engineering*.
- National Heart, Lung, and Blood Institute. (2018). Calculate your body mass index. Retrieved from [https://www.nhlbi.nih.gov/health/educational/lose\\_wt/BMI/bmicalc.htm?source=quickfitnesssolutions](https://www.nhlbi.nih.gov/health/educational/lose_wt/BMI/bmicalc.htm?source=quickfitnesssolutions).
- NFPA. (2017). U.S. fire department profile-2015. Retrieved from <https://www.nfpa.org/-/media/Files/News-and-Research/Fire-statistics/Fire-service/osfdprofile.pdf>.
- NFPA. (2018a). About NFPA. Retrieved from <https://www.nfpa.org/About-NFPA>.
- NFPA. (2018b). List of NFPA codes and standards. Retrieved from <https://www.nfpa.org/codes-and-standards/all-codes-and-standards/list-of-codes-and-standards/detail?code=1582>.
- Pignataro, C. Helping mentally distressed firefighters help themselves. *Fire Engineering*, 38-47.
- Poston, S. C., Haddock, K., Jahnke, S. A., Jitnarin, N., Tuley, B. C., & Kales, S. N. (2011). The prevalence of overweight, obesity, and substandard fitness in a population-based firefighter cohort. *Journal of Occupational and Environmental Medicine*, 53(3), 266-273.

- Poston, W. S. C., Jitnarin, N., Haddock, C. K., Jahnke, S. A., & Tuley, B. C. (2012). The impact of surveillance on weight change and predictors of change in a population-based firefighter cohort. *Journal of Occupational and Environmental Medicine, 54*(8), 961-968. doi: 10.1097/JOM.0b013e31825296e0.
- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*(1), 38-38. doi: 10.4278/0890-1171-12.1.38.
- Soteriades, E. S., Smith, D. L., Tsismenakis, A. J., Baur, D. M., & Kales, S. N. (2011). Cardiovascular disease in US firefighters. *Cardiology in Review, 19*(4), 202-215. doi: 10.1097/CRD.0b013e318215c105.
- U.S. Fire Administration. (2017). Firefighter fatalities in the United States in 2016. Retrieved from [https://www.usfa.fema.gov/downloads/pdf/publications/ff\\_fat16.pdf](https://www.usfa.fema.gov/downloads/pdf/publications/ff_fat16.pdf).

## Appendix A: Wellness Survey

### Demographics:

1. Gender:

- Male
- Female
- I prefer not to answer

2. Age:

- <20
- 20-29
- 30-39
- 40-49
- 50-59
- 60+
- I prefer not to answer

3. Years of employment on the department

- <1
- 1-5
- 5-10
- 10-15
- 15-20
- 20-25
- 25+
- I prefer not to answer

4. Relationship Status

- Single (never married)
- Married or in a domestic partnership
- Divorced
- Widowed
- Separated
- I prefer not to answer

5. With what race do you self-identify?

- White
- Black or African American
- Asian
- American Indian and Alaska Native
- Native Hawaiian and Other Pacific Islander

- Other
- I prefer not to answer

#### 6. Ethnicity

- Hispanic or Latino
- Not Hispanic or Latino
- I prefer not to answer

### Physical Activity

1. Please read the statements below. Select the statement that best describes your current level of physical activity. When considering time spent being active, count any time you are active for at least 10 minutes at a time. In other words, if you have three 10 minute “bouts” of activity in a day, record that as 30 minutes in a day. “Vigorous” exercise includes activities like jogging, running, fast cycling, aerobics classes, swimming laps, singles tennis and racquetball. These types of activities make you sweat and make you feel out of breath. “Moderate” exercise includes activities such as brisk walking, gardening, slow cycling, dancing, doubles tennis or hard work around the house.

- I don’t exercise or walk regularly now, and I don’t plan to start in the near future.
- I don’t exercise or walk regularly, but I’ve been thinking about starting.
- I’m doing moderate or vigorous physical activities for at least 30 minutes on some days, but fewer than five days a week.
- I’ve been doing moderate or vigorous physical activities for at least 30 minutes in a day, on five or more days a week, and have been doing it for the last one to six months.
- I’ve been doing moderate or vigorous physical activities for at least 30 minutes in a day, on five or more days a week, and have been doing it for seven months or longer.

2. When do you get most of your physical activity each day?

- Before work
- During work hours
- After work
- None of the above. I am not physically active or am only active on my days off.

3. Please check the box that best applies. “Engaging in physical activity is a priority for me.”

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

## Nutrition and Weight Status

1. Please read the statements below. Select the statement that best describes your current intake of 100% juices and fresh, frozen and/or dried fruits and vegetables. A serving is 1/2 cup or one medium piece of most fresh or frozen fruits and vegetables, 6 ounces of 100% juice and 1/4 cup of dried fruits or vegetables.

