MILITARY READINESS: RELATIONSHIPS AMONG ALCOHOL USE, EATING HABITS, EXERCISE, AND BODY MASS INDEX

By

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A dissertation submitted to the

School of Public Health

and the

Graduate School – New Brunswick

Rutgers, State University of New Jersey

In partial fulfillment of the requirements for the degree of

Doctor of Philosophy

Graduate Program in Health Education and Behavioral Science

Written under the direction of

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New Brunswick, NJ

May 2017

ABSTRACT OF DISSERTATION

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Major roles of the United States (US) Armed Forces include "protecting the US against adversaries, serving as a defensive wall and guaranteeing the security and independence of the nation" (Department of Defense, 2013a, p. i). To sustain these roles, service members must maintain a high level of readiness that includes a high level of physical fitness, meeting body composition standards, being medically fit, and able to deploy to combat zones. An increased understanding of the relationships between behavioral factors that may influence military readiness can be used to shape health policy, direct health resources and improve health education. This dissertation examined the relationship between alcohol use, body composition, eating habits, physical activity and military readiness (passing the fitness test, ability to deploy, medical readiness and job performance). Seven hypothesized relationships were explored: (1) greater alcohol use would be negatively correlated with military readiness, (2) greater alcohol use would be positively correlated with BMI, (3) greater alcohol use would be associated with poorer eating habits, (4) alcohol use and physical activity would be reflected by an

inverted u-shaped curve**,** (5) BMI would mediate the relationship between alcohol use and military readiness, (6) eating habits would moderate the relationship between alcohol use and BMI, and (7) physical activity habits would moderate the relationship between BMI and military readiness. Additionally, a hypothetical model was examined using structural equation modeling regarding the hypothesized relationships and other socio-demographic and alcohol use characteristics.

## Acknowledgement

The Army Medical Department was paramount to my ability to excel in this program, providing the opportunity and funding. Without the encouragement and support of many mentors over the years, this accomplishment would have not been possible. I would like to extend my sincere appreciation for my advisor and dissertation chair, Dr. Patrick Clifford, for his guidance and mentorship throughout my time at Rutgers. I am confident the knowledge I have gained will continue to support my growth as a researcher. Thank you for sharing your passion for learning and teaching.

I would also like to thank my committee members, Dr. Christine Davis, Dr. Rick Boyd and Dr. Aaron Crombie. Dr. Davis, thank you for always being willing to brainstorm, listen and challenge me to seek out a greater understanding of statistical methods. Dr. Boyd, thank you for your thoughtful guidance and suggestions. Dr. Crombie, thank you for supporting my efforts, always being ready to provide insight and giving me the best advice upfront when I entered this program, which undoubtedly helped me to excel. Additionally, I would like to extend my appreciation for Dr. Jane Lewis for being willing to mentor, challenge and support my growth intellectually.

Finally, I would be amiss if I did not acknowledge those individuals in my personal life that helped me to earn this degree. To my fellow doctoral classmates, thank you for your friendship. To my husband, Saleem, thank you for being my rock, for having confidence in my abilities and sacrificing unselfishly during this time. To my sister Cassie, thank you for always being my sounding board. To Gina and Jose, thank you for your unwavering support; not only in caring for Mina, but also for your friendship. Without all of you this degree would not have been possible.

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## Chapter 1: Introduction

Major roles of the United States (US) Armed Forces include "protecting the US against adversaries, serving as a defensive wall and guaranteeing the security and independence of the nation" (Department of Defense, 2013a, p. i). To sustain these roles, service members must maintain a high level of readiness that includes physical fitness, meeting body composition standards, and being medically fit and able to deploy to combat zones. Each military branch has specific regulations outlining these requirements (United States Air Force [USAF], 1994; Department of the Army [DA], 2013; Department of the Navy, 2008; Department of the Navy, 2016; United States Coast Guard [USCG], 2015). In addition, military service includes very specific traditions and culture (e.g., hand salute, rank structure, drill and ceremony) that emphasize discipline, professional ethos, etiquette, and unit cohesion as well as additional subcultures within specific military communities such as the infantry, submariners and other specialized units (Jones & Fear, 2011; Ames G. , Cunradi, Moore, & Stern, 2007; Poehlman, et al., 2011).

Alcohol consumption has maintained a strong presence in military tradition and culture with moderate alcohol consumption used as a means to build unit cohesion. Alcohol also was used as a mechanism to decrease stress (Jones & Fear, 2011), for example, it was used by POWs during internment in prison camps during WWII (Cave, 2006). Even today alcohol has a role (e.g., the grog bowl at formal dining in ceremonies, alcohol is served in combat theaters during the super bowl and a 'Beer Day' can be permitted on a ship). However, heavy or high-risk consumption of alcohol can have negative effects on military readiness. Studies have linked alcohol use in the U.S. military to increased losses in productivity and increased financial costs (Harwood, Zhang, Dall, Olaiya, & Fagan, 2009). A study by Bray and Hourani (2005) found that the prevalence of heavy and frequent drinking in the military ranged from 15-20 percent of the individuals who completed a large-scale survey in 2005 and that these rates increased significantly from 1998 to 2002 and have remained constant from 2002 to 2005. Arrests related to alcohol use in the military have been estimated to cost $1.12 billion per year; a substantial cost that impacts force readiness (Harwood et al., 2009).

The effects of alcohol use goes beyond the financial and productivity costs for the military as excessive alcohol use places individuals at risk for negative health consequences. For example, frequent heavy alcohol consumption can affect the brain by slowing communication between neurotransmitters, weakens heart muscles, scars liver tissue, and damages the pancreas, among other debilitating illnesses (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2010), all of which can degrade military readiness.

Understanding the relationship between alcohol use, and body composition (which is evaluated using body mass index – a commonly used body composition measure), eating habits, and physical activity is important for the military population because of the specific requirements (e.g., body composition and physical fitness) for service and failing to meet these requirements can lead to separation. Alcohol use has been linked to changes in body composition, although the extant literature on this topic is varied. For example, moderate alcohol use has been associated in some samples with reduced risk of obesity, while binge drinking has been linked to higher risk of obesity; alcohol calories appear to be additive except in individuals diagnosed with alcohol use disorders where they replace food calories (Yeomans, 2010; Gruchow, Sobocinski, Barboriak, & Scheller, 1985; Addolorato G. , Capristo, Greco, Stefanini, & Gasbarrini, 1998; Addolorato G. , et al., 2006). Women who drink moderately are more likely to be underweight or at normal weight compared to non-drinkers (Thomson, et al., 2012). Alternatively, mean body mass index increased with greater alcohol consumption in men (Lahti-Koski, Pietinen, Heliovaara, & Vartiainen, 2002). Other studies, however, have found no difference in obesity levels for drinkers and nondrinkers (Gruchow et al., 1985; Colditz, et al., 1991) and some studies have found that BMI decreases as drinking increases (e.g., drinkers had lower BMIs than non-drinkers) or that a u-shape curve forms such that BMI increases with alcohol consumption until it reaches a peak where it decreases with heavier drinking (Gruchow et al., 1985; Colditz, et al., 1991; Yeomans, 2010; Williamson, et al., 1987). The relationship between alcohol use and body mass index has not been explored in the military population. This exploration could highlight the need to address alcohol use if it leads to increased BMI which is associated with a lower likelihood of passing the military physical fitness test (Gregg & Jankosky, 2012), poorer health (Gantt, Neely, Villafana, Chun, & Gharabaghli, 2008) and restrictions on deployment (Department of Defense), all of which negatively affect military readiness.

Alcohol use also has been shown to alter dietary habits. For example, several large surveys have found increased fat and protein, and decreased carbohydrate intake among drinkers (Colditz, et al., 1991; Gruchow, Sobocinski, Barboriak, & Scheller, 1985). Further, the type of foods eaten has been shown to differ with alcohol use (e.g., fruit and vegetable intake decreases, while ingestion of cheeses, meats and processed foods increase; Tolstrup, et al., 2005; Kesse, Clavel-Champelon, Slimani, van Liere, & E3N Group, 2001). In addition, alcohol related eating habits have been found to be a risk factor for obesity among college students, where greater alcohol consumption was related to infrequent breakfast intake, greater fast food consumption, a lower ingestion of fruits and vegetables, greater instances of overeating and making unhealthy food choices (Nelson, Lust, Story, & Ehlinger, 2009; Lloyd-Richardson, Lucero, DiBello, Jacobson, & Wing, 2008). The relationship between alcohol use and eating habits has not been explored in the military population, however. Poor eating habits as a result of alcohol use could have important implications for this population. For example, a service member who fails to meet body composition standards, (which has been shown to decrease physical performance levels) could receive administrative separation from service.

With respect to exercise, alcohol use has been shown to have a positive relationship with physical activity in several studies, with moderate drinkers, within multiple samples, being more physically active than abstainers (Musselman & Rutledge, 2010; Smothers & Bertolucci, 2001). Other studies, however, have not supported this association (Kopp, et al., 2015) or have found that the level of drinking (e.g., moderate vs. heavy) influences activity levels (Nelson, Lust, Story, & Ehlinger, 2009; Ejsing, Becker, Tolstrup, & Flensborg-Madsen, 2015). For example, a u-shape relationship was observed among women; those who consumed moderate amounts of alcohol had the highest activity levels (Wang, Lee, Manson, Buring, & Sesso, 2010). Furthermore, heavy drinking has been associated with improved vigorous and moderate cardiovascular and strength activity patterns among college students (Nelson et al., 2009), although, in other samples, heavy drinking has been associated with a more sedentary lifestyle (Ejsing, et al., 2015).

Physical performance has also been found to differ by drinking level. Studies conducted by Suter and Schutz (2008) found that alcohol use was associated with a decrease in physical performance and was correlated with a lower level of cardiovascular fitness (e.g., decreased running and cycling performance). Similarly, Prentice, Stannard, and Barnes (2015) reported that alcohol use was related to a reduction in lower body power output among rugby players. The relationship between physical activity and alcohol use has significant implications for the military population, which is expected to meet physical fitness standards. However, this relationship within the military has not been explored.

Given the above-noted associations with alcohol use and body mass index, eating habits, and physical activity and related implications for military readiness, the primary purpose of this study was to examine the associations between alcohol use, and eating habits, physical activity, and body mass index (BMI), and their relationships with military readiness (i.e., passing the physical fitness test, deployment status, job performance and medical fitness). A secondary purpose of this study was to conduct analyses to determine the utility of retaining as covariates, select socio-demographic and military alcohol use culture variables (i.e., military alcohol use culture, branch of service, gender, rank, marital status and service commitment).

This dissertation study examined the following research questions:

1. What is the relationship between alcohol use and military readiness?

**Hypothesis 1**: Greater alcohol use will be negatively correlated with military readiness.

2. What are the relationships between alcohol use and body mass index (BMI), alcohol use and eating habits, and alcohol use and physical activity?

**Hypothesis 2a:** Greater alcohol use will be positively correlated with BMI.

**Hypothesis 2b:** Greater alcohol use will be associated with poorer eating habits (i.e., a lower frequency of healthy foods and greater frequency of less healthy foods).

**Hypothesis 2c:** The association between alcohol use and physical activity will be reflected by an inverted u-shaped curve, such that low-to-moderate levels of alcohol use will be associated with higher levels of physical activity relative to no alcohol use and heavy alcohol use will be associated with lower levels of physical activity relative to low-to-moderate alcohol use.

3. Does BMI explain the relationship between alcohol use and military readiness?

**Hypothesis 3**: BMI will mediate the relationship between alcohol use and military readiness such that greater alcohol use will be associated with a higher BMI, which in turn will be associated with lower military readiness.

4. Do eating habits moderate the relationship between alcohol use and BMI (i.e., moderated-mediation)?

**Hypothesis 4**: Eating habits will moderate the relationship between alcohol use and BMI such that a higher frequency of healthier food intake will protect against higher BMI and a higher frequency of less healthy food intake will contribute to higher BMI.

5. Does physical activity moderate the relationship between BMI and military readiness (i.e., moderated-mediation)?

**Hypothesis 5**: Physical activity habits will moderate the relationship between BMI and military readiness such that greater physical activity will reduce the negative association between BMI and military readiness.

6. What are the factors affecting the relationship between alcohol use and military readiness?

**Hypothesis 6**: The hypothetical model presented in Figure 2 will be supported, (see Chapter 3, data analysis section).

This study addresses several gaps in the literature related to the understanding of alcohol use and its association with various lifestyle, cultural, and socio-demographic factors within the active duty military population. This study also has important public health and preventative service implications for military populations, provides greater understanding of the associations between alcohol use and eating habits, physical activity, and body mass index as well as their association with military readiness. Such understanding is important for policy decisions regarding alcohol use within the military, and may provide insight on where to focus military health resources. Additionally, this study may help to identify subpopulations within the military that might be at greater risk for decreased military readiness based on their alcohol use and its relationship to other behavioral and socio-demographic factors.

# Chapter 2: Literature Review

This chapter examines available literature on the associations between alcohol use, and eating habits, physical activity, body mass index (BMI), and their relationships with military readiness (i.e., passing the physical fitness test, deployment status, job performance and medical fitness). Additionally, it identifies secondary variables and provides reasoning for including, these select socio-demographic and military alcohol use culture variables (i.e., military alcohol use culture, branch of service, gender, rank, marital status and service commitment) as covariates.

This literature review is presented in five sections. Section one entitled, 'Alcohol Use and Military Readiness', presents a review of the literature specific to alcohol use and military readiness. Section two 'Alcohol Use and Body Composition', presents a review of the literature specific to the relationship between alcohol use and body mass index. Section three 'Body Composition and Military Readiness', presents a review of the literature specific to the relationships between body mass index and military readiness and provides reasoning for examining the relationship between alcohol use and BMI. Section four 'Alcohol Use and Eating Habits', presents a review of the available literature specific to the relationship between alcohol use and eating habits. Finally, section five 'Alcohol Use and Physical Activity', presents a review of the available literature on the relationships between alcohol use and physical activity.

## 2.1 Alcohol Use and Military Readiness

Alcohol consumption has maintained a strong presence in military tradition and culture with moderate alcohol consumption used as a mechanism to build unit cohesion, a catalyst for bonding, historically as a mechanism to mediate stress (Jones & Fear, 2011).

Additionally, moderate to heavy drinkers in the military reported believing alcohol use was a "characteristic of military culture, that supervisors tolerated it and that it was the only recreational activity available" (Bray, et al., 2006, p. 93). The most commonly reported reasons for consuming alcohol by military members have included "celebration, relaxation, to be more sociable, to make things more fun, and to enjoy party situations" (Bray, et al., 2006, p. 93). A smaller number of service members also reported that they used alcohol to forget about personal problems and to improve mood (Bray, et al., 2006).

Heavy or high-risk consumption of alcohol has been associated with negative consequences and lower job performance within the military. Heavy alcohol drinkers reported greater rates of serious consequences (e.g., being passed over for promotion, loss of one week or more of work, arrests, etc.) and more than twice the rate of productivity loss compared to moderate drinkers (Mattiko, Olmsted, Brown, & Bray, 2011). The prevalence of heavy and frequent drinking in the military has been found to range from 15-20 percent; these rates increased significantly from 1998-2002 and have remained constant (Bray & Hourani, 2007). Trend analyses have shown a general increase in heavy alcohol use among active duty military members since the 1980s that remains even after adjusting for socio-demographic changes within the population overtime (Bray & Hourani, 2007; Bray, et al., 2006). Arrests related to alcohol use in the military are estimated to cost $1.12 billion per year; a substantial cost that impacts force readiness (Harwood, Zhang, Dall, Olaiya, & Fagan, 2009). An ethnographic study by Ames et al. (2007) identified several themes among Navy careerists related to alcohol use: consumption of alcohol was associated with a conflict between policy and tradition, young single members were more likely to be identified as drinking heavily, and normative beliefs about the use of alcohol were associated with heavy and heavy episodic drinking during liberty as well as year-round alcohol abuse. These findings indicate that although there are policies to deter alcohol consumption, heavy alcohol use continues to be prevalent within the military ranks, thus negatively affecting military readiness.

Alcohol use has been found to differ by certain characteristics within the military for example, by age, marital status, gender, branch, and geographic locations (Bray, et al., 2006). In all branches, rates of heavy drinking are higher in men than women (Ames & Cunradi, 2004; Bray, Fairbank, & Marsden, 1999; Bray, et al., 2006). Women were more likely to abstain, be light or moderate drinkers, while service men tended to have an greater prevalence of alcohol related problems (Brown, Bray, & Hartzell, 2010). Younger, unmarried personnel who were on their first assignment were identified among a group of Marine and Navy personnel, as those most likely to consume alcohol (Poehlman, et al., 2011). This was supported by Ames and Cunradi (2004) who found that young men in each service branch had significantly higher rates of heavy drinking (32.2%) than their civilian comparison group (17.8%). In general, the prevalence of drinking among all military personnel has been found to be higher than among civilians (Bray, Fairbank, & Marsden, 1999; Bray, Marsden, & Peterson, 1991), which lends to the importance of this study and examining the relationships of alcohol use and other behavioral factors.

A review of the literature regarding the relationships between alcohol use and rank and alcohol use and gender in the military revealed that alcohol use differs across the ranks and within the ranks by gender. Specific to rank, officers in general had relatively low rates of heavy drinking for both men and women. However, the “2005

Department of Defense (DOD) Health Related Behaviors Survey for Active Duty Military Personnel" found that heavy drinking had significantly increased among junior officers since the 1980s (Bray, et al., 2006; Bray & Hourani, 2007). Female officers were more likely to be moderate to moderate heavy drinkers compared to enlisted females who were more likely to binge drink (defined as: "consuming five or more drinks on the same occasion at least once in the past 30 days"; Brown, Bray, & Hartzell, 2010). A larger percentage of male officers were found to be moderate or moderately heavy drinkers compared to enlisted males who were more likely to be heavy or binge drinkers and to have higher rates of dependence symptoms, productivity losses and serious consequences (Brown, Bray, & Hartzell, 2010). Additionally, junior officers (those below the rank of Major) were more likely to drink heavily compared to senior officers (Bray, et al., 2006).

Rates of binge drinking (defined as more than five drinks on one occasion) were shown to differ by characteristics (e.g., age, small group setting). Binge drinking has been shown to be more common among male service members and in individuals between the age of 18-25, and it was found to occur most often in small group settings (Bray, et al., 2006). Binge drinking, among college students has led to individuals engaging in more risky behaviors (e.g., having unprotected sex, missing classes, regretting their actions among other detrimental behaviors, and physical consequences, in studies, Bennett, Miller, & Woodall, 1999; Wechsler, Davenport, & Dowdall, 1994). Within the military population, binge drinking has been associated with illegal military behavior (e.g., violation of a direct order, late for muster, unauthorized absence), illicit civil behaviors (e.g., larceny, possessing an open container of alcohol) and unlawful civil behavior (e.g., underage drinking, driving under the influence) all of which can negatively affect military readiness (Ong & Joseph, 2008; Bray, et al., 2006). These findings indicate that rank and gender should be considered when examining the relationship between alcohol use and other behavioral factors as well as alcohol use and military readiness.

Alcohol use has been shown to vary by military service branch. Bray et.al (2006) found that the percentage of heavy drinkers differed across branches, with the lowest rates among Air Force personnel (10.3%) followed by the Navy (17.0%), the Army (24.5%), and finally the Marine Corps who had the highest prevalence of heavy drinking (25.4%). Not surprisingly, the results of this survey also showed that rates of self-reported "one binge-drinking episode (defined as five or more drinks on the same occasion) in the past month" were found to vary by branch. More specifically, the lowest and highest reported rates, respectively, were among the Air Force (33.9%) and the Marine Corps (53.2%) personnel. In addition, "drinking to the point of feeling drunk more than six times in the previous year" varied by branch: Air Force (23.0%), Army (40.1%), Navy (30.1%), and Marine Corps (44.4%); Bray, et al., 2006). This difference across the branches demonstrates the need to consider branch of service when evaluating alcohol use within the military.

Studies have linked heavy alcohol use in the U.S. military to lower productivity and greater financial costs. (Harwood, Zhang, Dall, Olaiya, & Fagan, 2009; Bray, et al., 2006). Productivity loss related to alcohol use level has been shown to be higher among heavy drinkers. Specifically, heavy drinkers were more likely than light drinkers to be late for work, leave work early and to work below normal levels (Fisher, Hoffman, Austin-Lane, & Koa, 2000; Bray, et al., 2006). A trend study by Bray et.al (2006) found that productivity losses related to alcohol consumption increased in 2002 to 17.3% up from 13.6% in 1998 and then decreased in the active duty population to 13.2% in 2005 although heavy alcohol levels have remained constant.

Productivity losses and heavy drinking have been shown to co-vary across branches of the military. In this regard, alcohol use and reduced productivity, amongst the heaviest drinking individuals, across military branch of service have been estimated at: 19.8% and 42.9%, respectively, within the Marine Corps; 15.4 % and 35.1%, respectively, within the Army; 13.4% and 37.5% within the Navy; and 7.4% and 27.6%, respectively, within the Air Force (Bray, et al., 2006). This relationship demonstrates the importance of considering the effect of alcohol use on productivity and job performance as it relates to military readiness.

Research investigating the relationships between alcohol use and physical fitness, and heavy alcohol use and physical injuries is limited in this population. One study of primarily male service members found that physical fitness performance, injury or sick/absence days were not significantly related to heavy alcohol consumption (Zadoo & Fengler, 1993). A recent study by Kazmen et al. (2015) found that women in the Army who reported binge drinking (defined as 5 drinks on any one occasion) in the previous six months were more likely to report physical injury and to report seeking medical care than those who did not report binge drinking. Passing the physical fitness test, however, was not significantly associated with drinking level. These relationships between alcohol use, physical activity, and passing the physical fitness test, two important elements of military readiness are examined further in this dissertation.

Heavy alcohol use can have devastating negative effects on the body as it can affect the brain by slowing the pace of communication between neurotransmitters, weaken the heart muscle, and lead to scarring of the liver and pancreas among other debilitating illnesses (National Institute on Alcohol Abuse and Alcoholism [NIAAA], 2010) all of which can decrease military readiness. This relationship between alcohol use and the likelihood of developing other medical conditions (e.g., high blood pressure, high cholesterol, high blood sugar, high triglycerides, and low HDL cholesterol) has not been examined previously in this population and is examined in this dissertation as it pertains to military readiness.

Finally, the relationship between alcohol use and a military member's ability to deploy to an austere environment has had minimal exploration. A study by Ong and Joseph (2008) examined the relationship between alcohol use and negative consequences of military members stationed in Okinawa, Japan. This study highlighted challenges (i.e., separation from family and friends, limited resources and recreational activities, increased deployments and restrictive local laws) that service members face and identified maladaptive alcohol consumption as a coping mechanism among young, single, junior service members that placed them at increased risk for engaging in negative behavior that resulted in a referral for alcohol treatment (Ong & Joseph, 2008). Other studies have looked at alcohol use trends after deployment (Federman, Bray, & Kroutil, 2000); however, no studies were identified that specifically examined the relationship between alcohol use and the relationship with a military member's ability to deploy.

**2.2 Alcohol Use and Body Composition**

Alcohol use has been associated with body composition, although the extant literature on this topic is varied. Previous studies have found different associations between alcohol and body mass index (a common measure of body composition). A positive association (Lahti-Koski, Pietinen, Heliovaara, & Vartiainen, 2002; Wannamethee & Shaper, 2003) or null association (Colditz, et al., 1991; Gruchow, Sobocinski, Barboriak, & Scheller, 1985) has been found among men while a positive, (French, Popovici, & Maclean, 2009; Grucza, et al., 2010; Nelson, Lust, Story, & Ehlinger, 2009; Shelton & Knott, 2014; Lloyd-Richardson, Lucero, DiBello, Jacobson, & Wing, 2008) inverse, (Wang, Lee, Manson, Buring, & Sesso, 2010; Gruchow, Sobocinski, Barboriak, & Scheller, 1985; Colditz, et al., 1991), and null (Lahti-Koski, Pietinen, Heliovaara, & Vartiainen, 2002) relationships have been found among women. Along these lines, light-to-moderate female drinkers have been found to have a lower risk of becoming overweight or obese compared to nondrinkers (Wang, Lee, Manson, Buring, & Sesso, 2010).

Moderate alcohol use has been associated, in some samples, with reduced risk of obesity; while binge drinking has been linked to higher risk of obesity. Alcohol calories appear to be additive except among individuals diagnosed with an alcohol use disorders who replace food calories with calories derived from alcohol (Yeomans, 2010; Gruchow, Sobocinski, Barboriak, & Scheller, 1985; Addolorato, Capristo, Greco, Stefanini, & Gasbarrini, 1998; Addolorato, et al., 2006).

In studies of individuals who were moderate-to-moderate heavy drinkers, the literature is varied. Studies have found that alcohol intake among males contributed to weight gain and obesity; with the odds ratio for a high BMI increasing progressively from light-moderate to the heavy and very heavy groups (Wannamethee & Shaper, 2003). Increased BMI also has been observed among moderate-risk drinking college students relative to non-drinkers and low-risk drinkers (Lloyd-Richardson, Lucero, DiBello, Jacobson, & Wing, 2008). Although moderate drinking has been associated with increased BMI among men (Wannamethee & Shaper, 2003), it has not been associated with incident overweight or obesity in women (Thomson, et al., 2012). Additionally, physically active moderate drinkers, both male and female, who consumed healthy foods, appeared to maximize the likelihood of having a normal body weight (Lahti-Koski, Pietinen, Heliovaara, & Vartiainen, 2002). Other studies, however, have found no difference in BMI across drinkers and nondrinkers and reported that the relationship between alcohol consumption and BMI only existed for waist to hip ratio differences among men (Sakurai, et al., 1997). On the other hand, some studies have found that BMI decreases as drinking increases (e.g., drinkers had lower BMIs than non-drinkers) or that a u-shape or j-shape curve forms such that BMI is lowest at the intermediate drinking level (Gruchow, Sobocinski, Barboriak, & Scheller, 1985; Colditz, et al., 1991; Yeomans, 2010; Williamson, et al., 1987; Liangpunsakul, Crabb, & Qi, 2010; Lukasiewicz, et al., 2004).

Binge drinking (defined as: consuming $\geq$ 5 drinks in one setting) has been linked to higher risk of obesity and has been found to be associated with alcohol related eating among college students, poor diet, unhealthy weight control practices, body dissatisfaction and sedentary behaviors (Nelson, Lust, Story, & Ehlinger, 2009). This is important because recent survey data indicate that binge-drinking rates are substantially higher within the military relative to the civilian population. For example, the Health Related Behaviors Survey (HRBS) data indicated that the active duty military binge-drinking rate was 41.8% in 2002 and 44.5% in 2005. Furthermore, the 2011 HRBS report stated that approximately 1/3 of active duty service members reported binge drinking in the previous 30 days (Bray, et al., 2006; Barlas, Higgins, Pflieger, & Diecker, 2013).

Studies of heavy alcohol drinkers have found greater caloric intake from alcohol, lower food consumption, and a higher resting energy expenditure rate (REE). Furthermore, individuals with heavy alcohol use have increased energy needs resulting in an underweight or normal weight status (Addolorato, Capristo, Greco, Stefanini, & Gasbarrini, 1998; Levine, Harris, & Morgan, 2000), which could partially explain why a negative association between heavy alcohol consumption and BMI is observed. Research has indicated that individuals with an alcohol use disorder (AUD) have lower BMIs, are underweight with caloric malnutrition, and lower fat mass. Some individuals also experience protein energy malnutrition, which is a great concern regarding the physical performance capabilities of military service members (Addolorato, et al., 2006).

In addition studies have shown that heavy alcohol consumption contributes directly to weight gain regardless of the type of alcohol ingested (Wannamethee & Shaper, 2003; French, Popovici, & Maclean, 2009), although the strength of this relationship is higher among males. Additionally, studies examining individuals in recovery from alcohol and other drug addiction have found that recovering individuals tend to be overweight or obese and that BMI was highest among male former drinkers (Breslow, Guenther, Juan, & Graubard, 2010).

The varied findings specific to the relationship between alcohol use and BMI across studies, may be attributed, at least in part, to a number of complex interrelationships between alcohol use and other factors, to include: social (e.g., geographic location, type of alcohol consumed, physical activity habits, social relationships), clinical (e.g., medical conditions), metabolic (e.g., alcohol metabolism) and other (e.g., changes in food preferences). For example, the French cohort study sample consisted of all women who consumed 61.5% of their alcohol as wine, and the Japanese service officer sample was all male and consumed <1% of their alcohol as wine. (Sakurai, et al., 1997; Kesse, Clavel-Champelon, Slimani, van Liere, & E3N Group, 2001). Changes in taste preferences associated with alcohol consumption also may partially explain the positive association between alcohol ingestion and BMI. In this regard, Krahn et al. (2006) reported that individuals who drink alcohol regularly were more likely to prefer sweeter tasting beverages, and that this taste preference increased significantly among individuals who did not maintain periods of alcohol abstinence.

Other sample characteristics should also be noted. For example, the average sample age varied substantially across reported studies. A large majority of the studies related to BMI and alcohol use focused on college-aged individuals (Lloyd-Richardson, Lucero, DiBello, Jacobson, & Wing, 2008). Other study samples included adult cross-sectional national surveys (Kesse, Clavel-Champelon, Slimani, van Liere, & E3N Group, 2001; French, Popovici, & Maclean, 2009; Breslow, Guenther, Juan, & Graubard, 2010; Liangpunsakul, Crabb, & Qi, 2010; Rissanen, Heliovaara, Knekt, Reunanen, & Aromaa , 1988), smaller study samples of adult working or retired individuals (Jones, Barrett-Connor, Criqui, & Holdbrook, 1982; Sakurai, et al., 1997; Westerterp, Meijer, Goris, &

Kester, 2004) or individuals diagnosed with an alcohol use disorder versus alcohol users (Addolorato, Capristo, Greco, Stefanini, & Gasbarrini, 1998; Addolorato, et al., 2006). Uncontrolled lifestyle characteristics related to eating habits, exercise habits, and other factors (e.g., medical conditions, occupation, etc.) also may have differed significantly across studies.

Other factors that may contribute to the varied findings include measurement and operationalization of variables, particularly the alcohol use and body composition measures. For example, some studies examined total alcohol consumption, while other studies focused on binge drinking (defined as: 5 drinks in one setting). In addition, some studies classified individuals into alcohol use categories (e.g., nondrinkers, moderate, moderate heavy and heavy; French, Popovici, & Maclean, 2009), while other studies addressed comparisons among abstinent or low risk drinkers and moderate-risk drinkers (Lloyd-Richardson, Lucero, DiBello, Jacobson, & Wing, 2008) or focused on heavy drinkers (Addolorato, et al., 2006).

The relationship between alcohol use and body mass index has not been explored in the military population and is examined in this dissertation, with regards to military readiness.

**2.3 Body Composition and Military Readiness**

While the previous section presented information related to alcohol use and BMI, this section explores why this relationship is important for the military. Rates of overweight and obese individuals continues to increase among American adults (National Institute of Diabes and Digestive and Kidney Diseases, 2008), and the United States Military is no exception. The military has seen a surge in its overweight and obesity rates. The combined prevalence of overweight and obese individuals in the military was 57.2% in 2002 and this percent increased in 2005 to 60.5% (Smith, et al., 2012). Factors associated with a greater likelihood of being overweight or obese in this population have included being greater than 40 years old, male, married, or an ethic/racial minority (Smith, et al., 2012). Obesity is categorized as a leading contributor to many health conditions such as heart disease, stroke, diabetes and some cancers (Center for Disease Control (CDC), 2010). Being overweight or obese has been associated with greater incidence of poor health conditions such as hypertension and hyperlipidemia as well as significantly greater health care costs (Gantt, Neely, Villafana, Chun, & Gharabaghli, 2008). Development of these health concerns can be detrimental to military readiness and in some cases may result in disqualification from service (Department of Defense [DoD], 2010). Additionally, having a higher BMI has been associated with lower work productivity. More specifically, individuals with a BMI $\geq$ 35 were found to have the greatest reduction in work productivity (i.e., requiring more time to complete tasks and more limitations related to physically demanding jobs; Gates, Succop, Brehm, Gillespie, & Sommers , 2008).

All branches of the military require their members to meet specific height and weight standards, body fat standards, and physical fitness standards (Department of the Army, 2013; Department of the Navy, 2008; United States Air Force, 2013; United States Coast Guard [USCG], 2015). Failing to meet these standards can result in negative performance ratings and administrative separation from the service resulting in greater costs to recruit and train personnel (i.e., $\geq$ $48K per new recruit; U.S. Department of Defense PharmacoEconomic Center, 2010). A service member's ability to deploy also diminishes with a higher BMI. Current U.S. Central Command policies state that individuals with a BMI>35 with other comorbidities will be considered non-deployable unless they have a waiver and are in compliance with body fat standards (United States Central Command [USCENTCOM], 2011).

Body mass index has been linked to lower physical fitness within the military. Having an overweight or obese BMI (BMI >25 or BMI >30) was found to result in a 14 times higher odds ratio of failing a physical readiness test among male Navy personnel (Gregg & Jankosky, 2012). Previous studies addressing increased BMI within the military population have found an association with lower levels of passing the military physical fitness test (Gregg & Jankosky, 2012), poorer health (Gantt, Neely, Villafana, Chun, & Gharabaghli, 2008) and restrictions on deployment, which negatively affects military readiness. Obese individuals at a major Naval Medical Center were found to be two times more likely to fail their fitness test and to be diagnosed with hypertension than normal weight service members (Gantt, Neely, Villafana, Chun, & Gharabaghli, 2008).

Individuals who serve in the military confront many of the same environmental and social factors that have been associated with weight gain in civilian samples (e.g., high calorie foods and beverages, alcohol consumption, stress, rapid eating and sedentary activity level, etc.) (Otsuka, et al., 2006; Gaesser, 2007; Wardle, Chida, Gibson, Whitaker, & Steptoe, 2011; Crumm, Dessieux, Andrews, & Thompson, 2006). However, military members may be more likely to experience additional stress elements, related to their career path (e.g., deployments, family separations, physically demanding job, universal healthcare, etc.), that influence weight gain. A Navy study found that the odds of being overweight or obese were 22% higher on a short submarine than on an aircraft carrier (Gregg & Jankosky, 2012). Additionally, the long tradition of alcohol use (e.g., as a catalyst for unit cohesion, during formal ceremonies, etc.) may be associated with weight changes, although the available data are sparse.

**2.4 Alcohol and Eating Habits**

Eating habits have been shown to be associated with alcohol use although the relationship varies across studies. Some studies have found a positive association between alcohol use and total caloric intake (i.e., total energy intake increased with higher alcohol consumption; Colditz, et al., 1991; Jones, Barrett-Connor, Criqui, & Holdbrook, 1982; Bebb, Houser, Witshci, Littell, & Fuller , 1971; Fisher & Gordon, 1985; Breslow, Guenther, Juan, & Graubard, 2010; Yeomans, 2010). Other studies however, have found that alcohol use is associated with a lower energy intake or that alcohol ingestion replaces energy from other food (Carels, et al., 2008; Barboriak, Rooney, Leitschuh, & Anderson, 1978; Hillers & Massey, 1985; Addolorato, Capristo, Greco, Stefanini, & Gasbarrini, 1998; Addolorato, et al., 2006). Eating habits (specifically, greater calorie intake) have been shown to be related to changes in body mass index (BMI) (Howarth, Huang, Roberts, Lin, & McCrory, 2007).

Alcohol use also has been associated with differences in dietary habits (e.g., types of foods eaten, frequency of eating, and consumption of breakfast). Female college students were shown to be less likely to engage in alcohol related eating than their male counterparts (Nelson, Lust, Story, & Ehlinger, 2009). Alternatively, among adults, both male and female, increased alcohol ingestion results in reduced diet quality, and among former and current female drinkers greater energy intake. (Breslow, Guenther, Juan, & Graubard, 2010) . Several studies have found that alcohol calories are additive calories for light and moderate drinkers and that changes occur in dietary composition (Breslow, Guenther, Juan, & Graubard, 2010; Gruchow, Sobocinski, Barboriak, & Scheller, 1985). Several large surveys have found increased fat and protein and decreased carbohydrate intake among drinkers (Colditz, et al., 1991; Gruchow, Sobocinski, Barboriak, & Scheller, 1985). Additionally, the type of foods eaten has been shown to differ with alcohol use (e.g., fruit and vegetable intake was lower, while ingestion of cheeses, meats and processed foods was higher with alcohol use) (Tolstrup, et al., 2005; Kesse, Clavel-Champelon, Slimani, van Liere, & E3N Group, 2001; Wang, Lee, Manson, Buring, & Sesso, 2010). A French cohort study found that there were substantial differences in dietary patterns and nutrient intake that varied with alcohol consumption among a cohort of women drinkers who consumed greater amounts of overall calories and more cheese, processed meat, seafood, vegetable oil, poultry, coffee, potatoes, eggs and lamb (Kesse, Clavel-Champelon, Slimani, van Liere, & E3N Group, 2001). An additional study echoed these findings among men and women finding that drinkers consumed less total fruit, larger amounts of fat and added sugars and that energy and protein greater. Specifically in men, the diet quality score was lower with greater alcohol consumption (Breslow, Guenther, Juan, & Graubard, 2010). However, not all studies have found a positive association with less healthy food and alcohol. For example, a negative association was found between frequency of alcohol ingestion and consumption of chocolate and junk food among women but not men (Worsley, Wang, & Hunter, 2012), and a study of Scottish men found that energy intake was higher in nondrinkers and heavy drinkers compared to those with low and medium alcohol intake levels (Thomson, et al., 1988).

Alcohol related eating also has been found to be a risk factor associated with obesity among college students, where greater alcohol use was shown to result in infrequent breakfast intake, greater fast food consumption and lower ingestion of fruits and vegetables, greater rates of overeating and making unhealthy food choices (Nelson, Lust, Story, & Ehlinger, 2009; Lloyd-Richardson, Lucero, DiBello, Jacobson, & Wing, 2008). Alcohol consumption was related to compensatory eating behaviors among a college age sample that reflected an association between alcohol consumption and eating habits among females such that caloric control strategies related to drinking were more likely to reflect changes in food consumption (i.e., increased consumption of low-fat and low-calorie foods, or reduction in total calorie intake) to compensate, whereas both males and females reported greater rates of exercising and calorie restriction strategies (Bryant, Darkes, & Rahal, 2012).

The relationship between alcohol and eating habits among individuals receiving treatment for an alcohol use disorder (AUD) can provide some insight into food consumption patterns among heavy alcohol consumers. Individuals receiving treatment for an AUD have been found to have poor eating habits, dysfunctional eating patterns, and to suffer co-morbid eating disorders (Jackson & Grilo, 2002). This realtionship between alcohol use and eating is important as eating behaviors may vary with different levels of alcohol use and this association (i.e., alcohol use and eating habits) has not been explored within a military population.

**2.5 Alcohol Use and Physical Activity**

The extant literature indicates that physical activity is associated with alcohol use, although the relationship varies across studies, as well. Multiple studies have found that alcohol use was associated with overall physical activity such that the amount of physical activity varies with level of alcohol consumed but varies based on sample characteristics (e.g., gender, past military service) and exercise intensity (i.e., moderate vs. vigorous). Some studies have found a positive association (Lisha, Martens, & Leventhal, 2011; Smothers & Bertolucci, 2001; Jurakic, Golubic, Pedisic, & Pori, 2014; Wang, Lee, Manson, Buring, & Sesso, 2010) between alcohol ingestion and physical activity, while others failed to support such an association (Sakurai, et al., 1997; Blair, Jacobs, & Powell, 1985) or found an inverse relationship (Liangpunsakul, Crabb, & Qi, 2010; Jones, Barrett-Connor, Criqui, & Holdbrook, 1982).

In studies that compared drinkers vs. nondrinkers, a positive association was found between drinkers and physical activity such that individuals who drank were more likely to be physically active relative to nondrinkers and former drinkers (Smothers & Bertolucci, 2001; Higgins, Gaul, Gibbons, & Van Gyn, 2003; Pate, Heath, Dowda, & Trost, 1996). Other studies, however, have found moderate alcohol consumers had the greatest amount of physical activity compared to non-drinkers or heavy drinkers (Mukamal, Ding, & Djousse, 2006; Smothers & Bertolucci, 2001).

Binge drinking has been found to be associated with greater moderate and vigorous, physical activity as well as strength training exercise among college students (Nelson, Lust, Story, & Ehlinger, 2009). College students were found to be more likely to meet the current moderate and vigorous physical activity recommendations if they participated in one or more episodes of binge drinking (Dinger, Brittain, & Hutchinson, 2014). Heavy drinking, on the other hand, has been associated with a more sedentary lifestyle (Ejsing, Becker, Tolstrup, & Flensborg-Madsen, 2015; Seo, et al., 2014).

Heavy alcohol use has been associated with deteriorated physical capabilities and mental performance such as detriments in longer duration anaerobic activities, cognitive function impairments in memory retrieval, attention and reaction time associated with the hang-over state (Suter & Schutz, 2008).

Age and gender may moderate the relationship between alcohol use and exercise such that higher levels of vigorous activity is associated with greater alcohol use among individuals less than 50 years of age (Lisha, Martens, & Leventhal, 2011), and moderate physical activity may have a stronger relationship with alcohol use among males (Jurakic, Golubic, Pedisic, & Pori, 2014). Additionally, higher levels of physical fitness have been associated with lower alcohol intake among women, but not men (Blair, Jacobs, & Powell, 1985). A u-shaped curve reflects the association between alcohol use and physical activity such that individuals reporting intermediate amounts of alcohol use also report the greatest level of physical activity (Wang, Lee, Manson, Buring, & Sesso, 2010). This relationship has been supported by other studies showing that moderate drinkers are almost twice as likely as abstainers to display a physically active lifestyle and vigorous intensity exercise (Smothers & Bertolucci, 2001).

Ultimately, high levels of alcohol intake may negatively impact physical performance, which is an essential component of military readiness (i.e., passing the fitness test) but has not been examined within a military population.

**2.6 Summary**

Examining the relationships between service member eating habits, body mass index, physical activity, and alcohol consumption patterns is an important component of understanding their contribution to military readiness. This dissertation has important public health and preventive service implications for military populations, can provide greater insight into understanding the relationships between alcohol use, eating, physical activity, body mass index, and military readiness. Such information is important for policy decisions regarding alcohol use and the allocation of health resources within the military. Additionally, this study may help to identify subpopulations within the military that might be at greater risk for decreased military readiness based on their alcohol use, BMI, eating habits, and physical activities.

# Chapter 3: Methods

A subset of data obtained from the cross-sectional "2011 DoD Health Related Behaviors Survey (HRBS) of Active Duty Military Personnel" was used for investigating study hypotheses. Study procedures specific to the HRBS are discussed in this chapter, which is divided into three sections: (1) Data Source; (2) Variable Operationalization; and (3) Data Analysis Plan.

## 3.1 Data Source

The "2011 DoD Health Related Behaviors Survey (HRBS) of Active Duty Military Personnel" was a large (N=39,877), web-based, voluntary survey that gathered data on self-reported health behaviors that could impact the health, well-being and military readiness of active duty military personnel. The HRBS covered multiple topics including: substance use, stress and mental health, combat exposure and deployment, weight management and fitness, and general health. The format of the survey questions and responses allowed for benchmarking to the Healthy People objectives (e.g., assessing if the military population met the healthy people physical activity objectives). All survey questions were developed by groups of experts in specific areas and pre-tested on junior enlisted service members prior to survey implementation. Detailed information related to the survey is provided in the "DoD Final Report for the 2011 Survey" (Jeffery, et al., 2013).

The 2011 HRBS survey was conducted as a web-based survey that was delivered to all eligible members of the population through the use of organizational email accounts. The survey invitations were distributed using staggered start dates with DoD participant notifications starting August 19, 2011 and United States Coast Guard (USCG) participant notifications starting October 4, 2011. Each participant received an initial invitation and three reminder post cards. The invitations and postcards contained the URL for the survey, a link to command support letters emphasizing the survey importance, and provided contact information for the survey helpdesk. Individuals who were identified as not having a valid email (i.e., the message returned undeliverable) were mailed an invitation and up to three post cards to their home address. The survey closed on January 11, 2012 for all participants.

**Survey sample.** The target population for the 2011 Health Related Behaviors Survey was all active duty members of the DoD, which included the Air Force, Army, Marine Corps, Navy and the United States Coast Guard (USCG) who were not deployed. The DoD survey population (N = 1,222,627) was identified from the Defense Manpower Data Center's (DMDC) July 2011 Active Duty Master Edit File (ADMF) for Air Force (N=303,760), Army (N=458,503), Marine Corps (N=173,969), and Navy (N=286,395). The Coast Guard survey population (N=39,624), was identified from the master census file current as of July 15, 2011. The DoD population was further defined by service branch, gender and rank to ensure adequate representation, which was used for sample weighting (see Appendix A., Table A1 for overall DoD characteristics).

Jeffrey et al. (2013) described a different sampling method for the Coast Guard group. The USCG was divided into two groups, a site-centered cluster sample (N=11,405) (with randomly assigned in-person participants (N=5,703) and an on-site web participant group (N=5,702). The remaining USCG group (i.e., those not selected for either of the on-site groups) was eligible for selection via an online survey sample (N=9,609) using stratified random sampling and their institutional email. The USCG web-distribution groups included individuals who were selected by stratified random sampling defined by work setting (air, afloat, ashore), gender and pay grade and those that were not included in the on-site groups. This dissertation study limited the USCG members to the web-based groups ($N$ = 14,771). The overall Coast Guard sample characteristics are presented in the Appendix A, Table A2.

After development of the sampling frame, an initial non-proportional stratified random sample of 281,872 members were selected from each service branch and divided into 12 sub strata based on six pay grades and gender, which was used for sample weighting. Jeffery et al. (2013) described the sample selection procedure as follows: "sample members were selected within each group with equal probability without replacement" (pg.11). This initial sample ($N$ = 281,872) was then randomly divided into three groups, primary send ($N$ = 118,971), holdback group one ($N$ = 83,121) and holdback group two ($N$ = 79,780). Based on response rates, the primary group and a randomly selected portion of hold back group one ($N$ = 36,797) were invited to complete the survey. The remainder of hold back group one ($N$ = 46,324) and hold back group two were not invited to participate in the survey. The invited sample was comprised of 170,421, DoD ($N$ = 155,768) and Coast Guard ($N$ = 14,653) members.

The usable completed sample was 39,877 (34,416 from DoD and 5,461 from the USCG) as determined by the number of respondents who completed the demographic questions and at least one question within the alcohol section (Jeffery, et al., 2013). The usable response rates for the HRBS were calculated by dividing the number of usable questionnaires by the eligible sample size. The overall DoD response rate was 22.35% with Air Force (32.89%), Army (15.19%), Marine Corps (21.27%) and Navy (22.28%).

The response rate for the Coast Guard was 37 %. The overall response rate for both the DoD and Coast Guard groups is 29.8%, which is very similar to other large scale web-based surveys of this population (Wessels & Barlas, 2013). For more detailed information related to the usable response rates by strata, see Appendix A., Table A3.

**Sample weighting.** Sample weighting was computed separately for the DoD and the USCG samples. Both groups had post-stratification weights that were adjusted for nonresponse and were further calculated to ensure that the groups within services were proportionally represented as well as to ensure the services were representative in the 'All Services' estimates (see Appendix A., Table A4). The final weighting for DoD sample included a base weight for each sampled case by stratum, which included: pay grade, gender, and branch of service as well as a second weight adjusting for the nonresponse rate associated with each sampled case by stratum and branch of service (Jeffery, et al., 2013). For the USCG online random sample, "data were weighted to the proportions of the census of the 10 sites within the strata of work setting, gender and rank using post-stratification weight only" (Jeffery, et al., 2013, p. 25). For the purely online distribution sample (i.e., unclustered sample), base weights were first computed using the proportions within strata of the distributed population using the same methods as the DoD group. Additionally, due to low response, several groups were collapsed (e.g., female enlisted [E5-E6] and [E7-E9], and female officers [W1-W5], [O1-O3] and [O4]) and a post stratification weight applied, which was applied to adjust for nonresponse and was the final sample weighting (see Appendix A., Table A5; Jeffery, et al., 2013).

## 3.2 Variable Operationalization

The variables used in this dissertation were largely categorical with the exception of the alcohol use measures, which were continuous. A description of the operationalization of each variable is presented in this section.

**Alcohol use.**

***Alcohol use frequency.*** The frequency of alcohol use was assessed using the following question: “In the past 12 months (365 days), on how many different DAYS would you estimate that you drank any type of alcoholic beverage?” Survey respondents could enter a number between zero and 365. This item was operationalized as a continuous variable to represent the number of drinking days (NDD).

***Drinks per drinking day.*** The quantity of alcohol consumed on a drinking day was derived from a single survey item: “In the past 12 months, on those days that you drank alcoholic beverages, on the average, how many drinks did you have?” Respondents were able to enter a number between zero and 50. This item was operationalized as a continuous variable to represent the mean number of drinks per drinking day (DDD).

***Average drinks per day.*** The average number of alcohol drinks per day (ADD) variable was derived by multiplying respondent responses to the frequency and quantity survey items and dividing the product term by 365.25 (i.e., frequency x quantity / 365.25) to produce an average alcohol drinks per day, which is a method used in other large scale survey studies (Breslow, Guenther, Juan, & Graubard, 2010).

***Heavy drinking days.*** A measure of heavy drinking was derived from a single survey item: “In the PAST 12 MONTHS, on how many DAYS did you have 5 or more drinks of any alcoholic beverage? Your best guess is fine.” Although the operationalization of heavy drinking days typically differs by gender (i.e., five or more drinks for males and four or more drinks for females), the 2011 HRBS employed a single definition for both males and females. Respondents were able to enter a number between zero and 365. This item was operationalized as a continuous variable to represent heavy drinking days (HDD).

***Drinker status.*** A measure of alcohol status was derived from a multiple survey items which asked a series of questions related to alcohol consumption, the final categories were provided in the data set. The respondents were classified into one of five categories.

> An 'Abstainer' was defined as having less than 12 alcoholic drinks in their entire lifetime. A 'Former Drinker' was defined as having at least 12 drinks in their lifetime and reported 0 days of drinking in the past 12 months. A 'Current Drinker' was defined as having at least 12 drinks in their lifetime and reported 1 or more days of drinking in the past 12 months. Current drinkers were categorized into three levels of drinking intensity. An 'Infrequent/Light Drinker' was defined as having less than 4 drinks per week in the past year. A 'Moderate Drinker' was defined as having 4 to 14 drinks per week for males, and 4 to 7 drinks per week for females in the past year. A 'Heavy Drinker' was defined as having more than 14 drinks per week for males, and more than 7 drinks per week for females in the past year. (Department of Defense (DoD), 2013, p. 303).

This variable was operationalized as a categorical variable using all five categories for drinker status in the analyses.

**Eating habits.**

The survey contained eleven items regarding frequency of consuming specific types of food in a typical week. For example, "In a TYPICAL WEEK, how often did you eat or drink the following foods?" Eleven types of food categories were assessed: fruit, starchy vegetables, vegetables, whole grains, dairy, lean protein, snack foods, sweets, sugary drinks, and fried foods. Each category of food type contained examples of foods within that category (e.g., "Dairy: milk, yogurt, cheese, etc. or fried foods: French fries, fried chicken, donuts, etc."; DoD, 2013b, p.340). The response set associated with food type categories ranged from one to six: (1) three or more times per day; (2) two times per day; (3) one time per day; (4) three to six times per week; (5) one to two times per week; and (6) rarely or never. Operationalization of the eating habits variable involved the following steps: (1) Reverse coding of the items so that the greatest quantity consumed is associated with the highest number in the scale; (2) the creation of two food type categories: healthy foods and less healthy food. (i.e., healthy foods category included fruit, vegetables, whole grains, lean protein and dairy; and less healthy foods category included starchy vegetables, snack foods, sweets, sugary drinks and fried foods); (3) scale reliability was computed using Cronbach's Coefficient alpha and the final healthy ($\alpha$ = 0.81) and less healthy ($\alpha$ = 0.75) food categories each contained the five relevant food items; and (4) The food type scores, within each category were summed so that a healthy food score and less healthy food score were available for each participant. The healthy food and less healthy food scores were used to assess the relationship between alcohol use and eating habits.