- I don't eat fruits and vegetables regularly now, and I don't plan to start in the near future.
- I don't eat fruits and vegetables regularly, but I've been thinking about starting.
- I'm eating some fruits and vegetables a day (total of two servings or less).
- I've been eating fruits and vegetables every day (total of three or more servings), for the last one to six months.
- I've been eating five or more servings of fruits and vegetables every day, for more than six months.

2. Please read the statements below. Select the statement that best describes your current intake of high fat foods.

- I don't worry about the fat content of the food I eat and I don't plan to in the near future.
- I eat high fat foods daily, but i've been thinking about trying to reduce my intake.
- I limit my intake of high fat foods to one-three times/week.
- I eat high fat foods less than once/week and have been for the past six months.
- I eat high fat foods less than once/week and have been for more than six months.

3. Please read the statements below. Select the statement that best describes your current intake of whole grain foods. The serving size for whole grains is one ounce (e.g. one slice of bread, one ounce of cereal, 1/2 cup of cooked rice or pasta).

- I don't cook, eat or purchase whole-grain foods now, and I don't plan to start in the near future.
- I don't cook, eat or purchase whole-grain foods regularly, but I've been thinking about starting.
- I'm cooking, eating or purchasing whole-grain foods three-four times a week.
- I've been cooking, eating or purchasing whole-grain foods every day, for the past one to six months.
- I've been cooking, eating or purchasing at least three servings of whole-grain foods every day, for seven months or longer.

4. Please type in your weight (lbs).

5. Please type in your height (ex: 5'11").

## Stress and Mental Health

1. Anxiety: About how often during the past 30 days did you feel nervous or anxious: would you say all of the time, most of the time, some of the time, a little of the time or none of the time?

- All
- Most
- Some
- A little
- None
- I don't know/I'm not sure

2. Depression: About how often during the past 30 days did you feel sad, blue or depressed- would you say all of the time, most of the time, some of the time, a little of the time or none of the time?

- All
- Most
- Some
- A little
- None
- I don't know/I'm not sure

3. Stress: About how often during the past 30 days did you feel stressed- would you say all of the time, most of the time, some of the time, a little of the time or none of the time?

- All
- Most
- Some
- A little
- None
- I don't know/I'm not sure

4. Stress: Please check the box that best applies. "I feel I am able to cope and handle my life stressors."

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

5. Sleep: On average, how many hours of sleep do you get at night?

- <5
- 6-7
- 7-8
- 8-9

■ >9

6. Sleep: Please check the box that best applies. “I feel the sleep I do get is quality sleep.”

- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

7. Sleep: Please check the box that best applies. “There is a difference in the quality of sleep I get when I am on duty versus when I am off duty.”

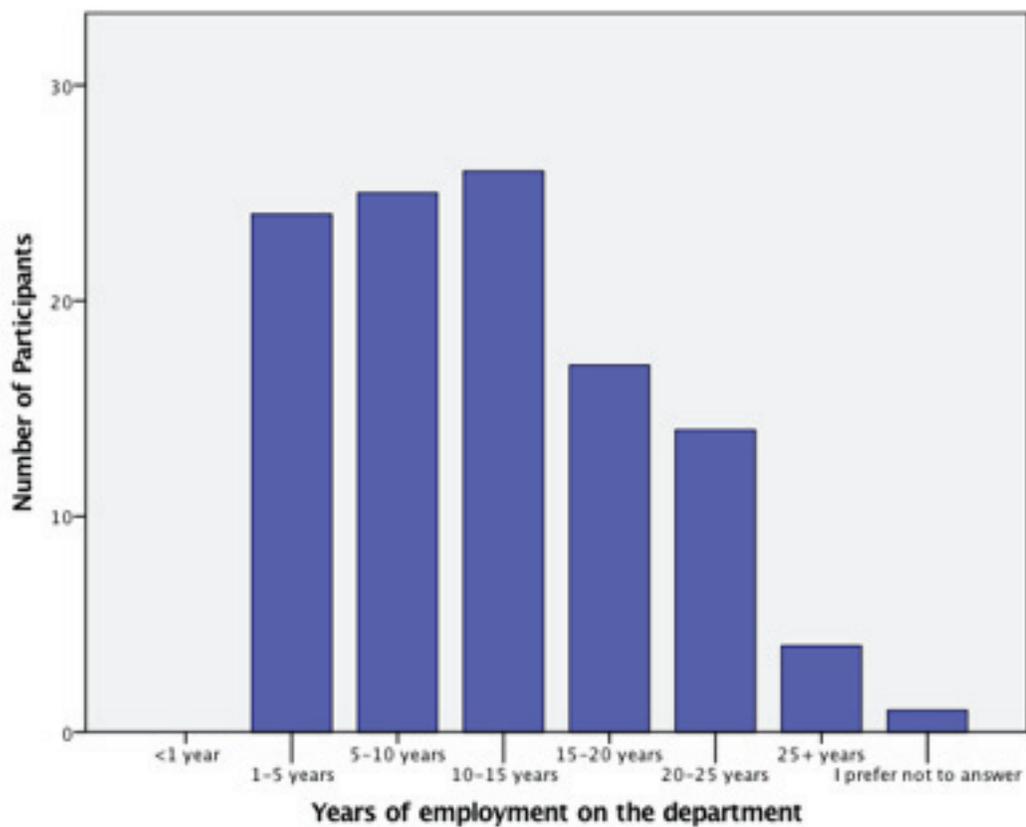
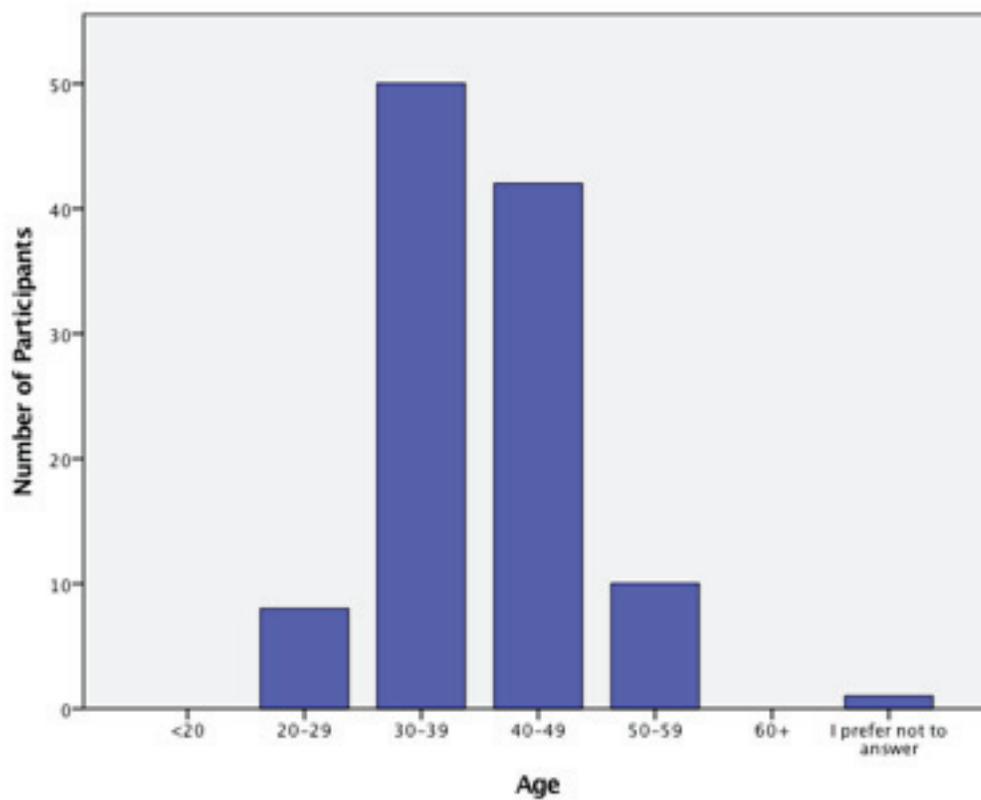
- Strongly agree
- Somewhat agree
- Neither agree nor disagree
- Somewhat disagree
- Strongly disagree