**Physical activity.**

Respondents were asked to report on the frequency and duration of their moderate cardiovascular, vigorous cardiovascular and strength physical activities. The survey included the following frequency and duration items specific to these three dimensions of physical activity: "During the past 30 days, how often did you do the following kinds of physical activity?"

> Moderate physical activity – exertion that raises heart rate and breathing, but you should be able to carry on a conversation comfortably during the activity,

> vigorous physical activity – exertion that is high enough that you would find it difficult to carry on a conversation during that activity, and strength training – including using weights or resistance training to increase muscle strength. (United States Department of Defense [DoD], 2013b, p. 338)

The response sets for the frequency and duration of physical activities items ranged from one to six and one to five, respectively. With respect to the frequency of physical activity items, the response scores ranged from 1 (*about every day*) to 6 (*not at all in the past 30 days*). For the duration of physical activity items, the response scores ranged from 1 (*60 or more minutes*) to a score of 5 (*never in the past month*). Response categories for both frequency and duration of specific types of physical activity will be reverse coded so that a higher score reflects more of the trait being measured (e.g., a score of 5 [*60 minutes or more*] and a score of 1 [*never*]). Physical activity was operationalized by multiplying the frequency and duration of each type of physical activity to obtain an estimate of the amount of time (i.e., minutes per week) spent engaging in moderate cardiovascular, vigorous cardiovascular, and strength physical activities.

Each of the physical activity variables (moderate cardiovascular, vigorous cardiovascular and strength training) was assessed in relation to the Healthy People 2020 objectives for physical activity: 150 min/week of moderate intensity cardiovascular activity or 75 min/week of vigorous intensity cardio vascular activity or an equivalent combination (U.S. Department of Health and Human Services [DHHS], 2016). These variables were assessed to determine the extent to which study respondents met the additional healthy people 2020 goals of: 300 min/week of moderate intensity cardiovascular activity or 150 min/week of vigorous intensity cardiovascular activity or an equivalent combination and strength training activities two or more days per week (DHHS, 2016).

**Body mass index.**

Respondents were asked to provide their height (feet and inches) and weight (pounds). These self-reported measures of height and weight were converted to meters squared (height: inches x $2.54^2$) and kilograms (weight: pounds / 2.2). Body mass index (BMI) was calculated by a standard BMI calculation: (BMI = Weight (kg) / (Height $(M)^2$) and used to classify respondents into one of four categories: (1) underweight (BMI less than 18.5), (2) healthy weight (BMI greater than/equal to 18.5 but less than 25), (3) overweight (BMI greater than/equal to 25 but less than 30) and (4) obese (BMI greater than/equal to 30).

**Military readiness.**

'Military readiness' is the outcome variable of interest and reflects overall military readiness of service members and is assessed via four indicators: fitness test, deploy-ability status, medical fitness, and job performance. The operationalization of each component of military readiness follows.

***Fitness test.*** The 'fitness test' variable is an indicator of whether or not the service member passed his/her most recent physical fitness test, which is a method used by each service branch to assess individual fitness. Study participants were asked "Did you pass your most recent physical fitness test?" The response set associated with this item is: (1) no; (2) yes; (3) I have not yet had a physical fitness test since joining the military; and (4) I was exempt from my most recent fitness test. The fitness test variable was operationalized in a dichotomous manner: (0) if the respondent reported that s/he had not passed their fitness test, indicating decreased military readiness; and a (1) if they had passed their most recent fitness test. Individuals who reported that they had not yet taken the fitness test ($N = 724$) as well as individuals reporting that they were exempt from their most recent fitness test ($N = 3,278$) had their responses recoded to missing because information regarding why they had not taken their fitness test or why they were exempt from taking the fitness test is unknown, which precluded classifying these individuals as passing or failing the fitness test. Failure to pass the physical fitness test, by definition, was considered decreased military readiness.

***Deployability.*** Deployability is defined as an individual's eligibility, during the prior 12-month period, for assignment to a non-combat or combat role in an austere environment. Respondents were queried about their deployability status with a single survey item: "Were you unable to deploy in the past 12 months," with a dichotomous response set of (1) yes or (0) no, which were recoded as (1) no and (0) yes (a "yes" response to this inquiry is indicative of decreased military readiness).

***Medical fitness.*** Medical conditions that may preclude individuals from being able to deploy to austere environments (i.e., decreased military readiness) are outlined in the Central Command Regulations for deployment (United States Central Command [USCENTCOM], 2011). Five survey items, based on an assessment by a doctor or other health care professional, were used to assess medical fitness and included the respondent being told by a doctor or other health care professional that s/he had any of the following health issues: high blood pressure, high blood sugar, high cholesterol, low HDL cholesterol and high triglycerides. A trichotomous response set was used for all five medical fitness items: (1) no, (2) yes, within the past 2 years and (3) yes, more than 2 years ago. An overall medical fitness variable was created by combining response categories (2) and (3) into a single "yes" category (with 'no' responses being coded as 1 and 'yes' responses coded as 0). Participant responses were summed across the five medical fitness items; a higher medical readiness score indicated increased military readiness.

***Job performance.*** Job Performance was represented by absence from work, which was evaluated in the HRBS using the following three items: "On how many work days in the PAST 12 Months did the following happen to you: (1) Missed work due to an injury from an on-the job accident; (2) I did not come to work at all because of an illness; and (3) I did not come to work at all because of a personal accident?" The response set for these items was comprised of 8 – categories that ranged from 1 (*more than 20 days)* to 8 (*none*). The three job performance items were reversed coded, so that a higher numerical value was associated with greater work absence, and summed to form a single work performance measure. A greater number of missed workdays was indicative of poorer job performance (Bycio, 1990) and was considered a marker for decreased military readiness.

**Secondary purpose variables.**

The extant literature indicates that certain socio-demographic and alcohol use culture variables may be correlated with the primary variables of interest (e.g., alcohol use, BMI and military readiness). For example, small scale studies have shown that alcohol use varies with marital status (Jones & Fear, 2011), rank (Jeffery & Mattiko, 2016; Brown, Bray, & Hartzell, 2010), service branch and gender (Lennon, Oberhofer, & McQuade, 2015; Ames, Cunradi, Moore, & Stern, 2007; Brown, Bray, & Hartzell, 2010), and BMI differs with marital status (Smith, et al., 2012). Therefore, analyses were conducted to determine the utility of retaining as covariates, these select socio-demographic and military alcohol use culture variables (i.e., military alcohol use culture, branch of service, gender, rank, marital status and service commitment). The operationalization of each variable is presented below.

***Military alcohol use culture.*** The HRBS contained three items related to alcohol use among peers, and discouragement of alcohol use by installation and supervisor. A single item was used to assess peer alcohol use and asked: “In your off-duty hours, how many of your friends do the following when you are around them – drink alcohol?” The response set for this item was comprised of three categories: (1) none, (2) some, and (3) most friends. This response set was recoded as (0) none, (1) some and (2) most friends. Discouragement of alcohol use was assessed with two survey items. Installation discouragement of alcohol use was assessed as: “Thinking about the installation at which you are currently stationed, how strongly does it discourage the use of alcohol?” and supervisor discouragement was assessed as; “Thinking about your immediate supervisor at the installation where you are currently stationed, how strongly does s/he discourage the use of alcohol?” The response set for these two items was trichotomous: (1) not at all, (2) somewhat discourages, and (3) strongly discourages. Response categories for these items were recoded to (0) not at all, (1) somewhat discourages, and (2) strongly discourages. Finally, the alcohol culture variable was represented by two variables: a peer alcohol use variable and a discouragement of alcohol use variable that was a sum score of the installation and supervisor alcohol discouragement items.

***Branch of service.*** A single survey item was used to determine the respondent's military branch of service, and the response set associated with this item was: (1) Army, (2) Navy, (3) Marine Corps, (4) Air Force and (5) Coast Guard.

***Gender.*** Gender was assessed via a dichotomously scored item: "Are you...?" with the response categories (1) male and (2) female.

***Rank.*** The HRBS item specific to current pay grade was used to determine the respondents' military rank: "What is your current pay grade?" The response set associated with this item originally consisted of seven categories, but was reduced to two categories in the publicly available dataset used for this dissertation: (1) enlisted and (2) officer.

***Marital status.*** Marital status was assessed via a single dichotomously scored (i.e., 1 = no and 2 = yes) item: "Are you currently married?"

***Service commitment.*** The original study authors developed a 'service commitment level' item. The service commitment was derived from three HRBS items. Two items were related to likeliness to stay on active duty: (1) "If you could stay on active duty beyond your current enlistment term, how likely is it that you would choose to do so?" and (2) "How likely are you to remain on active military duty for at least 20 years?" Both of these questions were presented on a 5-point scale ranging from 1 (*very likely*) to 5 (*very unlikely*). The remaining item was related to position satisfaction: "All in all, how satisfied or dissatisfied are you with your current primary MOS/PS/Rating/Designator / AFSC?" The response set associated with this item ranged from 1 (*very satisfied*) to 4 (*very dissatisfied*). To create a service commitment level, variable, the original authors, averaged the two items related to the likelihood of remaining in the military; thereby creating a single score reflecting the likelihood that the respondent plans to remain on active duty.

> The job satisfaction item and likeliness to stay on active item were then converted to comparable scales, averaged together and multiplied by 100 to form the service commitment level and divided into four categories: (1) detached (scores less than 20), (2) low service commitment (scores between 20 and 50), (3) moderate service commitment (between 51 and 85) and (4) high (scores greater than 85) (United States Department of Defense [DoD], 2013b, p. 329).

***Age, race, ethnicity and other social demographic factors.*** Age, race, ethnicity and other social demographic variables were omitted from the publicly available dataset to maintain respondent anonymity (i.e., there are a limited number of minorities, females, and age groupings holding specific ranks within each branch of service; thereby making them easy to identify (Department of Defense, 2013b).

## 3.3 Data Analysis

The data analysis process is presented in four sections: 1) Descriptive Analyses; 2) Variable Relationships; 3) Basic Mediation Model; and 4) Structural Equation Model.

**Descriptive analyses.**

Sample characteristics and descriptive statistics (e.g., frequencies, means, standard deviations, range) and distributional characteristics (e.g., skewness, kurtosis) were examined based on variable type (i.e., continuous vs. categorical) and are presented in tabular format. For example, alcohol use (continuous variables) included descriptive statistics (i.e., means, standard deviations, distributional characteristics and ranges) for each measure of alcohol use (i.e., drinking days, heavy drinking days, and drinks per drinking day). Additionally, information specific to subsample characteristics (e.g., the mean drinks for women in the Army) is presented. Descriptive analyses specific to body mass index (a categorical variable) included frequencies for each response category as well as within branch characteristics associated with each category of BMI.

Descriptive analyses pertaining to eating habits included the frequency of consumption of each food group (i.e., fruit, vegetable, whole gains, dairy and lean protein, starchy vegetables, sweets, sugary beverages, snack foods, and fried foods). Statistics specific to healthy eating and less healthy eating scores included means, ranges, standard deviations and variable distribution characteristics. Sample characteristics (i.e., gender, rank, service branch, marital status) related to each of these food type variables is presented in tabular format (e.g., frequency of consumption of fruit among Navy women). Additionally, reliability analyses (i.e., Cronbach's Coefficient alpha), and factor analysis for the healthy eating foods (i.e., fruit, vegetable, whole gains, dairy and lean protein) and less healthy eating foods (i.e., starchy vegetables, sweets, sugary foods, snack foods, and fried foods) were conducted to determine if these food type variables (i.e., healthy and less healthy) reflected a unidimensional construct with good internal consistency reliability. All healthy and less healthy food items were retained within the relevant food grouping.

Descriptive analyses specific to physical activity included the frequency and duration of each exercise category (vigorous cardiovascular, moderate cardiovascular and strength training) as well as the frequency of meeting the Healthy People 2020 objectives. A descriptive analysis of within branch characteristics specific to each category of physical activity was conducted (e.g., frequency data on the frequency and duration of vigorous activity for men in the Marine Corps).

For the military readiness variables, descriptive analyses pertaining to the categorical items: fitness test, deployability, and medical readiness (i.e., high blood sugar, high blood pressure, high cholesterol, low LDL, and high triglycerides) included frequencies and means, standard deviations, and ranges. Descriptive statistics specific to the continuous items (i.e., job performance, medical readiness score) included variable distribution characteristics (e.g., skewness and kurtosis). Each of the aforementioned items is described based on relevant within branch characteristic groupings (e.g., gender, branch of service, marital status).

**Variable relationships.**

Logistic regression models were used to evaluate study hypothesis 1 (i.e., greater alcohol use will be negatively correlated with military readiness). Two binary logistic regression models with the logit link function were used to evaluate the relationship between the alcohol use variables (i.e., drinks per drinking day [DDD], number of drinking days [NDD] and number of heavy drinking days [HDD]) as predictor variables and the dichotomously scored fitness test and deployability variables as outcomes measures (i.e., two indicators of the military readiness construct). In addition, regression analyses were used to examine the relationship among the alcohol use measures and the medical fitness and job performance components of the military readiness construct.

General logistic regression models with a logit link function were used to examine the relationships among the alcohol use variables (i.e., model predictor variables) and the categorical outcome variables BMI for hypotheses 2a (i.e., greater alcohol use will be positively correlated with BMI) and physical activity for hypothesis 2c (i.e., the association between alcohol use and physical activity will be characterized by an inverted u-shape curve, such that low-to-moderate levels of alcohol use will be associated with higher levels of physical activity relative to no alcohol use, and heavy alcohol use will be associated with lower levels of physical activity relative to low-to-moderate drinkers). Linear regression analyses were used to examine the associations among the three alcohol use variables (i.e., model predictor variables) and the outcome variables healthy eating, and the less healthy eating to test hypothesis 2b (i.e., greater alcohol use will be associated with a lower frequency of healthy food consumption and a greater frequency of less healthy food consumption).

**Basic mediation model.**

The data analytic plan described in this subsection addresses study hypothesis 3 (i.e., BMI will mediate the relationship between alcohol use and military readiness such that greater alcohol use will be associated with a higher BMI, which in turn will be associated with lower military readiness). Three tests of mediation were conducted, each using Tests of Joint Significance (Mackinnon, Taborga, & Morgan-Lopez, 2002; MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002), to test the mediation effect with respect to BMI and each of the three indicators of military readiness (i.e., fitness test, deployability and medical fitness). Regression analysis of the mediation effect of BMI on the relationship between alcohol use and job performance was not conducted as the direct effect of alcohol on job performance was found to be non-significant in prior analyses. The original hypothesized model is presented in Figure 1.

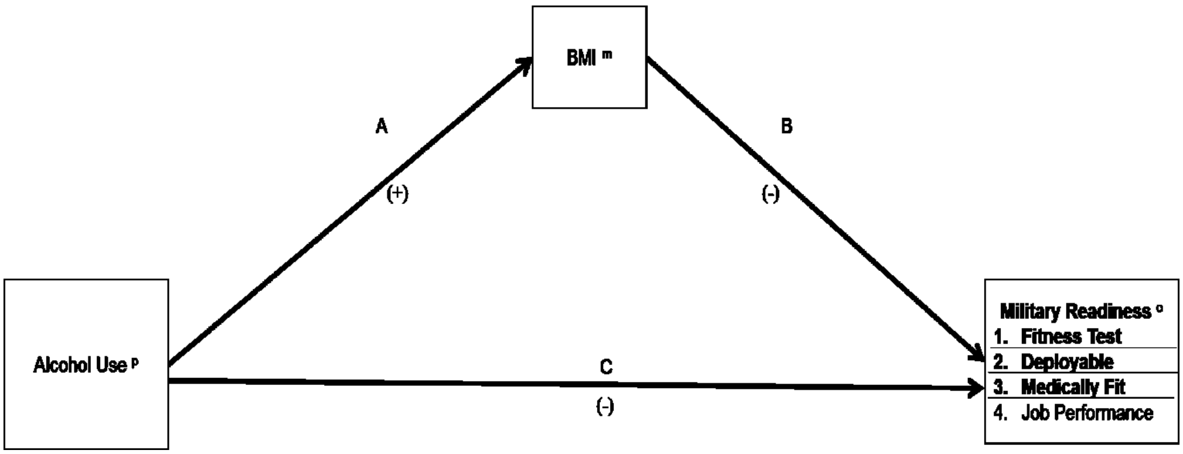


Figure 1. Hypothesized mediation model regarding alcohol use, body mass index (BMI), and military readiness among active duty military members. p = predictor variable, o = outcome variable, and m = mediators.

The Tests of Joint Significance was used to test the mediating effect of BMI on the associations between alcohol use and each component of military readiness that had a significant direct relationship between alcohol use and the military readiness variables (i.e., fitness test, deployability, and medical fitness) because this test has been found to have greater power, a more accurate Type I error rate compared to other methods, and is frequently used in social sciences research (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002). Alternatively, limitations associated with the test of joint significance include, a "sampling distribution of these tests [that] does not follow the normal distribution" resulting in a skewed distribution, and "the form of the null hypothesis that is tested is complex" (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002, p. 9).

**Structural equation model.**

The analyses described in this subsection addressed hypotheses 4 through 6: (4) eating habits will moderate the relationship between alcohol use and BMI such that a higher frequency of healthier food intake would protect against higher BMI and a higher frequency of less healthy food intake would contribute to higher BMI; (5) physical activity habits will moderate the relationship between BMI and military readiness such that greater physical activity would reduce the negative association between BMI and military readiness; and (6) the hypothetical model presented in Figure 2 will be supported.

The hypothetical model presented in Figure 2 shows the relationships among alcohol use, military readiness and other variables (i.e., mediators, moderators, covariates) and was tested using a series of seven structural equation models (*SEM*), one model for each of the significant alcohol use variables specific to the three military readiness variables (i.e., fitness test, deployability, and medical fitness) that were analyzed previously. Due to convergent errors associated with a high variance for HDD and NDD, these variables were transformed to proportion of heavy drinking days (PHDD) and proportion of drinking days (PDD) (Muthen & Muthen, 1998-2015, p. 466).

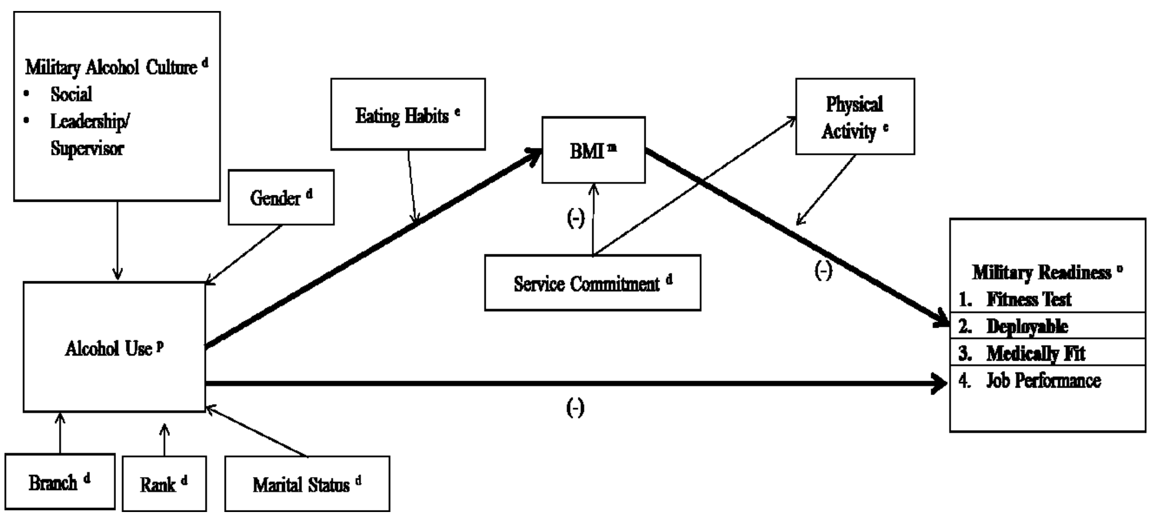


Figure 2. Original hypothetical conceptual model regarding the relationship among alcohol use and eating habits, physical activity, and other demographic, and cultural factors on military readiness in active duty military members. p = predictor variable, o = outcome variable, m = mediators, d = covariates*, and e = moderators.
*Covariates are included based on a review of the literature, however if they are not statistically significant they will be dropped from the model.

The HRBS dataset was a robust data set that met the large sample requirements for conducting a *SEM*. The benefits to using *SEM* was that it allowed for the evaluation of the entire hypothesized model and yielded goodness of fit measures to assess the extent to which the data and hypothesized model are consistent (Kline, 2011). During model building each variable was entered into the model, however, only those items that were significant were retained in the final model, yielding a more parsimonious model.

Data analyses for this dissertation were conducted using SPSS version 23, SAS version 9.4, and MPlus version 7.4 statistical software programs.

# Chapter 4: Results

## 4.1 Descriptive Characteristic

The 2011 HRBS sample (N = 39,877) included: Air Force (11,574, [24.1%]), Army (6,932, [36.3%]), Coast Guard (5,461, [3.1%]), Marine Corps (8,339, [13.8%]) and Navy (7,571, [22.7%]). Respondent characteristics by military service branch are presented in Table 1. The percentage of enlisted personnel varied by branch of service such that Air Force (79.96%) and Marine Corps (90.26%) had the lowest and highest percentage of enlisted personnel, respectively. All branches were over 80% male and more than 60% reported being married with the exception of the Marine Corps (55.32%). Across all branches 75.9 % of respondents reported moderate or high service commitment, with the Marine Corps and Army reporting the lowest (67.9%) and highest (88.0%) percentage of service commitment, respectively. Additional descriptive information broken down by rank and gender is presented in Appendix B., Table B1.

Table 1.
Demographic Characteristics by Military Service Branch

| Characteristic | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Rank | | | | | | |
| Enlisted | 84.17 | 79.96 | 84.97 | 84.71 | 90.26 | 83.58 |
| Officer | 15.83 | 20.04 | 15.03 | 15.29 | 9.74 | 16.42 |
| Gender | | | | | | |
| Male | 84.90 | 80.62 | 85.54 | 86.49 | 92.77 | 83.42 |
| Female | 15.10 | 19.38 | 14.46 | 13.51 | 7.23 | 16.58 |
| Marital Status | | | | | | |
| Not Married | 36.51 | 37.82 | 30.84 | 34.92 | 44.68 | 39.48 |
| Married | 63.49 | 62.18 | 69.16 | 65.08 | 55.32 | 60.52 |
| Service Commitment | | | | | | |
| Detached | 6.30 | 4.38 | 7.23 | 2.09 | 9.46 | 5.50 |
| Low | 17.81 | 15.82 | 19.46 | 9.87 | 22.69 | 15.42 |
| Moderate | 53.67 | 58.96 | 51.38 | 61.25 | 50.39 | 52.66 |
| High | 22.22 | 20.85 | 21.93 | 26.79 | 17.46 | 26.42 |

Notes. All percentages are based on weighting for the total military population across all service branches as well as for each service branch.

**Alcohol use descriptive characteristics.** The descriptive statistics and distribution characteristics for the alcohol use variables are presented in Table 2. The mean number of drinking days (NDD) for the previous year (365 days) across all service branches was 64.63 days.

Table 2.
Alcohol Use Variables By Military Service Branch

| Variable | All Service Branches | Air Force | Army | Coast Guard | Marine Corps | Navy |
|---|---|---|---|---|---|---|
| Number of Drinking Days | | | | | | |
| *(N)* | *(35,033)* | *(9,950)* | *(6,292)* | *(4,786)* | *(7,274)* | *(6,731)* |
| Mean | 64.63 | 48.60 | 64.41 | 76.11 | 80.56 | 70.58 |
| SD | 471.77 | 68.79 | 85.73 | 82.52 | 91.26 | 86.04 |
| S.E. Mean | 0.45 | 0.69 | 1.09 | 1.20 | 1.08 | 1.06 |
| Skewness | 2.38 | 2.52 | 2.08 | 1.50 | 1.78 | 1.92 |
| Kurtosis | 8.42 | 7.24 | 5.16 | 2.24 | 4.21 | 4.56 |
| Heavy Drinking Days | | | | | | |
| *(N)* | *(38,695)* | *(11, 192)* | *(6,753)* | *(5,336)* | *(8,075)* | *(7,339)* |
| Mean | 18.50 | 8.41 | 17.81 | 16.79 | 33.99 | 21.16 |
| SD | 267.67 | 30.21 | 46.64 | 40.80 | 63.36 | 50.91 |
| S.E. Mean | 0.24 | 0.29 | 0.57 | 0.56 | 0.71 | 0.60 |
| Skewness | 6.01 | 7.43 | 5.38 | 4.69 | 3.95 | 5.27 |
| Kurtosis | 49.83 | 69.36 | 36.81 | 28.48 | 20.84 | 35.86 |
| Drinks Per Drinking Day | | | | | | |
| *(N)* | *(38,822)* | *(11,220)* | *(6,767)* | *(5,361)* | *(8,113)* | *(7,361)* |
| Mean | 2.94 | 2.26 | 2.88 | 2.72 | 4.22 | 2.99 |
| SD | 20.22 | 2.63 | 3.49 | 2.79 | 4.88 | 3.61 |
| S.E. Mean | 0.02 | 0.02 | 0.04 | 0.04 | 0.05 | 8.77 |
| Skewness | 8.34 | 8.10 | 6.83 | 7.62 | 6.68 | 8.77 |
| Kurtosis | 131.35 | 124.48 | 85.67 | 114.03 | 77.99 | 138.04 |
| Mean Average Drinks Per Day | | | | | | |
| *(N)* | (34,903) | (9,914) | (6,273) | (4,770) | (7,245) | (6,701) |
| Mean | 0.66 | 0.38 | 0.64 | 0.64 | 1.15 | 0.70 |
| SD | 7.72 | 0.88 | 1.23 | 1.03 | 2.15 | 1.35 |
| S.E. Mean | 0.01 | 0.01 | 0.02 | 0.01 | 0.03 | 0.02 |
| Skewness | 8.42 | 10.33 | 5.92 | 4.91 | 7.36 | 8.40 |
| Kurtosis | 117.57 | 198.72 | 57.33 | 40.13 | 84.51 | 116.48 |

Notes: SD = standard deviation; S.E. Mean = standard error of the mean. All results are based on weighting.