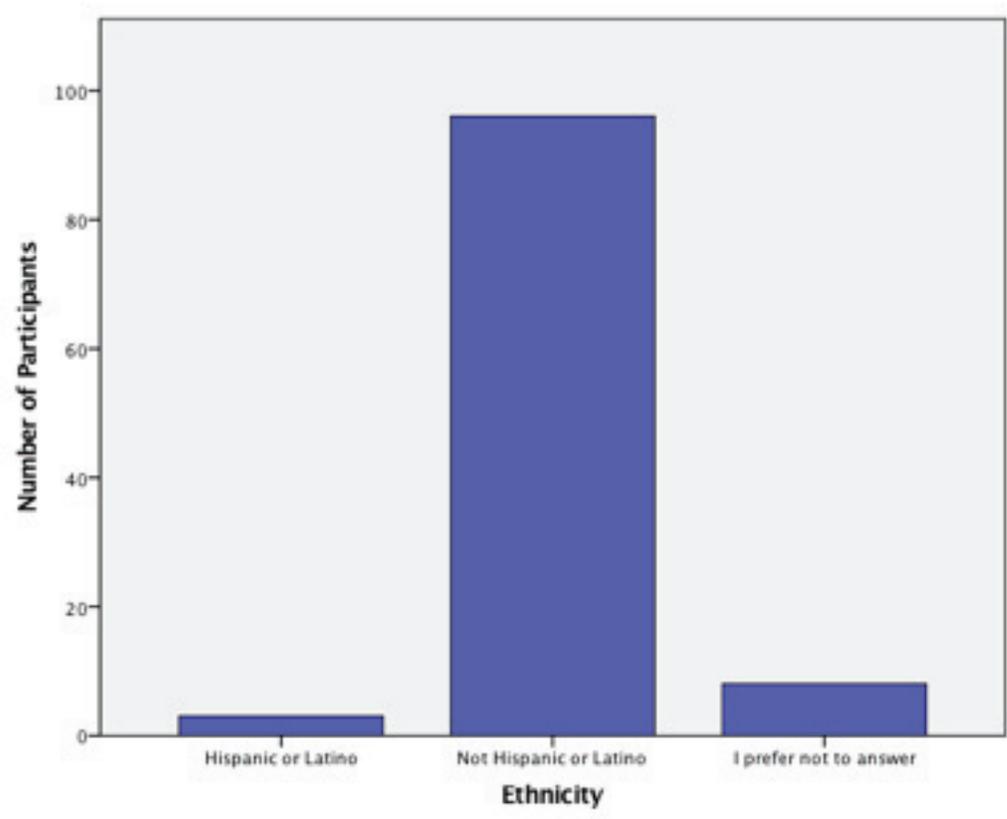
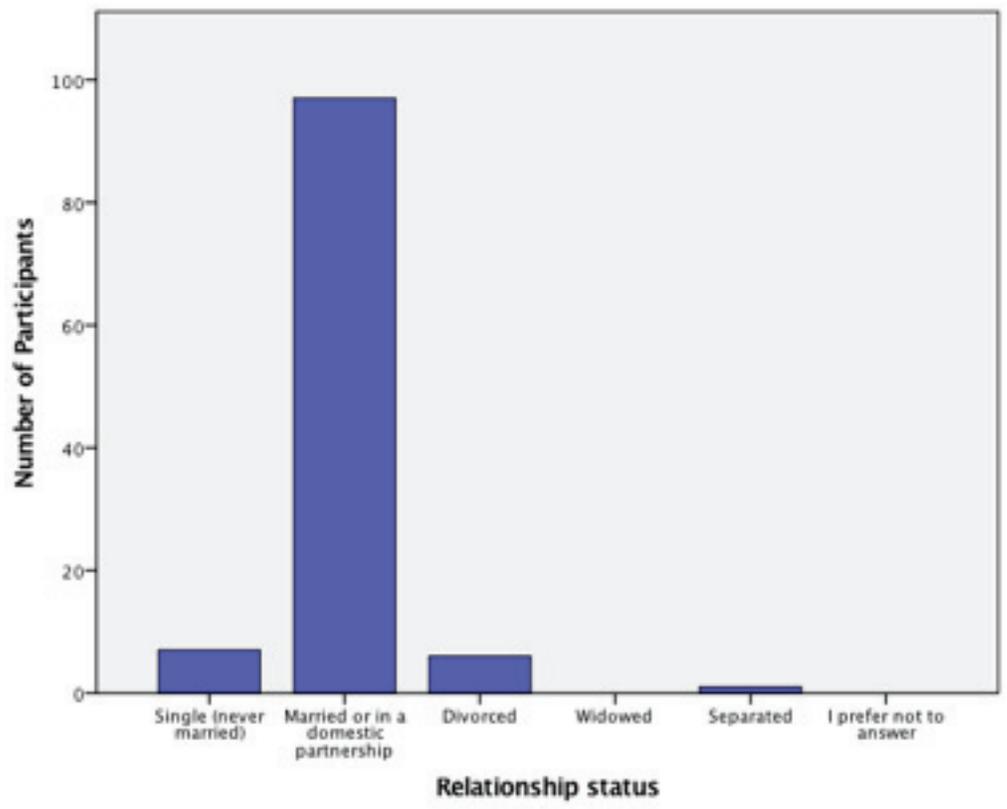
#### Areas of Interest