The mean NDD days reported by military service branch was highest for the Marine Corps 80.56 (SD = 91.26) and lowest for Air Force 48.60 (SD = 68.79). Across all branches, the mean number of drinks per drinking day (DDD) was 2.94 (SD = 20.22). The reported mean number of DDD by military service branch was highest for the

Marine Corps 4.22 (SD = 4.88) and lowest for the Air Force 2.26 (SD = 2.63). The range of values for DDD was the same for all the branches (i.e., 0 to 50 drinks). The mean number of HDD reported across all branches was 18.50 (SD = 267.67). The reported mean HDD by military service branch was highest for the Marine Corps 33.99 (SD = 63.36) and lowest for the Air Force 8.41 (SD = 30.21). The range of values for HDD was the same for all branches (i.e., 0 to 365 days). The mean average number of drinks per day (MADD) within each branch of military service, with the exception of the Marine Corps (1.15 drink/day), was less than one drink per day. Given the similarity of response across branches ($p>0.05$); this measure was not considered further for analysis.

***Alcohol use variables by military rank and gender.*** Descriptive statistics specific to each branch of service by rank are presented in Appendix B, Table B2. Overall, males (both enlisted and officers) reported the greatest frequency of alcohol use. In regards to NDD in the previous year (365 days), officers reported the greatest NDD, on average, in the Air Force, Coast Guard and Navy, with male officers reporting a greater NDD (ranging from: 83.8 days for Navy to 89.5 days for the Coast Guard) than female officers (ranging from: 56.8 days for the Air Force to 77.8 days for the Coast Guard). However, Marine Corps officers and enlisted males reported the greatest NDD and within the Army, male officers reported more drinking days than enlisted men (i.e., male officers reporting 82.4 days in the Army and 88.8 days for the Marine Corps; while enlisted males reported 82.1 days in the Marine Corps and 64.6 days in the Army). Enlisted females reported the lowest mean NDD across all service branches, ranging from 31.8 days (Air Force) to 57.9 days (Coast Guard).

**Body mass index descriptive characteristics.** Body mass index (BMI) varied across military service branches and is presented in Table 3. The Coast Guard (57.2%) had the highest percentage of individuals who reported being overweight and the Air Force had the lowest percentage (48.5%) of overweight individuals. The other branches did not vary greatly across the overweight BMI categories. The Army (15.8%) and Navy (14.9%) had greater percentages of individuals classified within the obese BMI category compared to All Service Branches (12.4%). With the exception of the Air Force (48.5%), all service branches reported 50% or greater prevalence of overweight individuals. Underweight prevalence was reported at less than 1% for all service branches.

Table 3.
Body Mass Index Category by Military Service Branch

| BMI Category | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Underweight | 0.61 | 0.66 | 0.55 | 0.41 | 0.57 | 0.68 |
| Healthy Weight | 35.73 | 41.22 | 31.81 | 31.59 | 41.76 | 33.21 |
| Overweight | 51.22 | 48.45 | 51.89 | 57.17 | 52.78 | 51.26 |
| Obese | 12.44 | 9.67 | 15.76 | 10.84 | 4.89 | 14.85 |

Notes. Underweight (BMI less than 18.5), Healthy Weight (BMI greater than/equal to 18.5 but less than 25), Overweight (BMI greater than/equal to 25 but less than 30) and Obese (BMI greater than/equal to 30. All Service Branches was calculated using the final population weight stratified by branch percentage of total forces, gender and rank plus non-response. Branch specific percentages were calculated using the final sample weight stratified within branch, rank and gender categories plus non-response rate.

***Body mass index category by military rank, gender and marital status.*** BMI prevalence varied across all military service branches by rank, gender and marital status and is presented in Table 4. Males reported the highest prevalence of being in the overweight and obese categories with male officers reporting the highest prevalence of overweight and enlisted males reporting the highest prevalence of obesity. Married males reported the greatest prevalence of being in the overweight (51.9%) and obese (12.4%) categories. Additional descriptive statistics specific to each branch of military service broken down by rank, gender and marital status are presented in Appendix B, Table B3 and B4.

Table 4.
Body Mass Index Category by Rank and Gender and Marital Status for All Service Branches

| | Enlisted | | Officer | |
|---|---|---|---|---|
| BMI Category | Male % | Female % | Male % | Female % |
| Underweight | 0.46 | 1.69 | 0.20 | 1.21 |
| Healthy Weight | 33.37 | 57.44 | 30.84 | 67.79 |
| Overweight | 54.01 | 34.46 | 59.38 | 27.61 |
| Obese | 12.16 | 6.41 | 9.58 | 3.39 |

| | Not Married | | Married | |
|---|---|---|---|---|
| | Male | Female | Male | Female |
| Underweight | 0.44 | 0.33 | 0.31 | 0.18 |
| Healthy Weight | 35.22 | 12.23 | 23.81 | 6.58 |
| Overweight | 38.53 | 6.04 | 51.85 | 4.16 |
| Obese | 6.19 | 1.02 | 12.35 | 0.76 |

Notes. Underweight (BMI less than 18.5), Healthy Weight (BMI greater than/equal to 18.5 but less than 25), Overweight (BMI greater than/equal to 25 but less than 30) and Obese (BMI greater than/equal to 30. All Service Branches was calculated using the final population weight stratified by branch percentage of total forces, gender and rank plus non-response. Branch specific percentages were calculated using the final sample weight stratified within branch, rank and gender categories plus non-response rate.

**Eating behavior descriptive characteristics.** The frequency of consuming various food items is presented in the subsequent sections. The food items are divided into a healthy food group (i.e., fruits, vegetables, whole grains, dairy and lean proteins) and a less healthy food group (i.e., starchy vegetables, snack food, sweets, sugary drinks and fried food).

***Healthy food item consumption by military service branch.*** Table 5 displays the percentage of individuals consuming specific types of healthy food (e.g., fruits) within and across military service branch. The highest percentage of individuals reporting daily consumption of all healthy food items were members of the Coast Guard (fruit; 66.6%, vegetables; 73.4%, whole grain; 70.1%; dairy; 73.8%, lean protein 71.9%).

Table 5.
Frequency of Healthy Food Items by Military Service Branch

| Food Group | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Fruit | | | | | | |
| Rarely/Never | 4.79 | 4.12 | 7.05 | 2.76 | 5.55 | 4.37 |
| 1-2 times per week | 14.77 | 13.97 | 16.70 | 11.94 | 16.52 | 14.34 |
| 3-6 times per week | 20.49 | 20.45 | 21.08 | 18.63 | 21.20 | 20.53 |
| 1 time per day | 25.67 | 25.15 | 24.58 | 28.88 | 25.77 | 25.05 |
| 2 times per day | 23.03 | 24.65 | 19.83 | 25.98 | 20.74 | 23.89 |
| 3 or more times per day | 11.25 | 11.65 | 10.75 | 11.80 | 10.23 | 11.82 |
| Vegetables | | | | | | |
| Rarely/Never | 3.33 | 2.81 | 3.76 | 1.92 | 4.42 | 3.54 |
| 1-2 times per week | 9.69 | 8.89 | 9.65 | 7.11 | 12.14 | 10.11 |
| 3-6 times per week | 20.45 | 20.08 | 21.89 | 17.48 | 20.90 | 21.37 |
| 1 time per day | 25.48 | 25.03 | 25.80 | 26.85 | 26.76 | 23.48 |
| 2 times per day | 28.31 | 29.66 | 26.01 | 33.03 | 25.71 | 27.82 |
| 3 or more times per day | 12.74 | 13.54 | 12.89 | 13.61 | 10.07 | 13.68 |
| Whole Grains | | | | | | |
| Rarely/Never | 3.41 | 2.61 | 4.40 | 3.03 | 3.14 | 4.29 |
| 1-2 times per week | 10.66 | 9.63 | 11.88 | 7.97 | 11.48 | 12.14 |
| 3-6 times per week | 19.54 | 19.00 | 20.44 | 18.92 | 20.07 | 19.42 |
| 1 time per day | 25.43 | 25.41 | 23.95 | 27.07 | 26.48 | 24.46 |
| 2 times per day | 28.27 | 30.53 | 26.83 | 30.69 | 26.49 | 26.37 |
| 3 or more times per day | 12.69 | 12.83 | 12.50 | 12.32 | 12.34 | 13.31 |
| Dairy | | | | | | |
| Rarely/Never | 3.91 | 2.89 | 4.69 | 2.71 | 4.26 | 5.25 |
| 1-2 times per week | 10.50 | 9.70 | 11.27 | 7.92 | 11.68 | 11.60 |
| 3-6 times per week | 17.78 | 17.39 | 18.62 | 15.54 | 18.22 | 18.74 |
| 1 time per day | 28.38 | 28.86 | 26.96 | 29.34 | 29.46 | 27.10 |
| 2 times per day | 26.96 | 29.22 | 25.22 | 31.19 | 24.24 | 25.02 |
| 3 or more times per day | 12.46 | 11.95 | 13.24 | 13.30 | 12.15 | 12.29 |
| Lean Protein | | | | | | |
| Rarely/Never | 2.12 | 1.51 | 2.85 | 1.19 | 2.49 | 2.67 |
| 1-2 times per week | 9.54 | 8.74 | 10.61 | 7.19 | 9.84 | 11.15 |
| 3-6 times per week | 20.85 | 20.50 | 22.12 | 19.71 | 20.80 | 21.08 |
| 1 time per day | 25.56 | 25.72 | 24.60 | 26.95 | 25.82 | 24.90 |
| 2 times per day | 28.34 | 30.08 | 26.58 | 31.70 | 26.51 | 26.87 |
| 3 or more times per day | 13.60 | 13.44 | 13.25 | 13.27 | 14.55 | 13.33 |

Note. All Service Branches was weighted using the final population weight based on branch percentage of total forces, gender and rank plus non-response. Branch specific percentages were calculated using the final sample weight based on the within branch, rank and gender categories plus non-response rate.

On the other hand, the Army had the lowest percentage of individuals reporting daily consumption of fruits (55.2%), whole grains (63.3%) and lean protein (64.4%), while the Marine Corps (62.54%) and Navy (64.41%) had the lowest percentage of individuals reporting daily vegetable and dairy consumption, respectively. Additional information specific to healthy food consumption across all branches of military service broken down by rank and gender is presented in Appendix B, Table B5 and Table B6.

***Healthy food group sum score by military service branch***. A mean healthy food group sum score by branch of military service is presented in Table 6. The healthy food group sum score ranged from five to 30 across and within all branches of military service. The Coast Guard had the highest mean healthy food group sum score (20.72, SD = 4.60), while the Marine Corps had the lowest (19.50, SD = 4.96).

Table 6.
Descriptive Statistics and Distributional Characteristics of the Healthy Food Group Sum Score by Military Service Branch

| | N | Mean | SD | Std. Error Mean | Skewness | Kurtosis | Min | Max |
|---|---|---|---|---|---|---|---|---|
| All Branches | 38693 | 19.84 | 28.04 | 0.03 | 2.72 | -0.29 | 5 | 30 |
| Air Force | 11206 | 20.27 | 4.85 | 0.05 | -0.51 | -0.26 | 5 | 30 |
| Army | 6732 | 19.56 | 4.96 | 0.06 | -0.58 | -0.11 | 5 | 30 |
| Coast Guard | 5307 | 20.72 | 4.60 | 0.06 | -0.33 | -0.30 | 5 | 30 |
| Marine Corps | 8104 | 19.50 | 4.96 | 0.06 | -0.48 | -0.15 | 5 | 30 |
| Navy | 7344 | 19.87 | 4.95 | 0.06 | -0.54 | -0.22 | 5 | 30 |

Notes: SD = standard deviation; Std. Error Mean = standard error of the mean; Min = range minimum; Max = range maximum.

***Less healthy food item consumption by military service branch.*** Table 7 displays the percentage of individuals consuming specific types of less healthy food (e.g., snack foods) within and across military service branch. With respect to daily consumption of less healthy food items, members of the Coast Guard reported the highest percentage of individuals consuming starchy vegetables (46.2%) and sweets (25.5%), while the highest percentage of individuals reporting the consumption of snack foods (27.3%), sugary beverages (42.5%) and fried foods (18.4%) were affiliated with the Marine Corps. In contrast, the lowest percentage of individuals reporting daily consumption of starchy vegetables (43.1%), sweets (22.5%) and fried food (13.3%) were members of the Air Force.

Table 7.
Frequency of Less Healthy Food Items by Military Service Branch

| Food Group | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Starchy Vegetable | | | | | | |
| Rarely/Never | 6.31 | 5.85 | 6.96 | 5.18 | 6.73 | 6.76 |
| 1-2 times per week | 23.29 | 24.00 | 23.50 | 22.58 | 22.17 | 23.76 |
| 3-6 times per week | 26.20 | 27.10 | 25.81 | 26.08 | 25.91 | 25.59 |
| 1 time per day | 26.13 | 26.07 | 25.36 | 28.25 | 25.75 | 25.83 |
| 2 times per day | 14.06 | 13.59 | 14.02 | 14.42 | 14.77 | 13.78 |
| 3 or more times per day | 4.00 | 3.40 | 4.34 | 3.48 | 4.66 | 4.27 |
| Snack Food | | | | | | |
| Rarely/Never | 20.95 | 21.16 | 23.68 | 19.17 | 19.95 | 20.50 |
| 1-2 times per week | 34.05 | 35.31 | 34.19 | 34.47 | 31.55 | 34.41 |
| 3-6 times per week | 20.32 | 20.46 | 19.15 | 20.80 | 21.24 | 19.84 |
| 1 time per day | 16.05 | 15.77 | 14.90 | 17.38 | 16.87 | 15.64 |
| 2 times per day | 6.20 | 5.62 | 5.35 | 6.19 | 7.04 | 6.96 |
| 3 or more times per day | 2.43 | 1.68 | 2.73 | 1.99 | 3.34 | 2.64 |
| Sweets | | | | | | |
| Rarely/Never | 24.29 | 23.58 | 25.30 | 22.30 | 27.06 | 22.81 |
| 1-2 times per week | 33.61 | 35.02 | 33.35 | 34.62 | 30.86 | 34.00 |
| 3-6 times per week | 17.92 | 18.94 | 17.76 | 17.59 | 16.79 | 17.97 |
| 1 time per day | 15.61 | 15.13 | 14.59 | 17.68 | 15.35 | 16.08 |
| 2 times per day | 5.94 | 5.49 | 5.82 | 5.87 | 6.43 | 6.24 |
| 3 or more times per day | 2.64 | 1.84 | 3.17 | 1.94 | 3.51 | 2.90 |
| Sugary Drinks | | | | | | |
| Rarely/Never | 26.77 | 29.42 | 25.64 | 34.32 | 19.55 | 26.27 |
| 1-2 times per week | 22.00 | 22.88 | 20.85 | 21.52 | 20.10 | 24.16 |
| 3-6 times per week | 16.00 | 15.75 | 16.07 | 14.18 | 17.80 | 15.63 |
| 1 time per day | 16.85 | 17.01 | 15.88 | 16.03 | 19.19 | 15.51 |
| 2 times per day | 10.92 | 9.38 | 11.87 | 9.12 | 13.27 | 11.10 |
| 3 or more times per day | 7.46 | 5.57 | 9.69 | 4.82 | 10.08 | 7.32 |
| Fried Food | | | | | | |
| Rarely/Never | 23.40 | 23.98 | 24.21 | 26.34 | 21.44 | 21.82 |
| 1-2 times per week | 43.04 | 45.20 | 43.49 | 42.23 | 40.01 | 43.26 |
| 3-6 times per week | 18.28 | 17.50 | 17.28 | 17.32 | 20.20 | 18.96 |
| 1 time per day | 9.88 | 9.05 | 9.46 | 9.83 | 11.56 | 9.71 |
| 2 times per day | 3.84 | 3.30 | 3.72 | 3.20 | 4.37 | 4.64 |
| 3 or more times per day | 1.56 | 0.97 | 1.83 | 1.08 | 2.42 | 1.61 |

Note. All Service Branches was calculated using the final population weight based on branch percentage of total forces, gender and rank plus non-response. Branch specific percentages were calculated using the final sample weight based on the within branch, rank and gender categories plus non-response rate.

The lowest percentage of individuals reporting daily consumption of snack foods (23.0%) and sugary beverages (30.0%) were members of the Army and Coast Guard, respectively. Additional information specific to less healthy food consumption broken down by military branch of service, rank, and gender is presented in Appendix B, Table B7.

***Less healthy food group sum score by military service branch***. A mean less healthy food group sum score by branch of military service is presented in Table 8. The descriptive and distributional characteristics pertaining to the less healthy food group sum score by military service branch also are presented in Table 8. Overall the mean less healthy food sum score was 13.60 (SD = 26.37) across all service branches. The mean sum scores ranged from 13.27 (SD = 4.45) for the Air Force to 14.17 (SD = 4.84) for the Marine Corps.

Table 8.
Less Healthy Food Group Sum Score Descriptive Statistics by Military Service Branch

| | N | Mean | SD | S.E. Mean | Skewness | Kurtosis | Min | Max |
|---|---|---|---|---|---|---|---|---|
| All Branches | 38596 | 13.60 | 26.37 | 0.02 | 5.40 | 1.16 | 5 | 30 |
| Air Force | 11181 | 13.27 | 4.45 | 0.04 | 1.15 | 0.82 | 5 | 30 |
| Army | 6709 | 13.58 | 4.73 | 0.06 | 3.35 | 1.03 | 5 | 30 |
| Coast Guard | 5282 | 13.35 | 4.60 | 0.06 | 1.17 | 0.79 | 5 | 30 |
| Marine Corps | 8083 | 14.17 | 4.84 | 0.05 | 3.70 | 1.03 | 5 | 30 |
| Navy | 7341 | 13.68 | 4.74 | 0.06 | 3.81 | 1.14 | 5 | 30 |

Notes: SD = standard deviation; S.E. Mean = standard error of the mean; Min = range minimum; Max = range maximum.

**Physical activity descriptive characteristics.** Physical activity was defined using three different variables (i.e., frequency, duration and meeting the healthy people goals) for three types of exercise (i.e., vigorous cardiovascular, moderate cardiovascular and strength training). The percentage of individuals reporting specific types of exercise by frequency category is presented in the subsequent sections. The results are presented for all service branches combined and within service branch by rank and gender.

***Frequency of physical activity by military service branch.*** The percentage of individuals reporting frequency of physical activity by type of activity varied by service branch and is presented in Table 9. Overall, 28.9% of the respondents reported participating in cardiovascular activity 'everyday'. Members of the Marine Corps (35.7%) and Air Force (19.2%) reported the highest and lowest percentage of individuals engaging in daily cardiovascular activity, respectively. The Army had the highest percentage of individuals reporting 'at least five days per week' of vigorous activity (26.3%), while the Navy had the lowest percentage (15.2%). The Navy (25.1%) also had the highest percentage of individuals reporting 'less than one day per week' of vigorous activity.

Table 9.
Frequency of Physical Activity by Military Service Branch

| | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Vigorous Activity Frequency | | | | | | |
| Not at all | 9.33 | 7.60 | 11.04 | 8.33 | 8.52 | 12.04 |
| <1 day week | 10.23 | 8.46 | 8.10 | 15.24 | 8.69 | 13.01 |
| 1-2 days week | 27.99 | 29.39 | 23.76 | 31.86 | 26.32 | 28.81 |
| 3-4 days week | 32.89 | 38.67 | 30.83 | 28.14 | 31.47 | 30.96 |
| 5-6 days week | 12.94 | 11.73 | 16.44 | 11.34 | 15.49 | 9.92 |
| Everyday | 6.60 | 4.14 | 9.84 | 5.09 | 9.51 | 5.27 |
| Moderate Activity Frequency | | | | | | |
| Not at all | 3.98 | 3.34 | 4.81 | 2.81 | 4.31 | 4.68 |
| <1 day week | 5.10 | 4.43 | 4.03 | 6.73 | 5.03 | 6.00 |
| 1-2 days week | 18.50 | 20.11 | 13.90 | 22.04 | 16.54 | 19.87 |
| 3-4 days week | 33.66 | 39.58 | 26.11 | 33.30 | 29.02 | 36.93 |
| 5-6 days week | 18.34 | 17.48 | 24.13 | 16.97 | 18.88 | 14.70 |
| Everyday | 20.42 | 15.06 | 27.02 | 18.15 | 26.23 | 17.82 |
| Strength Training Frequency | | | | | | |
| Not at all | 13.58 | 11.26 | 13.56 | 15.60 | 12.03 | 17.39 |
| <1 day week | 13.87 | 13.13 | 11.36 | 16.35 | 13.13 | 16.34 |
| 1-2 days week | 27.30 | 30.16 | 28.08 | 27.47 | 23.86 | 25.85 |
| 3-4 days week | 27.67 | 31.08 | 26.10 | 25.88 | 26.97 | 25.97 |
| 5-6 days week | 11.28 | 10.42 | 12.47 | 10.03 | 13.93 | 9.45 |
| Everyday | 6.31 | 3.96 | 8.43 | 4.66 | 10.08 | 4.99 |

Notes: Percentages are based on weighting to the total population.

The Army (51.2%) had the highest percentage of individuals reporting moderate activity 'at least five days per week'; while the Navy had the lowest percentage (32.5%).

The Navy (10.7%) also had the highest percentage of individuals reporting 'less than one day per week' of moderate activity. In regard to strength training, the Marine Corps (24.0%) had the highest percentage of individuals reporting strength training 'greater than five days per week', while the Air Force had the lowest percentage (14.4%). The Navy had the highest percentage of individuals reporting strength training 'less than one day per week' (33.7%). Additional information specific to the frequency of physical activity by physical activity type by rank and gender is presented in Appendix B, Tables B9 and B10.

***Duration of physical activity by military service branch.*** The percentage of individuals reporting participating in physical activity by type of activity and duration (i.e., minutes) varied across military service branch and is presented in Table 10.

Table 10.
Physical Activity Duration by Military Service Branch

| | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Vigorous Activity Duration | | | | | | |
| Never past month | 9.36 | 7.78 | 10.63 | 9.26 | 8.15 | 12.04 |
| < 20 min / day | 12.47 | 12.13 | 11.15 | 16.73 | 9.40 | 14.51 |
| 20-29 min / day | 22.38 | 24.72 | 18.29 | 24.31 | 20.84 | 22.87 |
| 30-59 min / day | 39.44 | 42.10 | 40.16 | 35.20 | 41.88 | 35.02 |
| 60 min or more / day | 16.36 | 13.27 | 19.77 | 14.50 | 19.74 | 15.55 |
| Moderate Activity Duration | | | | | | |
| Never past month | 4.02 | 3.33 | 4.84 | 3.23 | 4.37 | 4.52 |
| < 20 min / day | 7.30 | 7.72 | 5.74 | 9.86 | 6.04 | 7.67 |
| 20-29 min / day | 16.65 | 18.70 | 12.16 | 19.48 | 14.03 | 18.49 |
| 30-59 min / day | 44.55 | 47.80 | 44.33 | 41.95 | 43.46 | 42.87 |
| 60 min or more / day | 27.47 | 22.45 | 32.93 | 25.48 | 32.10 | 26.45 |
| Strength Training Duration | | | | | | |
| Never past month / day | 14.08 | 11.75 | 13.77 | 16.51 | 12.33 | 18.11 |
| < 20 min / day | 14.69 | 16.99 | 12.18 | 16.77 | 11.36 | 15.64 |
| 20-29 min / day | 18.68 | 20.38 | 17.09 | 20.90 | 15.99 | 18.90 |
| 30-59 min / day | 32.85 | 34.48 | 35.19 | 29.69 | 33.91 | 29.29 |
| 60 min or more / day | 19.71 | 16.40 | 21.76 | 16.14 | 26.41 | 18.06 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

Members of the Marine Corps (82.5%) had the highest percentage of individuals reporting '20 minutes or more per day' of vigorous cardiovascular activity, while the Navy (73.4%) had the lowest percentage of individuals reporting such activity. The Navy (12.0%) also had the highest percentage of individuals reporting that they had not engaged in vigorous cardiovascular activity in the past month.

For moderate activity duration, the Marine Corps (89.6%) had the highest percentage of individuals reporting at least 20 minutes of such activity per day, while the Coast Guard (86.9%) had the lowest percentage of individuals reporting such levels of moderate activity. The Army (4.8%) had the highest percentage of individuals reporting no moderate activity in the past month, while the Coast Guard (3.2%) had the lowest percentage of individuals reporting no moderate activity in the past month.

In regard to strength training duration, members of the Marine Corps (76.3%) and Navy (66.3%) had the highest and lowest percentage of individuals reporting at least 20 minutes of strength training per day. The Navy (18.1%) also had the highest percentage of individuals reporting no strength training in the past month. Additional information regarding the percentage of individuals reporting physical activity by type of activity and duration across military service branches and by rank and gender is presented in Appendix B, Tables B11 and B12.

***Healthy People physical activity goals by military service branch.*** The percentage of individuals meeting the Healthy People goals for physical activity by military service branch is presented in Table 11. The Marine Corps (57.1%) had the highest percentage of individuals who reported meeting the vigorous cardiovascular activity goal (i.e., 75 minutes or more per week), while the Coast Guard (45.1%) had the lowest percentage of individuals reporting such activity. The Army (68.7%) and the Coast Guard (56.3%) had the highest and lowest percentage of individuals reporting moderate activity of 150 minutes or more per week, respectively. The Air Force (75.6%) had the highest percentage of individuals who reported meeting the Health People strength training goal of one day per week, while the Navy (66.3%) had the lowest percentage of individuals reporting such activity. Additional information pertaining to physical activity type and duration by military rank and gender across military service branch is presented in Appendix B, Tables B13 and B14.

Table 11.
Healthy People 2020 Physical Activity Goals by Military Service Branch

| Healthy People 2020 Goals | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Vigorous Activity | | | | | | |
| Less than 75 minutes per week | 47.25 | 45.44 | 42.94 | 54.86 | 42.86 | 53.40 |
| 75 minutes or more per week | 11.23 | 12.92 | 10.75 | 10.23 | 10.86 | 10.18 |
| 150 minutes or more per week | 41.52 | 41.64 | 46.32 | 34.92 | 46.28 | 36.42 |
| Moderate Activity | | | | | | |
| Less than 150 min/week | 38.48 | 40.65 | 31.28 | 43.74 | 34.83 | 42.04 |
| 150 min or more /week | 37.38 | 41.00 | 35.75 | 35.29 | 35.47 | 36.97 |
| 300 min or more/week | 24.13 | 18.35 | 32.97 | 20.98 | 29.70 | 20.98 |
| Strength Training | | | | | | |
| Less than 1 day per week | 27.44 | 24.39 | 24.92 | 31.95 | 25.16 | 33.73 |
| 1 to 2 days per week | 27.30 | 30.16 | 28.08 | 27.47 | 23.86 | 25.85 |
| 3 or more days per week | 45.26 | 45.45 | 47.00 | 40.58 | 50.98 | 40.42 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

**Military readiness items descriptive characteristics.** Military readiness was represented by four variables (i.e., physical fitness test, ability to deploy, medical readiness score and job performance score). All readiness variables are presented for all military service branches as well as within military service branch by rank and gender in the subsequent sections.

***Fitness test and ability to deploy.*** The percentages of individuals passing the most recent physical fitness test and able to deploy by military branch of service are presented in Table 12.

Table 12.
Physical Fitness Test and Ability to Deploy by Military Service Branch

| Variable | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Passed Most Recent Physical Fitness Test | | | | | | |
| No | 4.04 | 5.40 | 4.28 | 3.16 | 2.37 | 3.30 |
| Yes | 95.96 | 94.60 | 95.72 | 96.84 | 97.63 | 96.70 |
| Able to Deploy Last 12 Months | | | | | | |
| No | 16.56 | 17.46 | 17.86 | 6.23 | 22.52 | 11.26 |
| Yes | 83.44 | 82.54 | 82.15 | 93.77 | 77.48 | 88.74 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

All military service branches reported that greater than 94% of individuals passed their most recent test. The Air Force had the highest percentage of people reporting that they failed their most recent test (5.4%), while the Marine Corps had the lowest percentage of individuals (2.4%) reporting that they failed to pass their most recent physical fitness test. The Marine Corps (22.5%) and Coast Guard (6.2%) had the highest and lowest percentage of individuals, respectively, reporting that they were unable to deploy. The percentage of individuals, across all branches of military service, reporting that they were able to deploy was 83.4%. Additional information regarding the physical fitness test and ability to deploy by rank and gender is presented in in Appendix B, Table B15.

***Medical readiness by branch of military service.*** The percentages of individuals reporting high blood pressure, high blood sugar, high cholesterol, low HDL cholesterol and high triglycerides by branch of military service are presented in Table 13.

Table 13.
Medical Readiness by Military Service Branch

| Medical Readiness Variable | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| High Blood Pressure | | | | | | |
| Yes | 14.69 | 11.95 | 17.86 | 11.85 | 13.02 | 13.93 |
| No | 85.31 | 88.05 | 82.14 | 88.15 | 86.98 | 86.07 |
| High Blood Sugar | | | | | | |
| Yes | 1.68 | 1.03 | 1.92 | 1.95 | 1.12 | 2.27 |
| No | 98.32 | 98.97 | 98.08 | 98.05 | 98.88 | 97.73 |
| High Cholesterol | | | | | | |
| Yes | 13.41 | 12.39 | 14.76 | 15.64 | 8.11 | 15.23 |
| No | 86.59 | 87.61 | 85.24 | 84.36 | 91.89 | 84.77 |
| Low HDL Cholesterol | | | | | | |
| Yes | 6.32 | 5.91 | 7.16 | 7.88 | 2.68 | 7.42 |
| No | 93.68 | 94.09 | 92.84 | 92.12 | 97.32 | 92.58 |
| High Triglycerides | | | | | | |
| Yes | 5.71 | 5.78 | 6.01 | 8.07 | 2.25 | 6.92 |
| No | 94.29 | 94.22 | 93.99 | 91.93 | 97.75 | 93.08 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

The Army had the highest percentage of individuals reporting high blood pressure (17.9%), while the Coast Guard had the lowest percentage of individuals reporting hypertension (11.9%). The Navy (2.3%) and the Air Force (1.0%) had the highest and lowest percentage of individuals reporting high blood sugar. The Coast Guard (15.6%) and Marine Corps (8.1%) had the highest and lowest percentage of individuals, respectively, reporting high cholesterol. The Coast Guard (7.9%) had the highest percentage of individuals reporting low HDL cholesterol; while the Air Force (5.91%) had the lowest percentage of individuals reporting low HDL cholesterol. The Navy (6.9%) and Marine Corps (2.7%) had the highest and lowest percentage of individuals reporting high triglycerides, respectively. Additional information specific to medical readiness by rank and gender across all branches of military service is presented in Appendix B, Table B16 and Table B17.

***Medical readiness sum score by branch of military service.*** A medical readiness sum score was calculated for each branch of military service by summing the response score of the five medical conditions (i.e., high blood pressure, high blood sugar, high cholesterol, low HDL cholesterol and high triglycerides). The descriptive and distributional characteristics by military branch of service are presented in Table 14. The mean scores across all branches of military service were very similar. The Army (4.47, SD = 0.95) and Navy (4.47, SD = 0.95) reported the lowest mean scores, while the Marine Corps reported the highest mean score (4.68, SD = 0.73). The medical sum score ranged from 0 to five and a higher medical readiness score was an indicator of higher medical and military readiness.

Table 14.
Medical Readiness Sum Score by Military Service Branch

| Medical Readiness Sum Score | N | Mean | SD | Mean Std. Error | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| All Service Branches | 39036 | 4.58 | 0.87 | 0.00 | -2.46 | 6.37 |
| Air Force | 11322 | 4.66 | 0.79 | 0.01 | -2.81 | 8.54 |
| Army | 6766 | 4.47 | 0.95 | 0.01 | -2.08 | 4.29 |
| Coast Guard | 5377 | 4.54 | 0.91 | 0.01 | -2.28 | 5.18 |
| Marine Corps | 8183 | 4.68 | 0.73 | 0.01 | -2.86 | 9.59 |
| Navy | 7388 | 4.47 | 0.98 | 0.01 | -2.15 | 4.51 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

***Job performance.*** Job performance was assessed by examining absenteeism related to a job accident, illness, or personal accident. The percentage of individuals within and across military branch of service is presented in Table 15. The Army had the highest percentages of individuals reporting missed work due to a job related accident (12.5%) and that they missed more than seven days of work because of job related accidents (6.0%). The Coast Guard had the highest percentage of individuals reporting missed work due to an illness (33.0%) or personal accident (48.3%).

Table 15.
Job Performance by Military Service Branch

| Job Performance Variables | All Service Branches % | Air Force % | Army % | Coast Guard % | Marine Corps % | Navy % |
|---|---|---|---|---|---|---|
| Absence Due to Job Accident | | | | | | |
| None | 90.87 | 94.13 | 87.49 | 91.86 | 90.36 | 93.00 |
| 1 to 6 days | 5.07 | 3.36 | 6.54 | 4.84 | 5.26 | 4.42 |
| 7 or more days | 4.06 | 2.51 | 5.96 | 3.30 | 4.38 | 2.58 |
| Absence Due to Illness | | | | | | |
| None | 72.84 | 68.50 | 73.25 | 66.99 | 78.25 | 74.30 |
| 1 to 6 days | 22.85 | 27.78 | 21.25 | 29.62 | 18.54 | 21.86 |
| 7 or more days | 4.31 | 3.72 | 5.50 | 3.38 | 3.21 | 3.84 |
| Absence Due to Personal Accident | | | | | | |
| None | 94.17 | 94.86 | 94.42 | 92.81 | 93.35 | 93.72 |
| 1 to 6 days | 4.30 | 3.75 | 4.21 | 5.43 | 4.41 | 4.80 |
| 7 or more days | 1.53 | 1.39 | 1.37 | 1.77 | 2.24 | 1.48 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

However, the Army had the highest percentage of individuals missing more than seven days of work related to illness (5.5%). The Marine Corps had the highest percentage of individuals who report missing more than seven days of work due to a personal accident (2.2%). The Air Force had the lowest percentage of individuals who reported missing any work days.

***Job performance sum score by military service branch.*** A job performance sum score was calculated by adding the scores across the three types of absenteeism (i.e., accident related to work, illness, and personal accident). The mean scores across all branches of military service were very similar. The Navy (4.21, SD = 2.38) and Army (4.53, SD = 2.80) had the lowest and highest mean sum scores, respectively. The mean sum score ranged from 0 to 18 where a higher mean sum score indicated more days missed and decreased military readiness. Detailed information specific to the job performance mean sum score within and across military branch of service is presented in Table 16. Additional job performance information broken down by military rank and gender across branch of military service is presented in Appendix B., Table B18 and Table B19.

Table 16.
Job Performance Sum Score by Military Service Branch

| Absence Sum Score | N | Mean | SD | Mean Std. Error | Skewness | Kurtosis |
|---|---|---|---|---|---|---|
| All Service Branches | 39453 | 4.33 | 2.52 | 0.01 | 2.85 | 11.14 |
| Air Force | 11451 | 4.28 | 2.33 | 0.02 | 2.84 | 11.59 |
| Army | 6854 | 4.53 | 2.80 | 0.03 | 2.53 | 8.16 |
| Coast Guard | 5413 | 4.37 | 2.43 | 0.03 | 2.80 | 11.37 |
| Marine Corps | 8247 | 4.34 | 2.69 | 0.03 | 2.97 | 11.62 |
| Navy | 7488 | 4.21 | 2.38 | 0.03 | 3.01 | 12.48 |

Notes: SD = standard deviation; Mean Std. Error = standard error of the mean.

### 4.2 Variable Relationships

**Relationship between alcohol use and military readiness.** A series of logistic and linear regression models were conducted to evaluate the relationships between each of the alcohol use variables and each of the military readiness variables. Hypothesis 1 proposed that greater alcohol use would be negatively correlated with military readiness (i.e., passing the physical fitness test, ability to deploy, medical readiness, and job performance).

The logistic regression models for the alcohol use variables (i.e., number of drinking days [NDD], heavy drinking days [HDD], and drinks per drinking days [DDD]) and the probability of passing the fitness test and being able to deploy are presented in Table 17. In regard to passing the fitness test, the NDD and DDD were both statistically significant in the model, while HDD was not ($p$ = .06). Unexpectedly, NDD was positively associated with passing the most recent physical fitness test such that, for every one day increase in drinking days, there was a 1.002 increase in the odds of passing. As hypothesized, DDD was negatively associated with passing the fitness test such that for every one unit increase in drinks per drinking day, there was a decreased odds (*OR* = 0.997) of passing resulting in decreased military readiness.

Table 17.
Logistic Regression Results for Alcohol Use and the Physical Fitness Test and Ability to Deploy across all Branches of Military Service

| | DF | Est. | S.E. | Wald Chi-Sq | Pr > Chi-Sq | 95% CL for the Model Est. LL | 95% CL for the Model Est. UL | OR Est. | 95% CL for OR Est. LL | 95% CL for OR Est. UL |
|---|---|---|---|---|---|---|---|---|---|---|
| Physical Fitness Test | | | | | | | | | | |
| NDD | 1 | 0.002 | 0.001 | 5.483 | **0.019** | 0.000 | 0.004 | 1.002 | 1.000 | 1.004 |
| HDD | 1 | -0.003 | 0.001 | 3.522 | 0.061 | -0.006 | 0.000 | 0.997 | 0.994 | 1.000 |
| DDD | 1 | -0.025 | 0.012 | 3.970 | **0.046** | -0.049 | 0.000 | 0.976 | 0.953 | 1.000 |
| Ability to Deploy | | | | | | | | | | |
| NDD | 1 | 0.002 | 0.000 | 23.870 | **<.001** | 0.001 | 0.003 | 1.002 | 1.001 | 1.003 |
| HDD | 1 | -0.002 | 0.001 | 7.268 | **0.007** | -0.004 | -0.001 | 0.998 | 0.996 | 0.999 |
| DDD | 1 | 0.008 | 0.010 | 0.554 | 0.457 | -0.013 | 0.028 | 1.008 | 0.987 | 1.029 |

Notes: NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate, S.E. = standard error; OR Est. = odds ratio estimate; CL = confidence levels, LL = lower limit, UL = upper limit.

Regarding the relationship between alcohol use and the ability to deploy, the NDD and HDD were both statistically significant ($p < .05$) in the model, while DDD was not. Unexpectedly, NDD was positively associated with the probability of being able to deploy such that for every one unit increase in number of drinking days, there was a 1.002 odds for being able to deploy. As hypothesized, HDD was negatively associated with the probability of being able to deploy such that for every one unit increase in HDD there was a decreased odds of being able to deploy of (*OR* = 0.998) suggesting decreased readiness.

The linear regression models specific to the relationship between the alcohol use and medical readiness score, and alcohol use and job performance are presented in Table 18. All of the drinking variables were significant (p < .05). Unexpectedly, HDD and DDD were both positively associated with the medical readiness score, while NDD was inversely related to medical readiness.

Table 18.
Linear Regression Results for Alcohol use and Medical Readiness and Job Performance Scores across all Branches of Military Service

| | | | | | | 95% CL Model Est. | |
|---|---|---|---|---|---|---|---|
| Variable | DF | Est. | S.E. | t Value | P < \|t\| | LL | UL |
| Medical Readiness Score | | | | | | | |
| NDD | 1 | -0.0002 | 0.000 | -2.030 | **0.04** | 0.000 | 0.000 |
| HDD | 1 | 0.001 | 0.000 | 2.500 | **0.01** | 0.000 | 0.001 |
| DDD | 1 | 0.013 | 0.002 | 6.370 | **<.001** | 0.009 | 0.017 |
| Job Performance Score | | | | | | | |
| NDD | 1 | -0.001 | 0.000 | -1.420 | 0.16 | -0.001 | 0.000 |
| HDD | 1 | 0.002 | 0.001 | 1.890 | 0.06 | 0.000 | 0.003 |
| DDD | 1 | 0.001 | 0.012 | 0.050 | 0.96 | -0.022 | 0.023 |

Notes: NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; S.E. = standard error; CL = confidence levels, LL = lower limit, UL = upper limit.

As hypothesized, NDD was negatively associated with medical readiness such that for every day increase in drinking there was decreased medical and military readiness. However, the findings were unexpected for the relationships between HDD and medical readiness as well as between DDD and medical readiness. More specifically, greater HDD was associated with a 0.001 unit increase in the medical readiness sum score (i.e. increased medical and military readiness). Similarly for DDD, for every DDD increase, there was a 0.013 point increase in the medical readiness sum score. Based on the results obtained from these logistic and linear regression models, hypothesis 1 was partially supported. The models evaluating these relationships only accounted for a very small amount of the variance ($R^2$ ranged from 0.0003 to 0.01). The amount of variance accounted for, was expected to increase with further examination of covariates therefore, those items that were significant were retained for further evaluation in the structural equation models.

**Relationship between alcohol use and body mass index.** A series of logistic regression models were used to assess the relationships between each alcohol use variable and body mass index. Hypothesis 2a proposed that greater alcohol use would be positively correlated with BMI. This model was first tested as a cumulative logistic regressions, however, due to a statistically significant score test of the proportional odds assumption (641.34, *DF* = 8, *p* = <.001), the models were changed to generalized ordered logistic models, using obese as the reference category. The results of the models for alcohol use and BMI are presented in Table 19.

Regarding the relationship between NDD and BMI, NDD was not significant ($p >$ .05) and a very small amount of the variance was explained by this model ($R^2$ = 0.003). As expected, DDD was significantly associated with the healthy weight and overweight categories but not with the underweight category.

Table 19.
Generalized Ordered Logistic Regression Model for Alcohol Use and BMI Probability Modeled in Ascending Order (Obese is the Reference)

| Alcohol Variable | BMI Category | DF | Est. | S.E. | Wald Chi-Sq. | Pr > Chi-Sq. | 95% CL for the Model Est. LL | 95% CL for the Model Est. UL | Odds Ratio Est. | 95% CL for Odds Ratio Est. LL | 95% CL for Odds Ratio Est. UL |
|---|---|---|---|---|---|---|---|---|---|---|---|
| NDD | Under Wt. | 1 | -0.001 | 0.002 | 0.748 | 0.39 | -0.005 | 0.002 | 0.999 | 0.995 | 1.002 |
| | Healthy | 1 | 0.000 | 0.000 | 1.000 | 0.32 | -0.001 | 0.000 | 1.000 | 0.999 | 1.000 |
| | Over Wt. | 1 | 0.000 | 0.000 | 0.413 | 0.52 | 0.000 | 0.001 | 1.000 | 1.000 | 1.001 |
| HDD | Under Wt. | 1 | 0.000 | 0.003 | 0.020 | 0.89 | -0.006 | 0.005 | 1.000 | 0.994 | 1.005 |
| | Healthy | 1 | 0.000 | 0.001 | 0.113 | 0.74 | -0.001 | 0.001 | 1.000 | 0.999 | 1.001 |
| | Over Wt. | 1 | 0.000 | 0.001 | 0.067 | 0.80 | -0.001 | 0.001 | 1.000 | 0.999 | 1.001 |
| DDD | Under Wt. | 1 | -0.037 | 0.028 | 1.771 | 0.18 | -0.092 | 0.018 | 0.964 | 0.913 | 1.018 |
| | Healthy | 1 | -0.026 | 0.007 | 12.627 | **<.001** | -0.041 | -0.012 | 0.974 | 0.960 | 0.988 |
| | Over Wt. | 1 | -0.014 | 0.006 | 4.383 | **0.04** | -0.026 | -0.001 | 0.986 | 0.974 | 0.999 |

Notes: NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; S.E. = standard error of the estimate; CL = confidence limit, LL = lower limit, UL = upper limit.

Therefore, for each drink increase in DDD, we expect a decrease in the odds of being in the healthy weight (*OR* = 0.97) and overweight (*OR* = 0.99) categories compared to the obese category (i.e. increased DDD is associated with increased BMI). A small portion of the variance was explained with this model ($R^2$ = 0.029). The results of the generalized ordered logistic regression model for HDD and body mass index found HDD was not a significant predictor of obesity ($R^2$ = 0.0004). Based on the results obtained from these logistic regression models, hypothesis 2a was partially supported. The models evaluating the aforementioned relationships accounted for a very small proportion of the variance ($R^2$ ranged from 0.0004 to 0.029).

**Relationship between Alcohol Use and Eating Behaviors.** Two linear regression models were used to test the relationship between alcohol use and each of the eating behavior scores (i.e., healthy food group sum score and less healthy food sum score). Hypothesis 2b proposed that greater alcohol use would be associated with a lower score for the healthy food group sum score and a higher score for the less healthy food group sum score. The results of the model are presented in Table 20.

Table 20.
Linear Regression Model for Alcohol use and Food Sum Scores for all Military Service Branches

| | | | | | | | 95% CL Model Est. | |
|---|---|---|---|---|---|---|---|---|
| Food Type | Variable | DF | Est. | S.E. | t Value | P < \|t\| | LL | UL |
| | NDD | 1 | 0.002 | 0.001 | 2.730 | **0.006** | 0.001 | 0.003 |
| | HDD | 1 | -0.006 | 0.002 | -3.490 | **0.001** | -0.009 | -0.002 |
| Healthy | DDD | 1 | -0.071 | 0.015 | -4.710 | **<.001** | -0.101 | -0.042 |
| | NDD | 1 | 0.000 | 0.001 | -0.020 | 0.985 | -0.001 | 0.001 |
| Less | HDD | 1 | 0.006 | 0.001 | 4.000 | **<.001** | 0.003 | 0.009 |
| Healthy | DDD | 1 | 0.051 | 0.016 | 3.260 | **0.001** | 0.020 | 0.081 |

Notes: Healthy = healthy food frequency score; Less Healthy = less healthy food frequency score; NDD = number of drinking days, HDD = heavy drinking days, DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; S.E. = standard error of the estimate; CL = confidence limit, LL = lower limit, UL = upper limit.

All of the alcohol use variables were significant predictors of the healthy food group sum score. As hypothesized, HDD and DDD were negatively associated with the healthy food group sum score. In contrast, NDD was positively associated with the healthy food group sum score. Specifically, a one-day increase in the NDD was associated with an increase of 0.002 in the healthy food group sum score ($p$ = .006). In contrast, every one-day increase in HDD was associated with 0.006 decrease in the healthy food group sum score ($p$ = .001), and a one drink increase in DDD was associated with a 0.071 decrease in the healthy food group sum score ($p$ = <.001). A small portion of the variance was explained with this model ($R^2$ = 0.005).

Alternatively, the NDD was not a significant predictor of the less healthy food group sum score. As hypothesized, HDD and DDD were significant predictors of the less healthy food group sum score (i.e., both were positively related to the less healthy food group sum score) supporting hypothesis 2b. Specifically, a one-day increase in HDD was associated with a higher less healthy food group sum score (i.e., increase by 0.006; $p$ = .001). Similarly, a one-drink increase in DDD day was associated with a higher less healthy food group sum score (i.e., increase by 0.051; $p$ = .001). A small portion of the variance was explained with this model ($R^2$ = 0.007). The hypotheses regarding alcohol use and eating habits were partially supported and varied by alcohol use variable.

**Relationship between alcohol use and physical activity.** The relationship between alcohol use and physical activity (i.e., frequency and duration of vigorous, moderate, and strength training physical activity as well as meeting Healthy People physical activity goals) was examined using a series of generalized logistic regression models. The association between alcohol use and physical activity was hypothesized (i.e., Hypothesis 2c) to be an inverted u-shape curve, such that low-to-moderate levels of alcohol use would be associated with higher levels of physical activity relative to no alcohol use, and heavy alcohol use would be associated with lower levels of physical activity relative to low-to-moderate alcohol use.

**Alcohol use variables and frequency of physical activity.** For vigorous physical activity frequency and alcohol use, the results of the logistic regression models are presented in Table 21. HDD was negatively associated with the vigorous physical activity frequency categories '1-2 days per week' (-0.004, 95% *CI*s [-0.006-0.002], $p$ = .001) and '3-4 days a week' (-0.004, 95% *CI*s [-0.006-0.001]; $p$ =.004). Specifically, for an increase of one day in the number of HDD, the odds of reporting vigorous physical activity '1-2 days a week' decreased (*OR* = 0.996) compared to 'everyday'; and the odds of reporting vigorous physical activity '3-4 days a week' decreased (*OR* = 0.996) compared to 'everyday', indicating a greater odds of more vigorous physical activity with greater HDD. The portion of the variance explained with this model was ($R^2$ = 0.18).

Table 21.
Logistic Regression Model Results for Alcohol Use Variables and Vigorous Physical Activity Frequency

| Variable | Category | DF | Est. | S.E. | Wald Chi-Sq. | Pr > Chi-Sq. | 95% CL for the Model Est. LL | UL |
|---|---|---|---|---|---|---|---|---|
| NDD | Not at all past 30 days | 1 | -0.001 | 0.001 | 1.078 | 0.30 | -0.002 | 0.001 |
| | Less than 1 day a week | 1 | 0.000 | 0.001 | 0.027 | 0.87 | -0.001 | 0.001 |
| | 1-2 days a week | 1 | 0.001 | 0.001 | 3.063 | 0.08 | 0.000 | 0.002 |
| | 3-4 days a week | 1 | 0.001 | 0.001 | 3.513 | 0.06 | 0.000 | 0.002 |
| | 5-6 days a week | 1 | 0.000 | 0.001 | 0.121 | 0.73 | -0.002 | 0.001 |
| HDD | Not at all past 30 days | 1 | -0.002 | 0.001 | 2.129 | 0.15 | -0.005 | 0.001 |
| | Less than 1 day a week | 1 | 0.000 | 0.001 | 0.038 | 0.85 | -0.003 | 0.002 |
| | 1-2 days a week | 1 | -0.004 | 0.001 | 10.632 | **<.001** | -0.006 | -0.002 |
| | 3-4 days a week | 1 | -0.004 | 0.001 | 8.392 | **<.001** | -0.006 | -0.001 |
| | 5-6 days a week | 1 | -0.002 | 0.001 | 2.375 | 0.12 | -0.005 | 0.001 |
| DDD | Not at all past 30 days | 1 | -0.004 | 0.017 | 0.042 | 0.84 | -0.037 | 0.030 |
| | Less than 1 day a week | 1 | -0.028 | 0.018 | 2.558 | 0.11 | -0.062 | 0.006 |
| | 1-2 days a week | 1 | 0.002 | 0.014 | 0.024 | 0.88 | -0.025 | 0.029 |
| | 3-4 days a week | 1 | 0.003 | 0.014 | 0.036 | 0.85 | -0.025 | 0.030 |
| | 5-6 days a week | 1 | 0.009 | 0.014 | 0.364 | 0.55 | -0.019 | 0.036 |

Note: Logits modeled used VIG_EX_FQ='About every day' as the reference category. NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; Std. Err. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate.

All the alcohol use variables were significant predictors of at least one of the moderate physical activity frequency categories and the results from the logistic regression models are presented in Table 22. More specifically, NDD was negatively associated with reporting no moderate physical activity in the past 30 days (-0.002, 95% *CI*s [-0.004, -0.001]; $p$ = .007), indicating that for a one day increase in the NDD, there would be greater odds of reporting moderate physical activity 'everyday' vs. 'not at all in the past 30 days'. HDD was negatively associated with reporting moderate physical activity '3-4 days a week' (-0.003; 95% *CI*s [-0.005, -0.001]; $p$ <.001), such that for each increase in HDD, the odds of reporting moderate physical activity '3-4 days a week' was 0.997 compared to 'everyday'. Therefore, a greater number of HDD was associated with greater odds of reporting moderate physical activity.