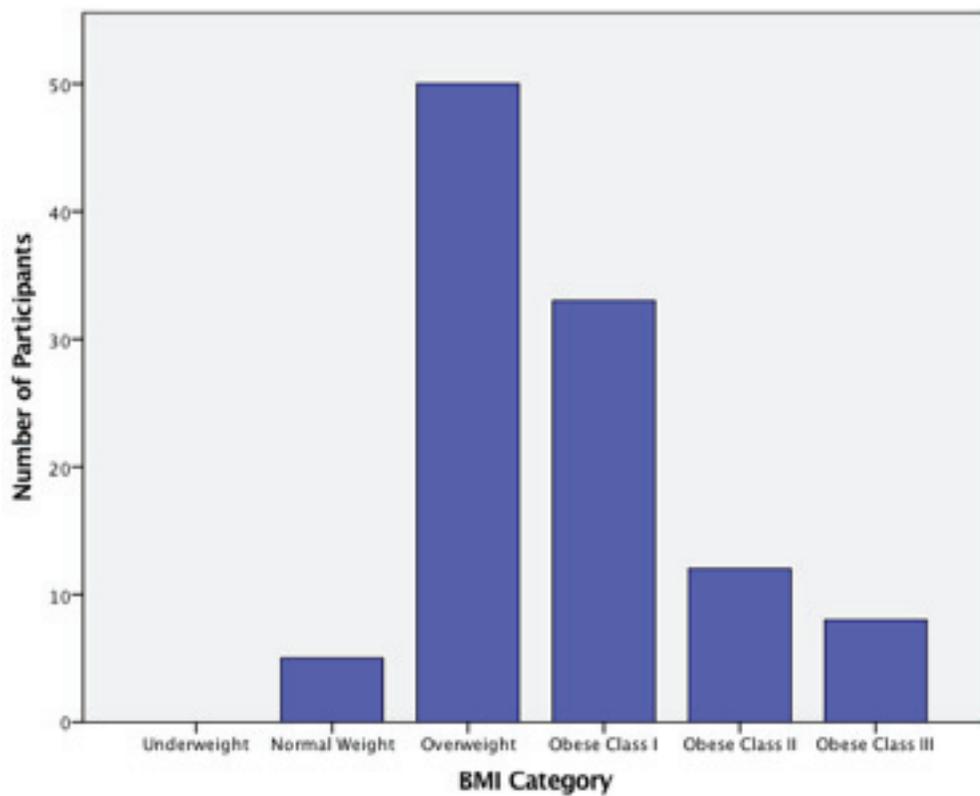
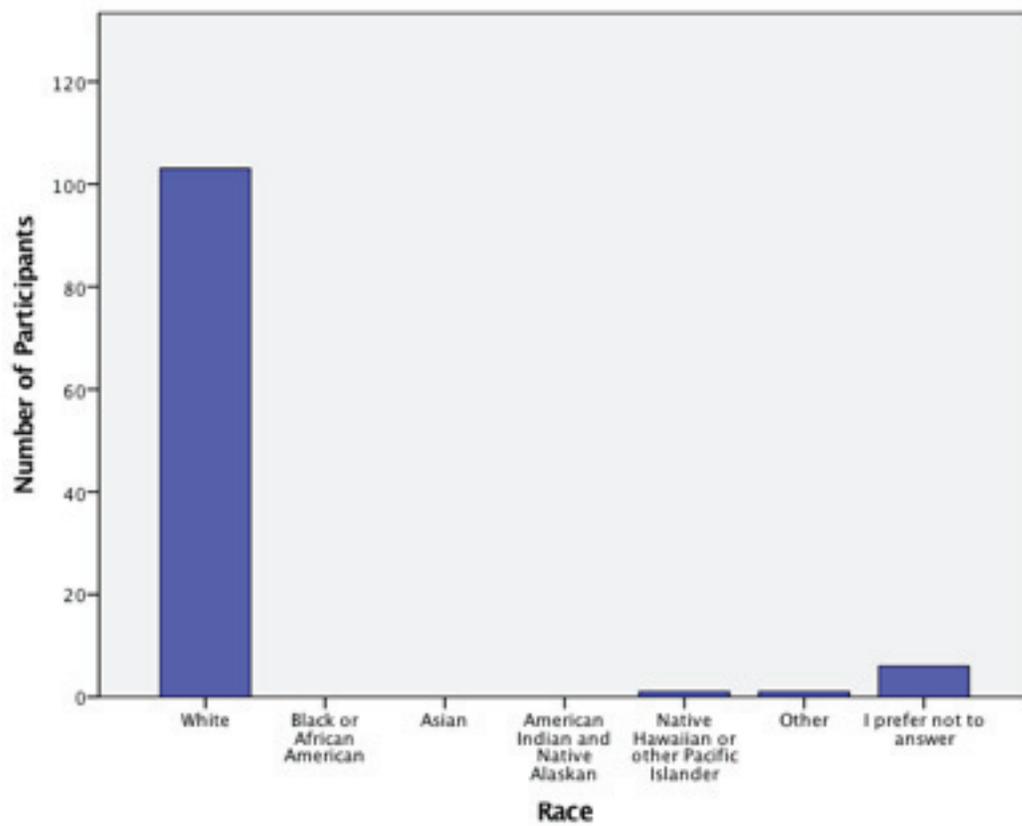
Please rate your interest in the following individual physical activity resources.	Very Low	Low	Neutral	High	Very High
1. Attending regular presentations on physical activity topics					
2. Receiving regular physical activity tips via e-mail					
3. Having access to web resources on physical activity					
4. Getting information on existing activities in the area					
5. Point of decision prompts to help you be active (signs by stairs, etc)					

Please rate your interest in the following group physical activity resources.	Very Low	Low	Neutral	High	Very High
1. Joining small groups for regular activity (walking groups, yoga class)					
2. Forming clubs for particular physical activities					
3. Discounted memberships at local health clubs, recreation centers, etc					
4. Participating in a division-wide fitness initiative with friendly competition between groups					
Please rate your interest in the following nutrition resources.	Very Low	Low	Neutral	High	Very High
1. Attending regular presentations on nutrition topics					
2. Receiving regular healthy eating tips via e-mail					
3. Having access to web resources on nutrition/healthy eating					
4. Getting information on existing food/diet groups in the area					
5. Recipes/healthy meal ideas					
6. Point of decision prompts to help you eat well (i.e. strategically placed healthy eating reminders)					
7. Participating in small groups for regular information on a healthy diet					

## Appendix B: Demographic Graphs







### Appendix C: One-Way ANOVAs

<b>Table 1: One-Way ANOVA-Physical Activity</b>	
<b>Variables</b>	<b>P-Value</b>
<b>Physical Activity x Age</b>	
Engaging in Physical Activity is a Priority	.172
<b>Physical Activity x Years of Employment</b>	
Engaging in Physical Activity is a Priority	.179
<b>Physical Activity x Relationship Status</b>	
Engaging in Physical Activity is a Priority	.636
<b>Physical Activity x Race</b>	
Engaging in Physical Activity is a Priority	.795
<b>Physical Activity x Ethnicity</b>	
Engaging in Physical Activity is a Priority	.462
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 2: One-Way ANOVA-Anxiety/Stress/Depression**

<b>Variables</b>	<b>P-Value</b>
How Often Felt Nervous or Anxious in Past 30 Days x Age	.801
How Often Felt Depressed in Past 30 Days x Age	.937
How Often Felt Stressed in Past 30 Days x Age	.317
Feel Able to Cope and Handle Life Stressors x Age	.710
How Often Felt Nervous or Anxious in Past 30 Days x Years of Employment	.091
How Often Felt Depressed in Past 30 Days x Years of Employment	.625
How Often Felt Stressed in Past 30 Days x Years of Employment	.087
Feel Able to Cope and Handle Life Stressors x Years of Employment	.755
How Often Felt Nervous or Anxious in Past 30 Days x Relationship Status	.262
How Often Felt Depressed in Past 30 Days x Relationship Status	.005*
How Often Felt Stressed in Past 30 Days x Relationship Status	.834
Feel Able to Cope and Handle Life Stressors x Relationship Status	.031*
How Often Felt Nervous or Anxious in Past 30 Days x Race	.178
How Often Felt Depressed in Past 30 Days x Race	.345
How Often Felt Stressed in Past 30 Days x Race	.100

**Table 2: One-Way ANOVA-Anxiety/Stress/Depression**

Feel Able to Cope and Handle Life Stressors x Race	.862
How Often Felt Nervous or Anxious in Past 30 Days x Ethnicity	.072
How Often Felt Depressed in Past 30 Days x Ethnicity	.119
How Often Felt Stressed in Past 30 Days x Ethnicity	.396
Feel Able to Cope and Handle Life Stressors x Ethnicity	.900
How Often Felt Nervous or Anxious in Past 30 Days x BMI Category	.060
How Often Felt Depressed in Past 30 Days x BMI Category	.095
How Often Felt Stressed in Past 30 Days x BMI Category	.065
Feel Able to Cope and Handle Life Stressors x BMI Category	.210
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 3: One-Way ANOVA- BMI**

<b>Variables</b>	<b>P-Value</b>
BMI by Age	.280
BMI by Years of Employment	.891
BMI by Relationship Status	.338
BMI by Race	.939
BMI by Ethnicity	.282
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 4: One-Way ANOVA-Sleep**

<b>Variables</b>	<b>P-Value</b>
Hours of Sleep per Night x Age	.990
I Feel the Sleep is Quality Sleep x Age	.914
Difference in Quality of Sleep On-Duty Versus Off-Duty x Age	.485
Hours of Sleep per Night x Years of Employment	.441
I Feel the Sleep is Quality Sleep x Years of Employment	.539
Difference in Quality of Sleep On-Duty Versus Off-Duty x Years of Employment	.052
Hours of Sleep per Night x Relationship Status	.952
I Feel the Sleep is Quality Sleep x Relationship Status	.409
Difference in Quality of Sleep On-Duty Versus Off-Duty x Relationship Status	.893
Hours of Sleep per Night x Race	.369
I Feel the Sleep is Quality Sleep x Race	.838
Difference in Quality of Sleep On-Duty Versus Off-Duty x Race	.710
Hours of Sleep per Night x Ethnicity	.611
I Feel the Sleep is Quality Sleep x Ethnicity	.958
Difference in Quality of Sleep On-Duty Versus Off-Duty x Ethnicity	.715
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 5: One-Way ANOVA- Areas of Interest x Age**

<b>Variables</b>	<b>P-Value</b>
Attending Regular Presentations of Physical Activity Topics	.280
Receiving Regular Physical Activity Tips via Email	.350
Having Access to Web Resources on Physical Activity	.315
Getting Information on Existing Activities in the Area	.458
Point of Decision Prompts to Help Be More Active	.313
Joining Small Groups for Regular Activity	.367
Forming Clubs for Particular	.073
Discounted Memberships at Local Health Clubs, Recreation Centers, etc	.180
Participating in a Division-Wide Fitness Initiative with Friendly Competition Between Groups	.143
Attending Regular Presentations on Nutrition Topics	.580
Receiving Regular Healthy Eating Tips via Email	.480
Having Access to Web Resources on Nutrition/Healthy Eating	.262
Getting Information on Existing Food/Diet Groups in the Area	.220
Receiving Recipes/Healthy Meal Ideas	.296
Point of Decision Prompts to Help Eat Well	.739
Participating in Small Groups for Regular Information on a Healthy Diet	.454
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 6: One-Way ANOVA- Areas of Interest x Years of Employment**