Table 22.
Logistic Regression Model Results for Alcohol Use and Moderate Physical Activity Frequency

| Variable | Category | DF | Est. | S.E. | Wald Chi-Sq. | P > Chi-Sq. | 95% CL for the Model Est. LL | UL |
|---|---|---|---|---|---|---|---|---|
| NDD | Not at all past 30 days | 1 | -0.002 | 0.001 | 7.275 | **0.01** | -0.004 | -0.001 |
| | Less than 1 day a week | 1 | 0.000 | 0.001 | 0.000 | 0.99 | -0.001 | 0.001 |
| | 1-2 days a week | 1 | 0.001 | 0.000 | 2.666 | 0.10 | 0.000 | 0.002 |
| | 3-4 days a week | 1 | 0.000 | 0.000 | 0.056 | 0.81 | -0.001 | 0.001 |
| | 5-6 days a week | 1 | -0.001 | 0.000 | 1.451 | 0.23 | -0.001 | 0.000 |
| HDD | Not at all past 30 days | 1 | 0.000 | 0.001 | 0.133 | 0.72 | -0.002 | 0.003 |
| | Less than 1 day a week | 1 | 0.001 | 0.001 | 0.450 | 0.50 | -0.002 | 0.003 |
| | 1-2 days a week | 1 | -0.001 | 0.001 | 1.011 | 0.31 | -0.003 | 0.001 |
| | 3-4 days a week | 1 | -0.003 | 0.001 | 12.593 | **<.001** | -0.005 | -0.001 |
| | 5-6 days a week | 1 | -0.001 | 0.001 | 0.823 | 0.36 | -0.002 | 0.001 |
| DDD | Not at all past 30 days | 1 | 0.026 | 0.017 | 2.183 | 0.14 | -0.008 | 0.060 |
| | Less than 1 day a week | 1 | 0.013 | 0.014 | 0.866 | 0.35 | -0.014 | 0.040 |
| | 1-2 days a week | 1 | 0.018 | 0.012 | 2.367 | 0.12 | -0.005 | 0.040 |
| | 3-4 days a week | 1 | 0.006 | 0.010 | 0.342 | 0.56 | -0.014 | 0.026 |
| | 5-6 days a week | 1 | 0.019 | 0.010 | 3.684 | **0.05** | 0.000 | 0.039 |

Note: Logits modeled used 'About every day' as the reference category. NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; Std. Err. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate.

DDD was positively associated with reporting doing moderate physical activity '5-6 days a week' category of moderate physical activity (0.019, 95% *CI*s [0.000, 0.039]; $p$ = .05), such that for an increase in DDD, the odds of reporting doing moderate physical activity '5-6 days a week' was 1.02 compared to 'everyday'. Thus, DDD was associated with greater odds of engaging in a lower frequency of moderate physical activity. The portion of the variance explained by this model was small ($R^2$ = 0.18).

Examining the relationships for strength training, NDD and HDD were significant predictors of at least one strength training frequency category, while DDD was not predictive of strength training frequency. The results of the logistic regression models are presented in Table 23. NDD was positively associated with all of the strength training frequency categories ($p < .05$) except '5-6 days per week', while HDD was negatively associated with all of the strength training frequency categories. A one-day increase in NDD was associated with increased odds of all strength training frequency categories, which ranged from 1.001-1.003 compared to 'everyday' ($p < .05$); suggesting that NDD was associated with reporting lower strength training.

Table 23.
Logistic Regression Model Results for Alcohol Use Variables and Strength Training Frequency

| Variable | Category | DF | Est. | S.E. | Wald Chi-Sq | Pr > Chi-Sq | 95% CL for the Model Est. LL | UL |
|---|---|---|---|---|---|---|---|---|
| NDD | Not at all past 30 days | 1 | 0.002 | 0.001 | 4.372 | **0.04** | 0.000 | 0.003 |
| | Less than 1 day a week | 1 | 0.003 | 0.001 | 12.668 | **<.001** | 0.001 | 0.004 |
| | 1-2 days a week | 1 | 0.002 | 0.001 | 8.099 | **<.001** | 0.001 | 0.003 |
| | 3-4 days a week | 1 | 0.002 | 0.001 | 4.509 | **0.03** | 0.000 | 0.003 |
| | 5-6 days a week | 1 | 0.001 | 0.001 | 1.792 | 0.18 | 0.000 | 0.003 |
| HDD | Not at all past 30 days | 1 | -0.004 | 0.001 | 7.866 | **<.001** | -0.006 | -0.001 |
| | Less than 1 day a week | 1 | -0.005 | 0.001 | 11.263 | **<.001** | -0.007 | -0.002 |
| | 1-2 days a week | 1 | -0.005 | 0.001 | 16.989 | **<.001** | -0.008 | -0.003 |
| | 3-4 days a week | 1 | -0.005 | 0.001 | 15.530 | **<.001** | -0.007 | -0.002 |
| | 5-6 days a week | 1 | -0.003 | 0.001 | 5.466 | **0.02** | -0.006 | 0.000 |
| DDD | Not at all past 30 days | 1 | 0.003 | 0.015 | 0.031 | 0.86 | -0.027 | 0.032 |
| | Less than 1 day a week | 1 | -0.020 | 0.017 | 1.382 | 0.24 | -0.053 | 0.013 |
| | 1-2 days a week | 1 | -0.018 | 0.014 | 1.692 | 0.19 | -0.046 | 0.009 |
| | 3-4 days a week | 1 | 0.004 | 0.014 | 0.099 | 0.75 | -0.022 | 0.031 |
| | 5-6 days a week | 1 | 0.022 | 0.013 | 2.933 | 0.09 | -0.003 | 0.048 |

Note: Logits modeled used 'About every day' as the reference category. NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; Std. Err. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate.

For HDD, the odds of all the strength training frequency categories ranged from 0.995-0.997 compared to 'everyday' ($p < .05$); suggesting greater HDD was associated with reporting greater strength training frequency. The proportion of variance explained by this model was small ($R^2 = 0.24$).

**Alcohol use variables and duration of physical activity.** The results of the logistic regression models between vigorous physical activity duration and alcohol use are presented in Table 24. The probabilities for these models were modeled over the lower categories with ‘60 minutes or more’ as the reference category. NDD, HDD and DDD were all significant in the model for at least one of the duration categories of vigorous physical activity. Specifically, NDD was positively associated with reporting doing vigorous physical activity ’20-29 minutes/day’ (0.002, 95% *CI*s [0.001, 0.003]; $p < .001$) and ’30-59 minutes/day’ (0.002, 95% *CI*s [0.001, 0.002]; $p < .001$) compared to ‘60 minutes or more/day’. Thus, for a one day increase in the NDD, there was a 1.002 greater odds of reporting being in each of those categories compared to reporting doing vigorous physical activity of ‘60 minutes or more/day’. Therefore, suggesting that greater NDD was associated with a lower duration of vigorous activity.

HDD was negatively associated with reporting doing vigorous physical activity for ’20-29 minutes/day’ (-0.002, 95% *CI*s [-0.004, -0.001]; $p = .01$) and ’30-59 minutes/day’ categories (-0.002, 95% *CI*s [-0.003, 0.00]; $p = .03$). Specifically, for a one day increase in HDD, there was an odds ratio of 0.998 specific to reporting vigorous physical activity for ’20-29 minutes/day’ and ’30-59 minutes/ day’ compared to ’60 min or more/day’. Thus, suggesting that greater HDD was associated with greater vigorous physical activity. Finally, DDD was negatively associated with reporting vigorous physical activity ‘less than 20 minutes/day’ (-0.035, 95% *CI*s [-0.063, -0.007]; $p = .02$). Specifically, for a one drink increase in DDD, there was a lower odds (*OR* = 0.96) for reporting vigorous physical activity ‘less than 20 minutes/day’ compared to ’60 minutes or more/day’. Therefore, greater DDD was associated with greater vigorous physical activity duration. The portion of variance explained by this model was relatively small ($R^2$ = 0.12).

Table 24.
Logistic Regression Model Results for Alcohol Use Variables and Vigorous Physical Activity Duration

| Variable | Category | DF | Est. | S.E. | Wald Chi-Sq | Pr > Chi-Sq | 95% CL for the Model Est. LL | UL |
|---|---|---|---|---|---|---|---|---|
| NDD | Never past month | 1 | 0.000 | 0.001 | 0.016 | 0.90 | -0.001 | 0.001 |
| | Less than 20 minutes | 1 | 0.001 | 0.001 | 1.094 | 0.30 | 0.000 | 0.002 |
| | 20-29 minutes | 1 | 0.002 | 0.000 | 24.611 | **<.001** | 0.001 | 0.003 |
| | 30 to 59 minutes | 1 | 0.002 | 0.000 | 13.845 | **<.001** | 0.001 | 0.002 |
| HDD | Never past month | 1 | -0.001 | 0.001 | 0.304 | 0.58 | -0.003 | 0.002 |
| | Less than 20 minutes | 1 | -0.001 | 0.001 | 0.369 | 0.54 | -0.003 | 0.001 |
| | 20-29 minutes | 1 | -0.002 | 0.001 | 7.276 | **0.01** | -0.004 | -0.001 |
| | 30 to 59 minutes | 1 | -0.002 | 0.001 | 5.056 | **0.03** | -0.003 | 0.000 |
| DDD | Never past month | 1 | -0.007 | 0.014 | 0.293 | 0.59 | -0.034 | 0.019 |
| | Less than 20 minutes | 1 | -0.035 | 0.015 | 5.839 | **0.02** | -0.063 | -0.007 |
| | 20-29 minutes | 1 | -0.005 | 0.010 | 0.228 | 0.63 | -0.024 | 0.015 |
| | 30 to 59 minutes | 1 | -0.002 | 0.008 | 0.061 | 0.81 | -0.019 | 0.014 |

Notes: Logits modeled used '60 minutes or more' as the reference category. NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; Std. Err. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate.

The results of the logistic regression models for the relationship between alcohol use and moderate physical activity are presented in Table 25. NDD was negatively associated with reporting no moderate physical activity in the past month (-0.002, 95% *CI*s [-0.003, -0.00]; *p* = .04). Thus, for a one day increase in NDD there was a lower odds (*OR* = 0.998) of reporting no moderate physical activity versus reporting '60 min. or more/day'. In contrast, NDD was positively associated with reporting moderate physical activity for '20-29 minutes/day' (0.001, 95% *CI*s [0.000, 0.002]; *p* = .04) and '30-59 minutes/day' (0.001, 95% *CI*s [0.000, 0.002], *p* = .01). Therefore, a one day increase in the NDD was associated with a 1.001 greater odds of reporting being in each of those categories versus the '60 min. or more/day' category. These findings suggest that greater NDD is associated with lower moderate physical activity duration.

In regard to DDD and moderate physical activity duration, DDD was negatively associated with reporting ‘30 to 59 minutes/day’ (-0.002, 95% *CI*s [-0.003, 0.000]; *p* = .01) compared to reporting ‘60 minutes or more/day’. Thus, for a one drink increase in DDD, there was a lower odds (*OR* = 0.99) of reporting moderate physical activity for ’30 to 59 minutes/day’ compared to the ‘60 minutes or more/day’. Therefore, greater DDD was associated with a greater reported duration of moderate physical activity. The proportion of variance explained by this model was relatively small ($R^2$ = 0.13). Finally, HDD was not significant in the model for moderate activity duration.

Table 25.
Logistic Regression Model Results for Alcohol Use Variables and Moderate Physical Activity Duration

| Variable | Category | DF | Est. | Std. Err. | Wald Chi-Sq | Pr > Chi-Sq | 95% CL for the Model Est. LL | UL |
|---|---|---|---|---|---|---|---|---|
| NDD | Never past month | 1 | -0.002 | 0.001 | 4.305 | **0.04** | -0.003 | 0.000 |
| | Less than 20 minutes | 1 | 0.000 | 0.001 | 0.382 | 0.53 | -0.001 | 0.001 |
| | 20-29 minutes | 1 | 0.001 | 0.000 | 4.334 | **0.04** | 0.000 | 0.002 |
| | 30 to 59 minutes | 1 | 0.001 | 0.000 | 10.006 | **<.001** | 0.000 | 0.002 |
| HDD | Never past month | 1 | 0.009 | 0.016 | 0.329 | 0.57 | -0.023 | 0.041 |
| | Less than 20 minutes | 1 | -0.002 | 0.015 | 0.024 | 0.88 | -0.031 | 0.026 |
| | 20-29 minutes | 1 | -0.012 | 0.011 | 1.163 | 0.28 | -0.034 | 0.010 |
| | 30 to 59 minutes | 1 | 0.002 | 0.007 | 0.101 | 0.75 | -0.012 | 0.017 |
| DDD | Never past month | 1 | 0.001 | 0.001 | 1.293 | 0.26 | -0.001 | 0.004 |
| | Less than 20 minutes | 1 | -0.001 | 0.001 | 0.750 | 0.39 | -0.003 | 0.001 |
| | 20-29 minutes | 1 | -0.001 | 0.001 | 0.588 | 0.44 | -0.002 | 0.001 |
| | 30 to 59 minutes | 1 | -0.002 | 0.001 | 6.789 | **0.01** | -0.003 | 0.000 |

Notes: Logits modeled used ’60 minutes or more’ as the reference category. NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; Std. Err. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate.

The results of the logistic regression models between alcohol use and strength training duration are presented in Table 26. All of the alcohol use variables were significant for at least one of the duration categories. The NDD was positively associated with all of the duration categories such that for a one day increase in the NDD, there was a greater odds of reporting being in each of those categories compared to the ’60 minutes or more/day' category of strength training. This suggests greater NDD is associated with lower strength training duration.

HDD and DDD were negatively associated with reporting strength training 'less than 20 min / day', '20-29 minutes / day', and '30 to 59 minutes / day' and were not significantly related to the 'never' category. For a one day increase in HDD or DDD, the odds of reporting being in one of the aforementioned categories ranged from 0.996 to 0.998 for HDD and from 0.94 to 0.98 for DDD compared to reporting being in the '60 min. or more/day' category. Thus, greater HDD and greater DDD were associated with reporting greater strength training duration.

Table 26.
Logistic Regression Model Results for Alcohol Use Variables and Strength Training Duration

| Variable | Category | DF | Est. | Std. Err. | Wald Chi-Sq | Pr > Chi-Sq | 95% CL for the Model Est. LL | UL |
|---|---|---|---|---|---|---|---|---|
| NDD | Never past month | 1 | 0.002 | 0.000 | 11.947 | **0.001** | 0.001 | 0.003 |
| | Less than 20 minutes | 1 | 0.002 | 0.000 | 13.132 | **<.001** | 0.001 | 0.003 |
| | 20-29 minutes | 1 | 0.002 | 0.000 | 26.197 | **<.001** | 0.001 | 0.003 |
| | 30 to 59 minutes | 1 | 0.002 | 0.000 | 29.071 | **<.001** | 0.001 | 0.003 |
| HDD | Never past month | 1 | -0.001 | 0.001 | 2.722 | 0.10 | -0.003 | 0.000 |
| | Less than 20 minutes | 1 | -0.004 | 0.001 | 14.146 | **<.001** | -0.006 | -0.002 |
| | 20-29 minutes | 1 | -0.003 | 0.001 | 8.548 | **<.001** | -0.005 | -0.001 |
| | 30 to 59 minutes | 1 | -0.002 | 0.001 | 5.639 | **0.02** | -0.003 | 0.000 |
| DDD | Never past month | 1 | -0.015 | 0.011 | 2.004 | 0.16 | -0.036 | 0.006 |
| | Less than 20 minutes | 1 | -0.065 | 0.015 | 17.889 | **<.001** | -0.095 | -0.035 |
| | 20-29 minutes | 1 | -0.038 | 0.011 | 11.029 | **<.001** | -0.060 | -0.015 |
| | 30 to 59 minutes | 1 | -0.019 | 0.008 | 5.316 | **0.02** | -0.035 | -0.003 |

Notes: Logits modeled used '60 minutes or more' as the reference category. NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; Std. Err. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate.

**Alcohol use variables and Healthy People goals.** The results of the generalized ordered logistic regression models for all the drinking variables and the Healthy People goals by each activity type are presented in Table 27. For the vigorous activity goal, the probabilities were modeled over the lower categories with the highest category '150 minutes or more' used as the reference category.

Regarding the vigorous activity goal and alcohol use, NDD was statistically significant and had a positive relationship with at least one category of vigorous physical activity while HDD and DDD were not statistically significant. Specifically, NDD was significantly associated with reporting doing vigorous activity for '75 minutes or more per week'.

Table 27.
Logistic Regression Model Results for Alcohol Use Variables and Healthy People Goals

| Variable | Category | DF | Est. | S.E. | Wald Chi-Sq. | P > Chi-Sq. | 95% CL for the Model Est. LL | UL |
|---|---|---|---|---|---|---|---|---|
| Vigorous Activity Goals | | | | | | | | |
| NDD | < 75 min. / wk. | 1 | 0.000 | 0.000 | 0.006 | 0.94 | -0.001 | 0.001 |
| | 75 + min. / wk. | 1 | 0.001 | 0.000 | 9.106 | **<.001** | 0.000 | 0.002 |
| HDD | < 75 min. / wk. | 1 | -0.001 | 0.001 | 0.837 | 0.36 | -0.002 | 0.001 |
| | 75 + min. / wk. | 1 | -0.002 | 0.001 | 2.473 | 0.12 | -0.003 | 0.000 |
| DDD | < 75 min. / wk. | 1 | -0.012 | 0.007 | 2.798 | 0.09 | -0.026 | 0.002 |
| | 75 + min. / wk. | 1 | 0.003 | 0.010 | 0.117 | 0.73 | -0.016 | 0.023 |
| Moderate Activity Goals | | | | | | | | |
| NDD | < 150 min. / wk. | 1 | 0.000 | 0.000 | 0.532 | 0.47 | 0.000 | 0.001 |
| | 150 + min. / wk. | 1 | 0.000 | 0.000 | 0.010 | 0.92 | -0.001 | 0.001 |
| HDD | < 150 min. / wk. | 1 | -0.001 | 0.001 | 3.118 | 0.08 | -0.002 | 0.000 |
| | 150 + min. / wk. | 1 | -0.002 | 0.001 | 8.605 | **<.001** | -0.004 | -0.001 |
| DDD | < 150 min. / wk. | 1 | 0.004 | 0.008 | 0.260 | 0.61 | -0.012 | 0.021 |
| | 150 + min. / wk. | 1 | 0.002 | 0.008 | 0.087 | 0.77 | -0.014 | 0.019 |
| Strength Training Goal | | | | | | | | |
| NDD | < 1 day / wk. | 1 | 0.001 | 0.000 | 9.184 | **<.001** | 0.000 | 0.002 |
| | 1 to 2 days / wk. | 1 | 0.001 | 0.000 | 7.861 | **0.01** | 0.000 | 0.002 |
| HDD | < 1 day / wk. | 1 | -0.001 | 0.001 | 0.924 | 0.34 | -0.002 | 0.001 |
| | 1 to 2 days / wk. | 1 | -0.002 | 0.001 | 5.715 | **0.02** | -0.003 | 0.000 |
| DDD | < 1 day / wk. | 1 | -0.015 | 0.009 | 2.971 | 0.08 | -0.032 | 0.002 |
| | 1 to 2 days / wk. | 1 | -0.026 | 0.008 | 9.458 | **<.001** | -0.043 | -0.009 |

Notes: Vigorous Activity logits modeled used '150 minutes or more per week' as the reference category. Moderate activity logits modeled used '300 minutes or more per week' as the reference category. Strength training logits modeled used '3 or more days per week' as the reference category. P values in bold = significant. NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; S.E. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate.

Thus, for a one day increase in NDD, there was a greater odds (*OR* =1.001) of reporting '75 minutes or more' versus '150 minutes or more' of vigorous activity. Thus, a greater NDD was associated with reporting being in a lower vigorous activity category.

For the moderate activity goal, the reference category was '300 minutes or more'. In regard to moderate activity and alcohol use, HDD was the only variable that was significant in the model ($p$ = .003). HDD was negatively related to reporting doing '150 min. or more per week' of moderate physical activity. For every one day increase in HDD, there was a decreased odds (*OR* = 0.988) of reporting '150 min. or more per week' compared to the '300 min. or more per week' of moderate activity, suggesting that a greater number of HDD is related to a greater likelihood of being in a higher moderate activity healthy people goal category. The model accounted for a relatively small portion of the variance ($R^2$ =0.091).

In regard to the strength training goal, the reference category was '3 or more days per week'. With respect to the association between the strength training goal and alcohol use, NDD was positively associated with reporting 'less than 1 day per week' and '1 to 2 days per week' of strength training. Specifically, for every one day increase in NDD, the odds of reporting engaging in strength training 'less than 1 day per week' (*OR* =1.001) or '1 to 2 days per week (*OR* =1.001) was greater than reporting '3 or more days per week' of strength training. This relationship suggests that greater NDD was associated with a lower healthy people goal strength training category.

The relationship between HDD and the strength training healthy people goal was such that HDD was negatively associated with reporting '1 to 2 days per week' ($p$ = .017) compared to '3 or more days per week' of strength training. Thus, for every one day increase in HDD, the odds of reporting '1 to 2 days per week' of strength training (*OR* = 0.998) was lower than the reporting '3 or more days per week' of strength training. This relationship suggests that a greater number of HDD is associated with a higher strength training goal category.

DDD was negatively associated with reporting ‘1 to 2 days per week’ of strength training ($p$ = .002). Thus, for every one drink increase in DDD, there was a lower odds (*OR* = 0.974) of reporting ‘1 to 2 days per week’ of strength training compared to strength training ‘3 or more days per week’. Similar to HDD, this relationship suggests that a greater number of DDD is associated with a higher strength training goal category.

**Drinker status and physical activity frequency, duration, and Healthy People goals.** A series of logistic regression models were used to evaluate the relationship between drinker status and physical activity frequency, duration, and Healthy People goals. The drinking status variable was coded based on type of drinker (i.e., lifetime abstainer, light drinker, former drinker, moderate drinker, and heavy drinker).

The relationship between drinker type and physical activity goals was such that light drinkers and moderate drinkers reported a greater likelihood of meeting the vigorous physical activity goal ($p < 0.001$). In contrast, heavy drinkers and light drinkers were less likely to meet the Healthy People moderate activity goal. This relationship was examined further with respect to the frequency and duration of physical activity.

Analysis of drinker status on frequency of activity by physical activity type provided support for hypothesis 2c. Similar to meeting the Healthy People vigorous activity goal, both moderate and light drinkers had a greater likelihood of reporting that they had engaged in vigorous physical activity compared to reporting no vigorous activity during the prior month, which provides partial support for hypothesis 2c. Similarly, both heavy and light drinkers had a lower likelihood of reporting moderate physical activity relative to moderate drinkers, which when plotted yields an inverted U-shaped curve, thereby providing support for hypothesis 2c. The relationship by drinker status on strength training frequency was not as consistent in supporting hypothesis 2c. Both heavy and moderate drinkers had a lower likelihood of reporting more frequent strength training during the prior month, while the association specific to light drinkers and strength training was not significant. More detailed information regarding drinker status and physical activity is presented in Table 28.

Table 28.
Model Results for Logistic Regression of Drinker Status on Physical Activity (Ref. Lowest Category)

| Variable | Activity Description | Drinker Type | DF | Est. | Chi-Sq. | Pr > Chi-Sq | OR | 95% CL LL | 95% CL UL |
|---|---|---|---|---|---|---|---|---|---|
| Healthy People Goals | | | | | | | | | |
| Vigorous | 75 min. + / wk. | Light | 1 | 0.221 | 8.33 | **<.001** | 1.556 | 1.22 | 1.98 |
| | 75 min. + / wk. | Moderate | 1 | 0.254 | 9.32 | **<.001** | 1.694 | 1.30 | 2.21 |
| Moderate | 150 min. + /wk. | Heavy | 1 | -0.158 | 7.13 | **0.01** | 0.811 | 0.67 | 0.99 |
| | 300 min. + /wk. | Light | 1 | -0.118 | 4.07 | **0.04** | 0.853 | 0.70 | 1.03 |
| Strength | 1 - 2 days / wk. | Light | 1 | 0.098 | 3.57 | 0.06 | 1.164 | 0.98 | 1.39 |
| Activity Frequency | | | | | | | | | |
| Vigorous | 1-2 days /wk. | Moderate | 1 | 0.205 | 5.72 | **0.02** | 2.573 | 1.91 | 3.47 |
| | 3-4 days /wk. | Light | 1 | 0.232 | 10.97 | **<.001** | 1.952 | 1.51 | 2.53 |
| | 3-4 days/ wk. | Moderate | 1 | 0.270 | 11.86 | **<.001** | 2.746 | 2.02 | 3.73 |
| | Every day | Moderate | 1 | 0.386 | 4.44 | **0.04** | 3.085 | 1.85 | 5.14 |
| Moderate | 3-4 days/ wk. | Heavy | 1 | -0.176 | 4.02 | **0.05** | 0.921 | 0.58 | 1.46 |
| | Every day | Light | 1 | -0.197 | 4.46 | **0.03** | 0.947 | 0.63 | 1.42 |
| | < 1 day a wk. | Moderate | 1 | 0.340 | 5.20 | **0.02** | 1.498 | 0.91 | 2.46 |
| Strength | 3-4 days/ wk. | Heavy | 1 | -0.197 | 4.79 | **0.03** | 0.748 | 0.56 | 1.00 |
| | Every day | Moderate | 1 | -0.338 | 3.73 | **0.05** | 0.629 | 0.40 | 0.99 |
| Activity Duration | | | | | | | | | |
| Vigorous | 20-29 min. | Light | 1 | 0.191 | 7.14 | **0.01** | 1.557 | 1.21 | 2.00 |
| | 20-29 min. | Moderate | 1 | 0.326 | 16.73 | **<.001** | 2.266 | 1.69 | 3.05 |
| | 20-29 min. | Heavy | 1 | 0.214 | 5.73 | **0.02** | 1.445 | 1.04 | 2.01 |
| | 30 to 59 min. | Moderate | 1 | 0.201 | 7.91 | **<.001** | 1.999 | 1.50 | 2.66 |
| | 60 + min. | Abstainer | 1 | 0.278 | 5.41 | **0.02** | 2.112 | 1.44 | 3.11 |

Notes: Logits were modeled over the higher categories with the lowest activity/duration category as the reference and former drinker as the reference. Abstainer = has not had 12 drinks in lifetime; Light = less than 4 drinks per week over the previous year; Moderate = 4-7 drinks/week females and 4-14 drinks/week males; Heavy = greater than 7 drinks/week female sand greater than 14 drinks/week males; DF = degrees of freedom; Est. = estimate; S.E. = standard error of the estimate; OR = odds ratio; CL = confidence limits, LL = lower limit, UL = upper limit.