<b>Variables</b>	<b>P-Value</b>
Attending Regular Presentations of Physical Activity Topics	.376
Receiving Regular Physical Activity Tips via Email	.275
Having Access to Web Resources on Physical Activity	.066
Getting Information on Existing Activities in the Area	.548
Point of Decision Prompts to Help Be More Active	.021*
Joining Small Groups for Regular Activity	.435
Forming Clubs for Particular	.031
Discounted Memberships at Local Health Clubs, Recreation Centers, etc	.066
Participating in a Division-Wide Fitness Initiative with Friendly Competition Between Groups	.263
Attending Regular Presentations on Nutrition Topics	.732
Receiving Regular Healthy Eating Tips via Email	.501
Having Access to Web Resources on Nutrition/Healthy Eating	.222
Getting Information on Existing Food/Diet Groups in the Area	.840
Receiving Recipes/Healthy Meal Ideas	.186
Point of Decision Prompts to Help Eat Well	.329
Participating in Small Groups for Regular Information on a Healthy Diet	.690
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 7: One-Way ANOVA- Areas of Interest x Relationship Status**

<b>Variables</b>	<b>P-Value</b>
Attending Regular Presentations of Physical Activity Topics	.299
Receiving Regular Physical Activity Tips via Email	.703
Having Access to Web Resources on Physical Activity	.900
Getting Information on Existing Activities in the Area	.718
Point of Decision Prompts to Help Be More Active	.306
Joining Small Groups for Regular Activity	.257
Forming Clubs for Particular	.868
Discounted Memberships at Local Health Clubs, Recreation Centers, etc	.583
Participating in a Division-Wide Fitness Initiative with Friendly Competition Between Groups	.894
Attending Regular Presentations on Nutrition Topics	.179
Receiving Regular Healthy Eating Tips via Email	.488
Having Access to Web Resources on Nutrition/Healthy Eating	.216
Getting Information on Existing Food/Diet Groups in the Area	.720
Receiving Recipes/Healthy Meal Ideas	.514
Point of Decision Prompts to Help Eat Well	.761
Participating in Small Groups for Regular Information on a Healthy Diet	.790
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 8: One-Way ANOVA- Areas of Interest x Race**

<b>Variables</b>	<b>P-Value</b>
Attending Regular Presentations of Physical Activity Topics	.470
Receiving Regular Physical Activity Tips via Email	.454
Having Access to Web Resources on Physical Activity	.846
Getting Information on Existing Activities in the Area	.456
Point of Decision Prompts to Help Be More Active	.648
Joining Small Groups for Regular Activity	.595
Forming Clubs for Particular	.753
Discounted Memberships at Local Health Clubs, Recreation Centers, etc	.867
Participating in a Division-Wide Fitness Initiative with Friendly Competition Between Groups	.385
Attending Regular Presentations on Nutrition Topics	.284
Receiving Regular Healthy Eating Tips via Email	.501
Having Access to Web Resources on Nutrition/Healthy Eating	.626
Getting Information on Existing Food/Diet Groups in the Area	.596
Receiving Recipes/Healthy Meal Ideas	.650
Point of Decision Prompts to Help Eat Well	.806
Participating in Small Groups for Regular Information on a Healthy Diet	.579
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 9: One-Way ANOVA- Areas of Interest x Ethnicity**

<b>Variables</b>	<b>P-Value</b>
Attending Regular Presentations of Physical Activity Topics	.157
Receiving Regular Physical Activity Tips via Email	.278
Having Access to Web Resources on Physical Activity	.777
Getting Information on Existing Activities in the Area	.330
Point of Decision Prompts to Help Be More Active	.393
Joining Small Groups for Regular Activity	.815
Forming Clubs for Particular	.804
Discounted Memberships at Local Health Clubs, Recreation Centers, etc	.906
Participating in a Division-Wide Fitness Initiative with Friendly Competition Between Groups	.220
Attending Regular Presentations on Nutrition Topics	.324
Receiving Regular Healthy Eating Tips via Email	.099
Having Access to Web Resources on Nutrition/Healthy Eating	.755
Getting Information on Existing Food/Diet Groups in the Area	.745
Receiving Recipes/Healthy Meal Ideas	.111
Point of Decision Prompts to Help Eat Well	.350
Participating in Small Groups for Regular Information on a Healthy Diet	.838
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