The relationship between duration of physical activity type and drinker status was significant for vigorous physical activity. All drinker categories had a positive relationship with vigorous activity duration. Specifically, heavy drinkers had the lowest odds of reporting vigorous physical activity followed by light drinkers while moderate drinkers had the highest odds of reporting '20-29 minutes' of vigorous activity compared to reporting no vigorous physical activity during the prior month, which when plotted yields an inverted u-shaped curve supporting hypothesis 2c.

**4.3 Basic Mediation Model**

A series of mediation models using MacKinnon's "test of joint significance" assessed the relationship between alcohol use (i.e., NDD, DDD, HDD), body mass index and each of the military readiness items (i.e., fitness test, ability to deploy and medical readiness score) and the test results are presented in Table 29. It was hypothesized (hypothesis 2a) that BMI would mediate the relationship between alcohol use and military readiness such that greater alcohol use would be associated with a higher BMI, which would be associated with lower military readiness.

Test results indicate that BMI mediated the association between two measures of alcohol use (DDD and NDD) and the physical fitness test. BMI, however, was not a significant mediator of the association between HDD and fitness test.

BMI mediated the relationship ($p$ = .034) between DDD and ability to deploy. BMI, however, did not mediate the relationships between HDD and NDD and the ability to deploy ($p > 0.05$). BMI also mediated the relationship between DDD and NDD and medical readiness although BMI did not mediate the relationships between HDD and medical readiness. The results of these tests provide partial support for hypothesis 3 and indicate that the relationship between alcohol use and BMI differs by alcohol use and military readiness variables.

Table 29.
Test of Joint Significance for Alcohol Use and Fitness Test with BMI as the Mediator

| Variable | Effect Type | Estimate | S.E. | Est./S.E. | P - value |
|---|---|---|---|---|---|
| Fitness Test | | | | | |
| | Indirect | 0.000 | 0.000 | -2.333 | **0.02** |
| DDD | Direct | -0.001 | 0.001 | -1.583 | 0.11 |
| | Total | -0.001 | 0.001 | -2.063 | **0.03** |
| | Indirect | 0.000 | 0.000 | 1.450 | 0.14 |
| HDD | Direct | 0.000 | 0.000 | -1.990 | **0.04** |
| | Total | 0.000 | 0.000 | -1.810 | 0.07 |
| | Indirect | 0.000 | 0.000 | -1.927 | **0.05** |
| NDD | Direct | 0.000 | 0.000 | 2.213 | **0.03** |
| | Total | 0.000 | 0.000 | 2.043 | **0.04** |
| Ability to Deploy | | | | | |
| | Indirect | 0.000 | 0.000 | -2.121 | **0.03** |
| DDD | Direct | 0.001 | 0.002 | 0.775 | 0.44 |
| | Total | 0.001 | 0.002 | 0.689 | 0.49 |
| | Indirect | 0.000 | 0.000 | 1.323 | 0.19 |
| HDD | Direct | 0.000 | 0.000 | -2.719 | **0.01** |
| | Total | 0.000 | 0.000 | -2.658 | **0.01** |
| | Indirect | 0.000 | 0.000 | -1.753 | 0.08 |
| NDD | Direct | 0.000 | 0.000 | 4.614 | **<.001** |
| | Total | 0.000 | 0.000 | 4.536 | **<.001** |
| Medical Readiness Score | | | | | |
| | Indirect | -0.002 | 0.001 | -2.446 | **0.01** |
| DDD | Direct | 0.015 | 0.002 | 7.231 | **<.001** |
| | Total | 0.013 | 0.002 | 6.23 | **<.001** |
| | Indirect | 0.000 | 0.000 | 1.448 | 0.15 |
| HDD | Direct | 0.001 | 0.000 | 2.244 | 0.03 |
| | Total | 0.001 | 0.000 | 2.511 | **0.01** |
| | Indirect | 0.000 | 0.000 | -1.951 | **0.05** |
| NDD | Direct | 0.000 | 0.000 | -1.521 | 0.13 |
| | Total | 0.000 | 0.000 | -1.976 | **0.05** |

Notes: NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; DF = degrees of freedom; Est. = estimate; Std. Err. = standard error for the estimate; CL = confidence limits, LL = lower limit, UL = upper limit; OR Est. = odds ratio estimate. P values in bold indicate significant.

## 4.4 Structural Equation Model

Seven structural equation models (*SEM*) were used to test hypotheses 4 thru 6. Hypothesis 4 proposes that eating habits moderate the relationship between alcohol use and BMI such that a higher frequency of healthier food intake protects against higher BMI and a higher frequency of less healthy food intake contributes to higher BMI. Hypothesis 5 states that physical activity habits moderate the relationship between BMI and military readiness such that, greater physical activity reduces the negative association between BMI and military readiness (i.e., physical fitness test, deployability and medical readiness score). Hypothesis 6 postulates that the initial path model presented in chapter 3, Figure 2 would be supported.

A separate *SEM* was tested for each alcohol use variable that was significantly related to any of the military readiness variables. Two confirmatory factor analytic procedures were conducted to assess the factor structure of the heating habits and physical activity variables. All three physical activity variables (i.e., vigorous activity, moderate activity, and strength training) loaded adequately onto a single factor with loadings greater than 0.67. Thus, a physical activity factor was entered into all *SEM* models. The eating habits variables (i.e., healthy eating food group sum score and less healthy food group sum score), however, did not load onto a single factor and therefore, were retained as individual variables in all *SEM*s.

All variables were entered into each model and model fit was assessed. Statistically non-significant variables were removed from each *SEM* and the resulting models were tested until all items retained in the *SEM* were significant and adequate model fit obtained using the criterion of root mean square error of approximation (*RMSEA*) of 0.06 or lower was (Muthen & Muthen, 1998-2015) . In the subsequent paragraphs, all models are described based on their support for the specified hypothesis. This description is model specific, as the support for the hypotheses varied across alcohol use variable (i.e., removal of eating habits due to non-significance indicates non-support in that model, but may indicate partial support overall as it may be significant in other models). The coefficients for all variables and factors, for all seven models, are presented in Appendix D, Tables D1 thru D7.

The final model assessing the relationship between the proportion of drinking days (PDD) and deployment (*RMSEA* = 0.05, 95% *CI*s [0.05, 0.053]) is presented in Figure 3.

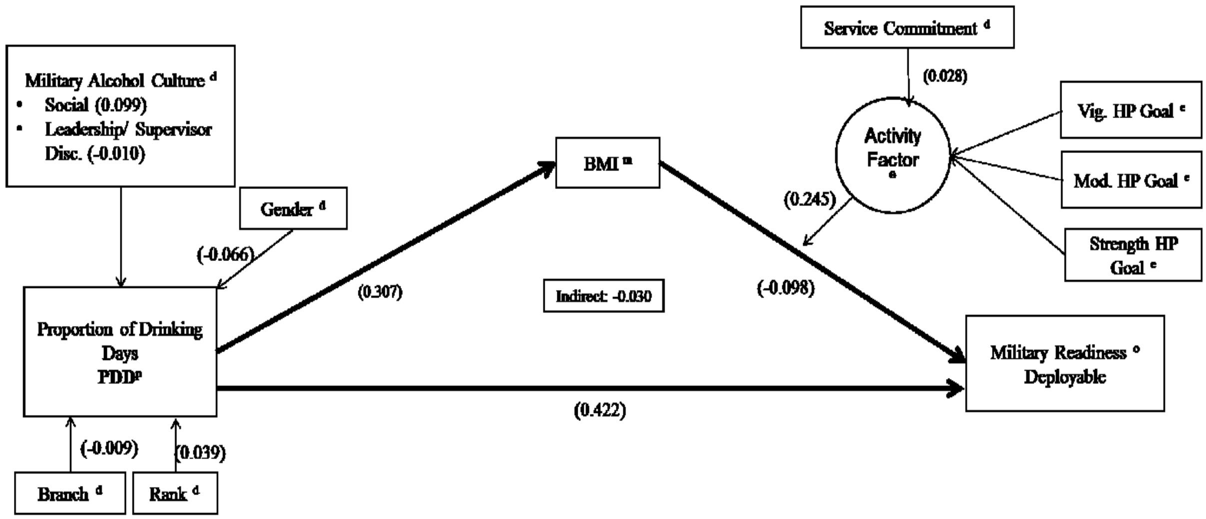


Figure 3. Final structural equation model assessing the relationship between proportion of drinking days and deployment. Notes: PDD = proportion of drinking days; p = predictor variable; o = outcome variable; m = mediator; d = covariate; e = moderator.

The conceptual model reflecting the factors affecting the association between PDD and deployment was such that both eating sum score variable (i.e., eating from healthy and unhealthy food groups) and marital status were not significant; consequently, these two variables were removed from the model. Although hypothesis 4 (i.e., moderating effect of eating habits) was not supported by this model, physical activity was retained in the model providing support for hypothesis 5 (i.e., moderating effects of physical activity).

The *SEM* assessing the relationship between the proportion of heavy drinking days (PHDD) and deployment (*RMSEA* = 0.041, 95% *CI*s [0.039, 0.042]) is presented in Figure 4. Rank, sum of alcohol discouragement, and both eating sum score variables were dropped from the model due to non-significance. Thus, hypothesis 4 (i.e., the moderating effect of eating habits) was not supported in this model. Hypothesis 5 (i.e., moderating effect of physical activity on the relationship between BMI and deployment), however, was supported in this model.

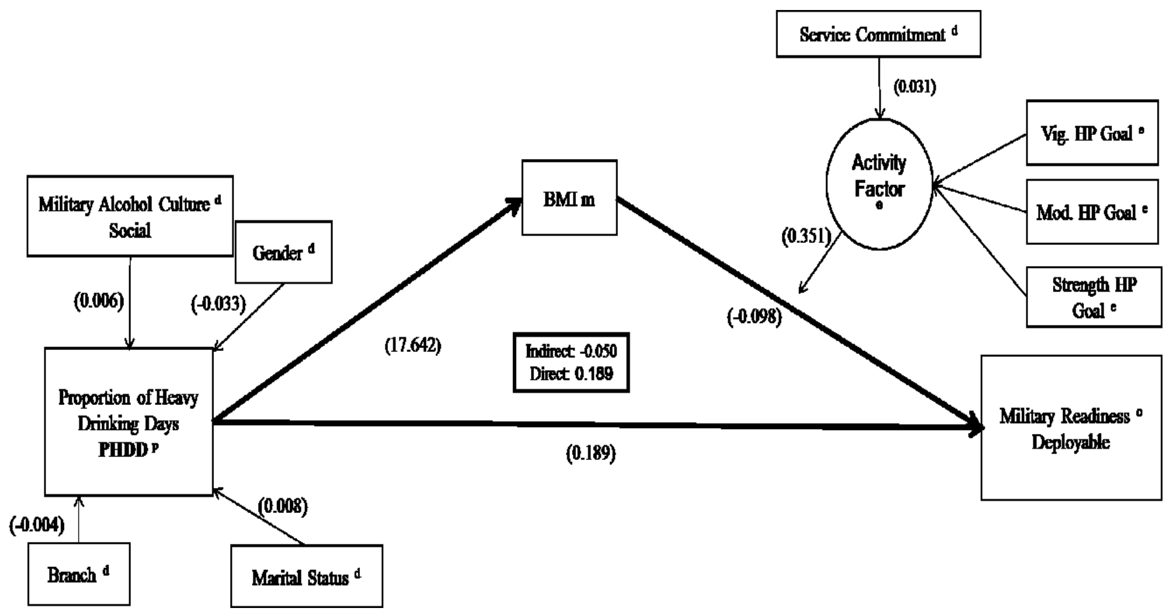


Figure 4. Final structural equation model for the relationship between proportion of heavy drinking days and deployment. Notes: PHDD = proportion of heavy drinking days; p = predictor variable; o = outcome variable; m = mediator; d = covariate; e = moderator.

The final model assessing the relationship between the PDD and the physical fitness test (*RMSEA* = 0.06, 95% *CI*s [0.061, 0.067]) is presented in Figure 5. Both eating sum score variable, marital status, physical activity variables, and the service commitment variable were dropped from this model due to statistical non-significance. Therefore, the moderating effects of eating habits (hypotheses 4) and physical activity (hypothesis 5) were not supported in this model.

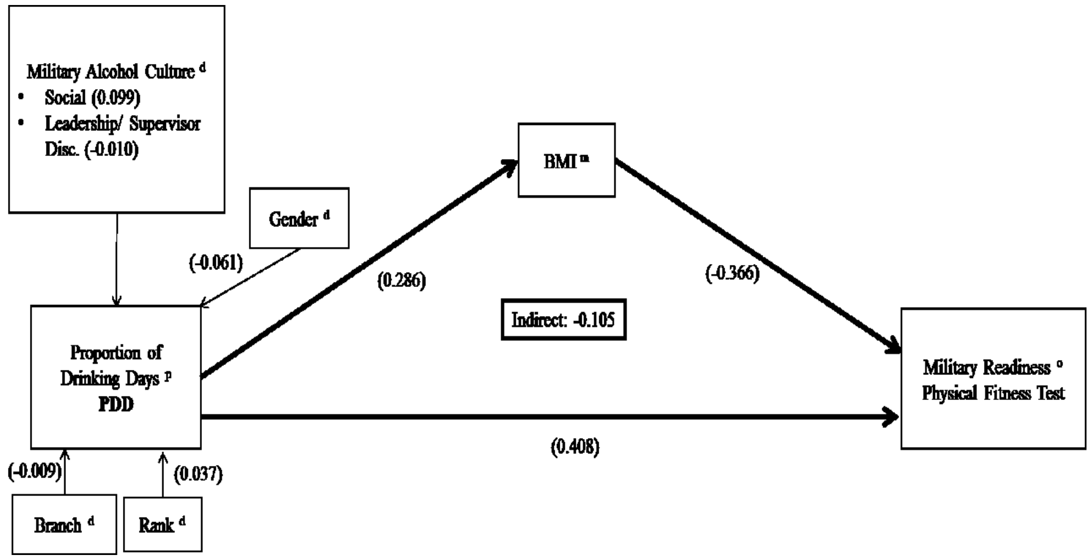


Figure 5. Final structural equation model assessing the relationship between proportion of drinking days and physical fitness test. Notes: PDD = proportion of drinking days; p = predictor variable; o = outcome variable; m = mediator; d = covariate; e = moderator.

Results from the final SEM used to examine factors affecting the relationship between DDD and the fitness test (*RMSEA* = 0.03, 95% *CI*s [0.03, 0.04]) are presented in Figure 6. The physical activity and service commitment variables were not statistically significant and therefore, dropped from the model. Hypothesis 5 (i.e., physical activity would moderate the relationship between BMI and physical fitness) was not supported, while Hypothesis 4 (i.e., eating habits will moderate the relationship between alcohol use and BMI) was supported in this model. Additionally, when covariates and food score variables are included in in the model, the relationship between DDD and the fitness test is no longer significant. The indirect relationship from DDD to BMI to fitness test, however, remains statistically significant, indicating full statistical mediation.

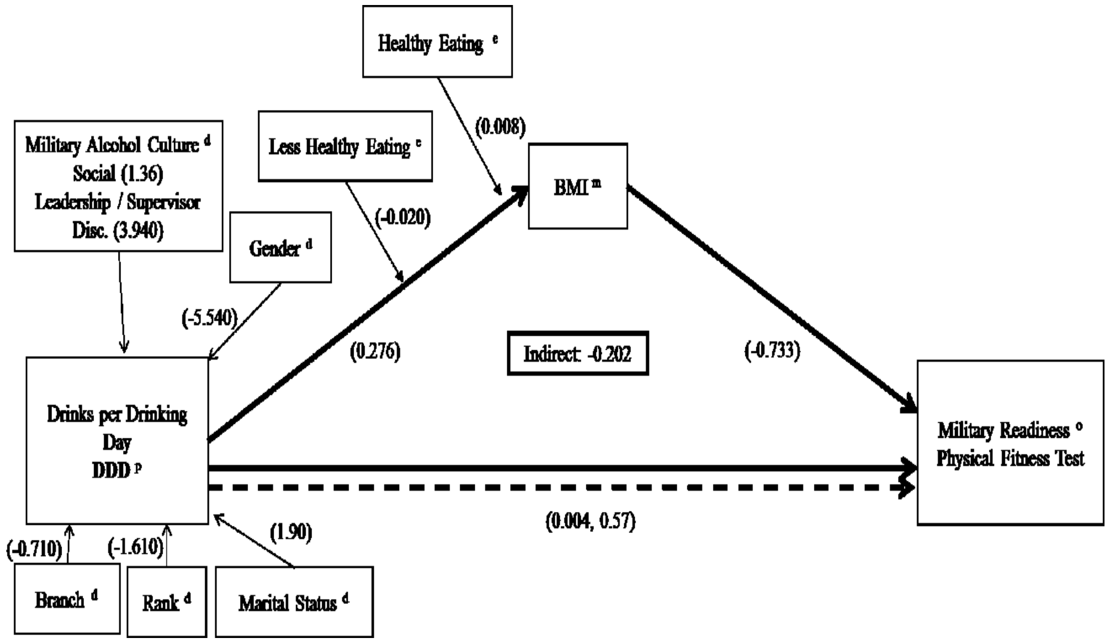


Figure 6. Final structural equation model assessing the relationship between DDD and physical fitness test. Notes: DDD = drinks per drinking day; p = predictor variable; o = outcome variable; m = mediator; d = covariate; e = moderator.

The SEM assessing the relationship between the PDD and medical readiness (*RMSEA* = 0.043, 95% *CI*s [0.04, 0.05]) is presented in Figure 7. The healthy food group sum score and alcohol discouragement variables were not statistically significant and dropped from the model. The less healthy food variable, however, was statistically significant and retained in the model, moderating the relationship between proportion of drinking days and body mass index, partially supporting hypothesis 4 in this model. Additionally, physical activity was retained in the model as a moderator between BMI and medical readiness, proving support for hypothesis 5.

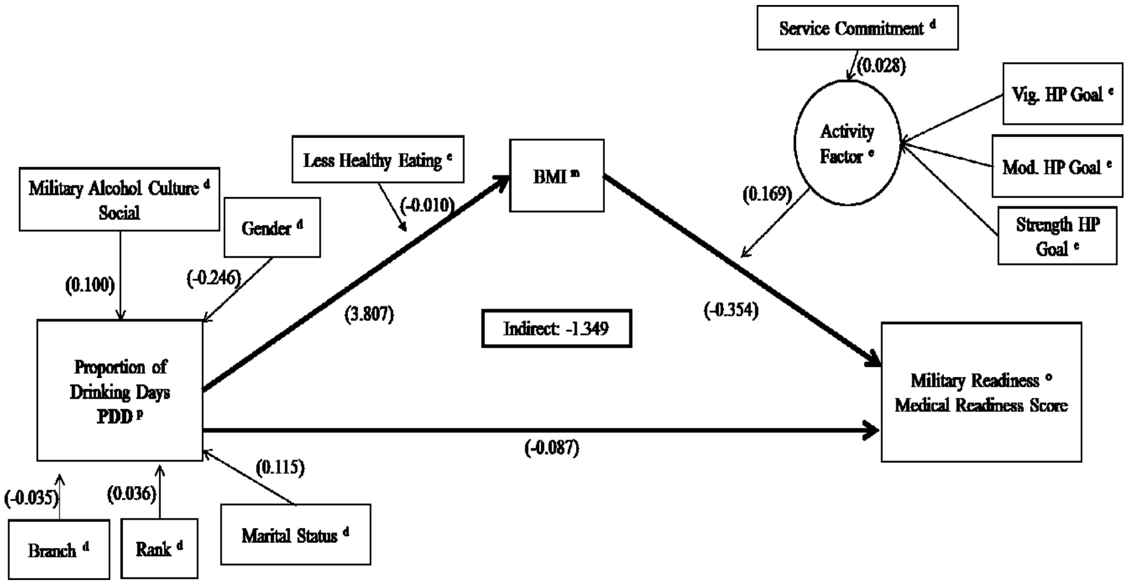


Figure 7. Final structural question model assessing the relationship between PDD and medical readiness score. Notes: PDD = proportion drinking days; p = predictor variable; o = outcome variable; m = mediator; d = covariate; e = moderator.

An SEM to assess the relationship between DDD and the medical readiness score (*RMSEA* = 0.06, 95% *CI*s [0.06, 0.07]) is presented in Figure 8.

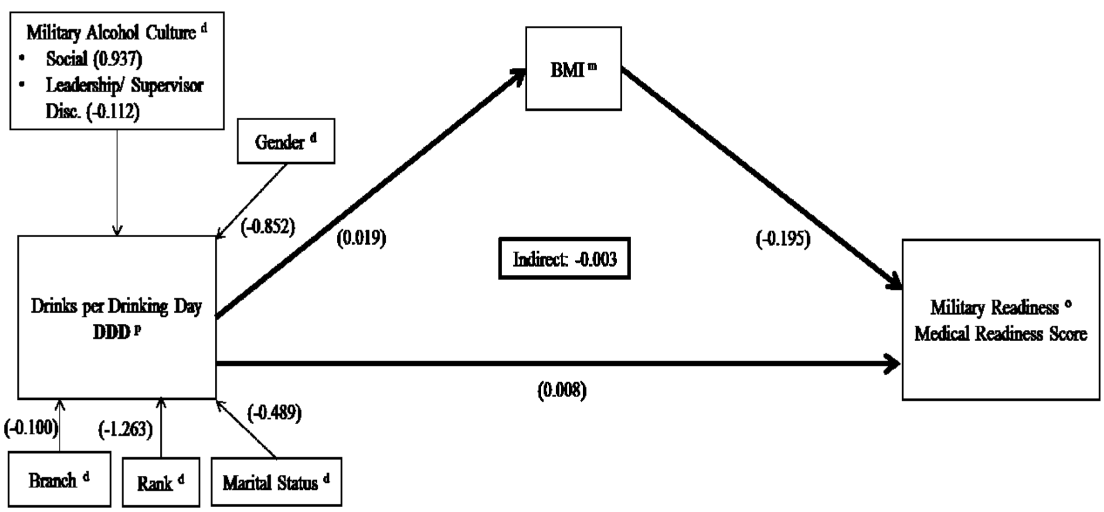


Figure 8. SEM assessing the relationship between drinks per drinking day and medical readiness score. Notes: DDD = drinks per drinking day; p = predictor variable; o = outcome variable; m = mediator; d = covariate; e = moderator.

The food group sum score, physical activity, and service commitment variables were not statistically significant and removed from the model. Hypotheses 4 (i.e., eating habits would moderate the relationship between alcohol use and BMI) and 5 (i.e., physical activity would moderate the relationship between BMI and medical readiness) were not supported by this model.

The last *SEM* examined the PHDD and the medical readiness score. The final model (*RMSEA* = 0.05, 95% *CI*s [0.052, 0.054]) is presented in Figure 9.

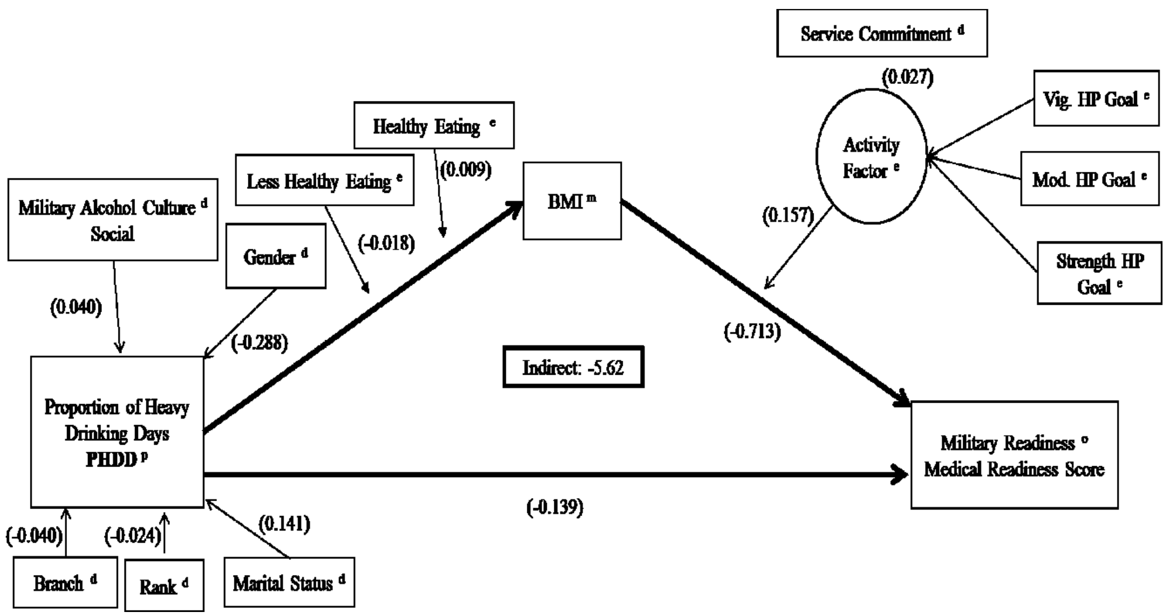


Figure 9. Final structural equation model assessing the relationship between PHDD and medical readiness score. Notes: PHDD = proportion heavy drinking days; a = predictor variable; b = outcome variable; c = mediator; d = covariate; e = moderator.