### Appendix D: Chi-Square Tests

<b>Table 1: Chi-Square-Physical Activity</b>	
<b>Variables</b>	<b>P-Value</b>
<b>Physical Activity x Age</b>	
Current Level of Physical Activity	.357
Time of Physical Activity	.646
<b>Physical Activity x Years of Employment</b>	
Current Level of Physical Activity	.926
Time of Physical Activity	.186
<b>Physical Activity x Relationship Status</b>	
Current Level of Physical Activity	.281
Time of Physical Activity	.347
<b>Physical Activity x Race</b>	
Current Level of Physical Activity	.428
Time of Physical Activity	.066
<b>Physical Activity x Ethnicity</b>	
Current Level of Physical Activity	.687
Time of Physical Activity	.753
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

**Table 2: Chi-Square-Nutrition**

<b>Variables</b>	<b>P-Value</b>
<b>Nutrition x Age</b>	
Intake of Fruits and Vegetables	.000**
Intake of High Fat Foods	.515
Intake of Whole Grains	.317
<b>Nutrition x Years of Employment</b>	
Intake of Fruits and Vegetables	.001*
Intake of High Fat Foods	.917
Intake of Whole Grains	.290
<b>Nutrition x Relationship Status</b>	
Intake of Fruits and Vegetables	.622
Intake of High Fat Foods	.675
Intake of Whole Grains	.939
<b>Nutrition x Race</b>	
Intake of Fruits and Vegetables	.001*
Intake of High Fat Foods	.946
Intake of Whole Grains	.329
<b>Nutrition x Ethnicity</b>	
Intake of Fruits and Vegetables	.005*
Intake of High Fat Foods	.275
Intake of Whole Grains	.674
Note: Significant at the $p < 0.05$ ; * $p < 0.05$	

### Appendix E: Readiness to Change Frequency Statistics

	Frequency	Percent	Valid Percent	Cumulative Precent
<b>I don't exercise or walk regularly now, and I don't plan to start in the near future.</b>	1	0.9	0.9	0.9
<b>I don't exercise or walk regularly, but I've been thinking about starting.</b>	16	14.4	14.4	15.3
<b>I'm doing moderate or vigorous physical activities for at least 30 minutes on some days, but fewer than five days a week.</b>	50	45	45	60.4
<b>I've been doing moderate or vigorous physical activities for at least 30 minutes in a day, on five or more days a week, and have been doing it for the last one to six months.</b>	18	16.2	16.2	76.6
<b>I've been doing moderate or vigorous physical activities for at least 30 minutes in a day, on five or more days a week, and have been doing it for seven months or longer.</b>	26	23.4	23.4	100
<b>Total</b>	111	100.0	100.0	

**Table 2: Frequency Table for Readiness to Change-Intake of Fruits and Vegetables**

	Frequency	Percent	Valid Percent	Cumulative Percent
<b>I don't eat fruits and vegetables regularly now, and I don't plan to start in the near future.</b>	3	2.7	2.7	2.7
<b>I don't eat fruits and vegetables regularly, but I've been thinking about starting.</b>	5	4.5	4.5	7.2
<b>I'm eating some fruits and vegetables a day (total of two servings or less).</b>	60	54.1	54.1	61.3
<b>I've been eating fruits and vegetables every day (total of three or more servings), for the last one to six months.</b>	31	27.9	27.9	89.2
<b>I've been eating five or more servings of fruits and vegetables every day, for more than six months.</b>	12	10.8	10.8	100
<b>Total</b>	111	100.0	100.0	

**Table 3: Frequency Table for Readiness to Change-Intake of High Fat Foods**

	Frequency	Percent	Valid Percent	Cumulative Present
I don't worry about the fat content of the food I eat and I don't plan to in the near future.	18	16.2	16.7	16.7
I eat high fat foods daily, but i've been thinking about trying to reduce my intake.	26	23.4	24.1	40.7
I limit my intake of high fat foods to one-three times/week.	54	48.6	50	90.7
I eat high fat foods less than once/week and have been for the past six months.	6	5.4	5.6	96.3
I eat high fat foods less than once/week and have been for more than six months.	4	3.6	3.7	100
<b>Missing</b>	3	2.7		
<b>Total</b>	111	100.0		

**Table 4: Frequency Table for Readiness to Change-Intake of Whole Grains**

	Frequency	Percent	Valid Percent	Cumulative Percent
I don't cook, eat or purchase whole-grain foods now, and I don't plan to start in the near future.	13	11.7	11.7	11.7
I don't cook, eat or purchase whole-grain foods regularly, but I've been thinking about starting.	16	14.4	14.4	26.1
I'm cooking, eating or purchasing whole-grain foods three-four times a week.	61	55.0	55.0	81.1
I've been cooking, eating or purchasing whole-grain foods every day, for the past one to six months.	11	9.9	9.9	91.0
I've been cooking, eating or purchasing at least three servings of whole-grain foods every day, for seven months or longer.	10	9.0	9.0	100.0
<b>Total</b>	111	100.0	100.0	