The alcohol discouragement variable was not statistically significant and was removed from the model. The healthy food score and less healthy food scores remained statistically significant and were retained in this model as moderators in the relationship between PHDD and body mass index providing support for hypothesis 4. Additionally, the physical activity variables remained statistically significant moderators of the effects between body mass index and medical readiness, providing support for hypothesis 5 in this model.

The seven *SEM*s yielded inconsistent hypothesis support. In this regard, hypothesis 1 (i.e., alcohol use will be negatively associated with military readiness) was supported in two of the models (i.e., PDD and medical readiness score and PHDD and medical readiness score). Alternatively, the other *SEM*s yielded statistically significant positive associations between alcohol use and military readiness (i.e., PDD and deployment, PHDD and deployment, PDD and physical fitness, DDD and physical fitness, and DDD and medical readiness score). The mediating effect of BMI on the association between alcohol use and military readiness (i.e., hypothesis 3) was supported across all *SEM*s. The moderating effect of eating habits on the association between alcohol use and BMI (i.e., hypothesis 4), however, was only partially supported. More specifically, the both eating habits variables (i.e., healthy eating habits and less healthy eating habits) moderated the associations between DDD and physical activity as well as the association between PHDD and medical readiness score. In addition, the eating less healthy foods variable was retained in the model assessing PDD and medical readiness, thereby providing partial support for hypothesis 4. The moderating effect of physical activity on the associations between BMI and military readiness (i.e., hypothesis 5) was supported in four of the seven *SEM*s (i.e., PDD and deployment, PHDD and deployment, PDD and medical readiness score, and PHDD and medical readiness score).

# Chapter 5: Discussion

This study examined alcohol, eating, and physical activity behaviors among members of the US military service across and within all five branches. Descriptive analyses revealed differences between branches as well as by rank, gender and marital status. These findings are important as they may have implications for health policy, health behavior education/intervention, and the allocation of military health resources. Additionally, in a time of budget constraints, and with the military population at its lowest, it is imperative to maintain a ready force. More in-depth understanding of the lifestyle factors that can negatively affect military force readiness is critical and contributes to reduced costs (e.g., recruiting and training new service members), enhancing the health of current force members, and ensuring a high level of military readiness

## 5.1 Alcohol Use and Military Readiness

Alcohol use was correlated with three of the military readiness variables (i.e., physical fitness test, ability to deploy, and medical readiness score), although the associations varied across outcome measures. Alcohol use was not correlated with job performance, which was measured with three types of absences (i.e., absence due to job accidents, personal accidents, and illness). One possible explanation for this lack of association may be the relatively small number of individuals (i.e., <7%) who reported missing work. Additionally, military requirements associated with missing work (i.e., going to sick call) may be a deterrent to absenteeism.

The directionality of the associations between NDD (i.e., positive correlation) and DDD (i.e., negative correlation) with passing the fitness test suggests that the frequency of alcohol use, in and of itself, may not be detrimental to this aspect of military readiness, but that the intensity of alcohol use (i.e., how much one drinks in a given day) may be the more important factor. This finding suggests that greater drinking levels are associated with a lower likelihood of passing the physical fitness test and can result in an increased likelihood of failing to meet military readiness standards and increased risk of separation from military service. Although the association between alcohol use and military readiness was very small (i.e., *OR* = 0.98), even a 2% decrease in readiness within this population could amount to substantial costs. For example, the approximate cost of recruiting and training one service member for a first term enlistment can range from $35K to $47K (United States General Accounting Officer [USGAO], 1998). Therefore, separation of service members because of a lack of military readiness can be costly.

Similar to the relationships between passing the fitness test and frequency of alcohol use, there was a positive association between the ability to deploy and number of drinking days. The number of heavy drinking days, however, was negatively correlated with the ability to deploy. These findings also suggest that the frequency of alcohol use, in and of itself, may not be detrimental to military readiness. Rather, the amount of alcohol consumed (i.e., quantity), particularly frequent heavy alcohol use, is more likely to contribute to decreased military readiness (i.e., ability to deploy). One of the key missions of the military involves the ability to deploy to austere environments; individuals who become non-deployable could significantly reduce the likelihood of mission success. In addition, individuals who are not deployable become eligible for administrative separation from military service, which further diminishes readiness, especially if those individuals have specialty training (e.g., Explosive Ordinance Disposal (EOD) Specialists, Engineers, and Pilots).

The correlations between the alcohol use and medical readiness measures are surprising. In this regard, NDD was negatively associated with medical readiness and both HDD and DDD were positively related to medical readiness. This suggests that a greater frequency of drinking increases the likelihood of reporting negative health conditions (e.g., high blood pressure, high cholesterol, and high blood sugar) and that a greater number of HDD and DDD decrease the likelihood of reporting such conditions. The directionality of these relationships is puzzling and difficult to explain as heavier alcohol use, particularly frequent heavy alcohol use, is expected to be associated with poorer health. One possible explanation for the obtained results may be time (i.e., a longer duration (e.g., years, decades of frequent heavy alcohol use may be necessary for symptoms of poorer health to emerge). Similar to passing the fitness test and ability to deploy, decreased medical readiness restricts military assignment and deployment capability and degrades military readiness. In addition, as noted previously, service members may become eligible for administrative or medical separation from military service, which contributes to higher costs specific to maintaining military readiness.

There was a positive relationship between the NDD and frequency of moderate physical activity and a negative relationship for most of the other activity categories (i.e., strength frequency, vigorous duration, moderate duration, strength duration, Healthy People vigorous activity, Healthy People strength training) while a positive relationship was found between HDD and DDD and physical activity. Although it is impossible to determine directionality or causality with this data set, these results suggest that a greater number of HDD and DDD are related to greater physical activity, while a greater NDD is associated with lower physical activity with the exception of moderate cardiovascular activity.

One possible explanation for these associations is that individuals in the Marine Corps, who had the highest number of heavy drinking days and drinks per drinking day, also had the highest physical activity rates in several of the categories. Another possible explanation is that the individuals who consume more alcohol have a higher BMI, failed their fitness test or body composition requirements, and were required to attend mandatory daily physical activity. Unfortunately, it is not possible to determine who was assigned to additional mandatory fitness training from this dataset. An alternative explanation is that these findings are a reflection of this population's lifestyle (i.e., they work hard and play hard). Irrespective of plausible explanations for the derived correlations between alcohol use and physical activity, it is important to recognize that physical fitness is an inherent part of military readiness and that heavy drinking is typically viewed as a negative health behavior that can contribute to decreased military readiness. Given the limitations inherent in cross-sectional studies, and this dataset in particular, future research should examine the relationships between alcohol use and physical activity using a longitudinal study design that affords an assessment of the directionality of the associations between alcohol use and physical activity.

**5.2 Body Mass Index and Military Readiness**

More than half the sample reported being overweight and 12% of the respondents were classified as obese. The relationship between body mass index and other health issues (e.g., hypertension, diabetes, obesity) leads to heightened concern for members of the armed forces as these conditions increase risk for separation from military service, which in turn contributes to lower military readiness and greater health expenditures.

BMI categories also differed by rank, gender and marital status. Males were more likely to have reported being overweight and obese, with married male officers reporting the greatest frequency of being overweight and married female officers reporting the lowest frequency of being overweight. These findings may indicate that greater emphasis on BMI reduction techniques is needed for males across all military service branches. Given that BMI is a ratio of height to weight, and is not necessarily an indicator of good or poor health, it should be interpreted with caution. Nevertheless, BMI is, and should be, used as a screening tool as well as to encourage actions to reduce overweight and obesity, which in turn contributes to increased military readiness and reduced health expenditures. The mediating effect of BMI on the associations between alcohol use and military readiness implies that BMI is an important target for effecting increased military readiness, although the proportion of variance accounted for is modest. The associations between alcohol use, military readiness and BMI have important implications for the military as service members can be removed from service for failing to meet body composition and military readiness standards. Better understanding of this relationship could enable health care providers to focus on behavior that is detrimental to military readiness. The associations between alcohol use, military readiness and BMI warrant further examination to determine the directionality of effects.

### 5.3 Eating Behaviors and Military Readiness

Overall, officers reported the greatest daily healthy food intake across all service branches. Enlisted males reported the lowest frequency of consuming fruits and vegetables and enlisted females reported the lowest frequency of consuming dairy and lean protein. Furthermore, enlisted males reported the greatest daily consumption of all less healthy food categories except sweets, whereas female officers reported the greatest frequency of daily consumption. Given such variation of eating behaviors, it may be beneficial to tailor nutritional information to specific subgroups of military personnel (e.g., enlisted males in all service branches may benefit from health education on the value of eating a diet rich in fruits and vegetables, while officer females could be provided targeted education on the potential detrimental effects of high intake of sweets). More generally, a significant percent of individuals did not report daily consumption of foods from the healthy food groups, suggesting that providing general health education related to nutrition could be beneficial for this population.

The observed relationships between alcohol use and the sum score eating behavior variables (i.e., frequency of healthy foods and frequency of less healthy foods) supported the hypothesis that alcohol use was negatively associated with the healthy eating sum score and positively associated with the less healthy eating sum score. Given that military readiness can be affected by eating behavior, alcohol use, and BMI, and that these behaviors are interrelated (i.e., consumption of healthy and less healthy foods varies with alcohol consumption and BMI is related to food choices and alcohol use), it appears that interventions targeting military readiness should include nutritional information specific to the interrelationships among these behaviors and outcomes.

### 5.4 Physical Activity and Military Readiness

Physical activity varied across military branch of service and within branch by rank and gender. The Army reported the greatest proportion of individuals meeting or exceeding the Healthy People objectives, followed by the Marine Corps, the Air Force, Coast Guard, and Navy. On the other hand, the Marine Corps had the greatest proportion of respondents reporting participation in vigorous cardiovascular physical activity and strength training. As expected, the Marines had the lowest frequency of individuals being categorized as obese. In contrast, the Army had a high proportion of individuals who were categorized as overweight or obese, but also had the highest proportion of individuals meeting or exceeding the Healthy People Goals.

These findings suggest that the type of physical activity may be important given its relationship to BMI (i.e., vigorous cardiovascular and strength training activities may be more protective against high BMI than moderate cardiovascular activity). An alternative explanation may be that service members who are in the higher BMI categories have failed their physical fitness test or body composition requirements and were mandated to attend remedial fitness training, which consists of daily moderate cardiovascular physical activity. Unfortunately, as previously noted, there are no measures in this dataset specific to mandated remedial fitness training.

The relationship between physical activity and alcohol use is interesting in that members of the Marine Corps reported the greatest frequency of alcohol use and also the greatest frequency of vigorous cardiovascular and strength training physical activity. Members of the Air Force, on the other hand, reported the lowest drinking frequencies and lower frequencies of vigorous cardiovascular and strength training activity, suggesting that there may be between branch differences in military lifestyle, culture, policy, or activities that influence alcohol use and physical activity habits. Irrespective of the varied associations between physical activity, BMI, and alcohol use across military service branch, it is clear that increased BMI is a risk factor for decreased military readiness and that heavy alcohol use, particularly frequent heavy alcohol use, also contributes to decreased military readiness. Furthermore, increased physical activity is beneficial and contributes to increased military readiness, although the type of physical activity may vary by military branch of service. In addition, the associations between drinker status and the frequency and duration of physical activity reflect an inverted u-shaped curve such that moderate drinkers had the highest activity levels compared to light and heavy drinkers. This finding provides additional evidence that heavy drinking, particularly frequent heavy drinking, contributes to decreased physical activity that may result in increased BMI and reduced military readiness.

**5.5 Study Limitations**

The purpose of this dissertation was to explore and describe the relationships among alcohol use, eating behaviors, physical activity, BMI, and military readiness. The 2011 HRBS dataset was used to explore the relationships among these aforementioned variables and study limitations must be taken into account when interpreting and generalizing results. Study limitations include a cross sectional study design, secondary data analyses, variable operationalization, low response rate, self-reported data, and the use of multiple statistical tests.

The analysis of cross sectional data precludes determination of temporal sequencing of events and thus, causal inference is not permissible. Therefore, caution should be used when interpreting study results to make certain that causal associations are not implied and that study results are stated as correlational. Although the HRBS dataset is not appropriate for asserting causal relationships, it is an excellent dataset for exploring and describing relationships among variables, such as those analyzed in this dissertation research, within the military population.

Secondary data analyses reflect a cost-effective approach to initial investigations in a research area and afford an opportunity to explore relationships among variables, generate theoretical frameworks and conceptual models as well as hypothesis generation that can be tested in future research. Of course, all secondary data analysis studies afford limited data availability. In this regard, the HRBS contained the more relevant variables of interest, although additional information (e.g., mandated remedial fitness training) and variable operationalization procedures that yielded more continuous measures as opposed to categorical variables would have been beneficial.

With respect to variable operationalization, many of the HRBS items were framed within a specific time period. For example, alcohol use was assessed during the past year, eating habits during a typical week, and physical activity during the past 30 days. Assessing behaviors that have occurred across differing time frames may lead to differential recall bias. The longer the recall period, the more likely it is to have error introduced (Babbie, 2013). Another measurement related concern centers on using BMI to assess body composition. Self-reported height and weight were not provided in the public use data file used for this dissertation. Rather, a pre-calculated categorical BMI variable, based on the ratio of height and weight, was provided. The categorized BMI variable is a less precise measure compared to a continuous BMI measure and limits statistical analysis to those techniques suitable for categorical data.

The response rate (29.5%) associated with the 2011 HRBS may be considered less than ideal as higher response rates have been thought to yield more accurate results

(A Day, 1996; Babbie, 1990; Backstrom & Hursh, 1963; Dillman, Smyth, & Christian, 2014; Babbie, 2013). In this regard, several survey researchers have indicated that a better response rate is the result of a better quality survey (Addolorato, Capristo, Greco, Stefanini, & Gasbarrini, 1998; Biemer & Lyberg, 2003; Dillman, Smyth, & Christian, 2014; Babbie, 2013). The major concern associated with low response rates is that the individuals who do not respond to the survey are somehow different from those that do respond resulting in a biased sample (Dillman, Smyth, & Christian, 2014). Although the overall response rate for the 2011 HRBS may be considered low (29.5%) by some research standards (Dillman, Smyth, & Christian, 2014), prior studies involving the military have found that stabilization of response occurs at 15% due to the homogeneity of this population (Wessel & Barlas, 2014). Furthermore, Wessel and Barlas (2014) reported that web surveys targeting this population only differ by one to two percentage points and that this does not change with higher response rates.

Importantly, it should be noted that HRBS non-response was taken into consideration via a sample weighting procedure and that Jeffery et.al (2013) conducted a within branch analysis of the sample to determine if response rates varied across rank and gender and found that all groups were represented. Overall, the sample was sufficiently large and diverse across the survey strata and mimicked response rates of other large-scale surveys involving the military population. Therefore, the relatively low response rate associated with the HRBS may not be so limiting (i.e., non-response may be unrelated to the variables being studied and those who didn't respond may be similar to those that did respond).

The use of self-report data, especially non-confirmed or uncorroborated self-report data, raises concern regarding data accuracy. Military populations may be at increased risk of reporting inaccurate information due to concerns that their military career may be damaged. To enhance honest responding and to protect individual identities the survey was administered in an anonymous manner and several variables were omitted from the publicly available dataset used for this dissertation research (e.g., there are very few minority females, particularly among the higher ranks). Consequently, the variables age, ethnicity and race, all of which may have effects on the variables being studied, were not available for analysis. Furthermore, study procedures were such that respondents could access the HRBS from a non-military environment and a cover letter from the military leadership was included that indicated survey privacy (Jeffery, et al., 2013).

The exploratory nature of this dissertation research required many statistical tests resulting in type I error inflation, which was not controlled. Controlling for type I error inflation is necessary when making inferences to populations of interest based on sample data that involve multiple statistical tests that are not independent of each other. The exploratory nature of this research, however, does not involve statistical inference as data analyses were conducted for descriptive purposes. Consequently, controlling type I error inflation was of less concern.

## Conclusions

This dissertation research was the first to examine the associations among alcohol use, BMI, eating behaviors, physical activity, and military readiness. Study findings showed that the associations between alcohol use and military readiness varied based on variable measure (e.g., HDD vs. NDD, moderate vs. vigorous physical activity) and by military service branch, rank, gender, and marital status.

Overall, alcohol use, particularly frequent heavy alcohol consumption, was associated with decreased military readiness. For example, frequency of drinking (i.e., number of drinking days) was associated with decreased medical readiness and a greater intensity of drinking (i.e., greater HDD and DDD) was associated with decreased military readiness (i.e., physical fitness test and deployment), although the relationship between medical readiness and military readiness is less clear. In this regard, the relationship between medical and military readiness may be indirect such that excessive alcohol use contributes to increased BMI, which in turn contributes to both decreased medical readiness and decreased military readiness. Furthermore, the relationships between alcohol use and eating habits and alcohol use and physical activity provide support for this interpretation as greater alcohol use was associated with poorer eating habits and poorer eating habits were associated with a higher BMI and lower military readiness. These findings suggest that alcohol use, eating habits and physical activity are important determinants of military readiness and warrant further study.

Alcohol use varied by branch of service (i.e., Marines reported the highest rates), rank (i.e., enlisted men and women reported higher drinking rates), gender (i.e., men reported higher drinking rates) and marital status (i.e., married men reported greater drinking rates and the highest BMI) indicating that these variables should be considered in future studies and programs addressing factors related to military readiness. Further research is needed to determine the directionality of the relationships among these variables and their effect on military readiness. Longitudinal study designs can be used to investigate the interrelationships among alcohol use, eating habits, and BMI so that proper temporal sequencing of events/behaviors is controlled; thereby enhancing the value of the derived study results as they can be used to inform health policy and resource allocation within the military health care system. Additionally, these findings suggest that health education/intervention needs vary within this population and that the tailoring of such programs may yield increased benefit (i.e., increased military readiness). It is recommended that programs directed at increasing military readiness address important lifestyle behaviors such as alcohol use, eating habits, and physical activity.

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**Appendix A. Methods Tables**

Table A1.
Population Parameters DOD Services

**Table 2.1 – Population Parameters**

| | Army | Navy | Marine Corps | Air Force | All DoD Services |
|---|---|---|---|---|---|
| **Gender** | | | | | |
| Male | 392,182 | 238,922 | 161,386 | 244,890 | 1,037,380 |
| Female | 66,321 | 47,473 | 12,583 | 58,870 | 185,247 |
| **Pay Grade** | | | | | |
| E1-E4 | 210,222 | 115,970 | 101,496 | 109,237 | 536,925 |
| E5-E6 | 118,396 | 97,558 | 40,833 | 103,142 | 359,929 |
| E7-E9 | 48,060 | 24,431 | 12,840 | 30,493 | 115,824 |
| W1-W5 | 12,895 | 1,419 | 1,849 | 0[a] | 16,163 |
| O1-O3 | 41,413 | 28,198 | 11,224 | 34,332 | 115,167 |
| O4 and higher | 27,517 | 18,819 | 5,727 | 26,556 | 78,619 |
| *Total* | 458,503 | 286,395 | 173,969 | 303,760 | 1,222,627 |

[a] The Air Force does not use the pay grade Warrant Officer.

Note. Copied from "Final Report, 2011 Health Related Behaviors Survey of Active Duty Military Personnel," by Jeffrey et al., 2013. No copyright. p.10.

Table A2.
Coast Guard Population Characteristics, Sub-Populations, and Sample Types

**Table 2.3 – Overall Coast Guard Population, Sub-Populations, and Sample Types by Selected Characteristics**

| | Total USCG Population | Distributed Population | Distributed Sample | Site-focused Population | Site-focused Sample |
|---|---|---|---|---|---|
| **Work Setting** | | | | | |
| Ashore | 26,931 | 19,059 | 4,261 | 7,872 | 3,935 |
| Afloat | 8,735 | 6,236 | 3,592 | 2,499 | 1,249 |
| Air | 3,958 | 2,924 | 1,216 | 1,034 | 518 |
| **Gender** | | | | | |
| Male | 34,270 | 24,619 | 8,062 | 9,651 | 4,832 |
| Female | 5,354 | 3,600 | 1,007 | 1,754 | 870 |
| **Pay Grade** | | | | | |
| E1-E4 | 12,862 | 9,750 | 5,095 | 3,112 | 1,588 |
| E5-E6 | 14,825 | 11,012 | 2,678 | 3,813 | 1,888 |
| E7-E9 | 4,371 | 3,010 | 415 | 1,361 | 681 |
| W1-W5 | 1,505 | 1,011 | 166 | 494 | 229 |
| O1-O3 | 3,585 | 2,298 | 515 | 1,287 | 658 |
| O4 and higher | 2,476 | 1,138 | 200 | 1,338 | 658 |
| *Total* | 39,624 | 28,219 | 9,069 | 11,405 | 5,702 |

Note. Copied from "Final Report, 2011 Health Related Behaviors Survey of Active Duty Military Personnel," by Jeffrey et al., 2013. No copyright. P.12.

Table A3.
Determination of Usable Response Rate by Strata

**Table 2.6 – Determination of Usable Response Rate by Strata**

| Strata | Sample N | Eligible Sample | Usable Respondents | Usable Response Rate |
|---|---|---|---|---|
| **Army** | | | | |
| E1-E4, Male | 19,833 | 19,317 | 997 | 5.16% |
| E5-E6, Male | 5,977 | 5,822 | 1,141 | 19.60% |
| E7-E9, Male | 2,129 | 2,074 | 709 | 34.19% |
| W1-W5, Male | 2,111 | 2,056 | 531 | 25.83% |
| O1-O3, Male | 2,109 | 2,054 | 404 | 19.67% |
| O4 and above, Male | 1,447 | 1,409 | 752 | 53.36% |
| E1-E4, Female | 8,009 | 7,801 | 882 | 11.31% |
| E5-E6, Female | 2,429 | 2,366 | 551 | 23.29% |
| E7-E9, Female | 857 | 835 | 278 | 33.30% |
| W1-W5, Female | 513 | 500 | 167 | 33.42% |
| O1-O3, Female | 814 | 793 | 256 | 32.29% |
| O4 and above, Female | 622 | 606 | 264 | 43.58% |
| **Total** | **46,850** | **45,632** | **6,932** | **15.19%** |
| **Navy** | | | | |
| E1-E4, Male | 11,972 | 11,912 | 852 | 7.15% |
| E5-E6, Male | 6,085 | 6,055 | 1,477 | 24.39% |
| E7-E9, Male | 2,141 | 2,130 | 996 | 46.75% |
| W1-W5, Male | 586 | 583 | 293 | 50.25% |
| O1-O3, Male | 2,783 | 2,769 | 637 | 23.00% |
| O4 and above, Male | 1,033 | 1,028 | 486 | 47.28% |
| E1-E4, Female | 4,794 | 4,770 | 761 | 15.95% |
| E5-E6, Female | 2,346 | 2,334 | 872 | 37.36% |
| E7-E9, Female | 820 | 816 | 504 | 61.77% |
| W1-W5, Female | 27 | 27 | 22 | 81.89% |
| O1-O3, Female | 1,121 | 1,115 | 418 | 37.48% |
| O4 and above, Female | 442 | 440 | 253 | 57.53% |
| **Total** | **34,150** | **33,979** | **7,571** | **22.28%** |
| **Marine Corps** | | | | |
| E1-E4, Male | 20,003 | 19,855 | 1,742 | 8.77% |
| E5-E6, Male | 5,932 | 5,888 | 1,622 | 27.55% |
| E7-E9, Male | 2,096 | 2,080 | 1,047 | 50.32% |
| W1-W5, Male | 775 | 769 | 401 | 52.13% |
| O1-O3, Male | 2,061 | 2,046 | 584 | 28.55% |
| O4 and above, Male | 1,398 | 1,388 | 567 | 40.86% |
| E1-E4, Female | 4,731 | 4,696 | 1,317 | 28.05% |
| E5-E6, Female | 1,732 | 1,719 | 687 | 39.96% |
| E7-E9, Female | 305 | 303 | 164 | 54.17% |
| W1-W5, Female | 35 | 35 | 14 | 40.30% |
| O1-O3, Female | 354 | 351 | 138 | 39.27% |
| O4 and above, Female | 78 | 77 | 56 | 72.33% |
| **Total** | **39,500** | **39,208** | **8,339** | **21.27%** |

Table A3. (Continued)

**Table 2.6 – Determination of Usable Response Rate by Strata**

| Strata | Sample N | Eligible Sample | Usable Respondents | Usable Response Rate |
|---|---|---|---|---|
| **Air Force** | | | | |
| E1-E4, Male | 12,026 | 12,000 | 2,680 | 22.33% |
| E5-E6, Male | 5,973 | 5,960 | 2,226 | 37.35% |
| E7-E9, Male | 2,540 | 2,534 | 1,263 | 49.83% |
| O1-O3, Male | 3,395 | 3,388 | 879 | 25.95% |
| O4 and above, Male | 1,326 | 1,323 | 530 | 40.06% |
| E1-E4, Female | 4,778 | 4,767 | 1,643 | 34.46% |
| E5-E6, Female | 2,339 | 2,334 | 1,017 | 43.58% |
| E7-E9, Female | 1,025 | 1,023 | 552 | 53.97% |
| O1-O3, Female | 1,332 | 1,329 | 499 | 37.55% |
| O4 and above, Female | 534 | 533 | 285 | 53.49% |
| **Total** | **35,268** | **35,190** | **11,574** | **32.89%** |
| **Coast Guard** | | | | |
| Ashore, E1-E4, Male | 2,341 | 2,322 | 779 | 33.54% |
| Ashore, E5-E6, Male | 2,449 | 2,429 | 1,146 | 47.17% |
| Ashore, E7-E9, Male | 705 | 699 | 462 | 66.06% |
| Ashore WO1-WO5, Male | 304 | 302 | 194 | 64.33% |
| Ashore, O1-O3, Male | 556 | 552 | 273 | 49.50% |
| Ashore, O4 and above, Male | 642 | 637 | 348 | 54.64% |
| Ashore, E1-E4, Female | 505 | 501 | 217 | 43.32% |
| Ashore, E5-E6, Female | 323 | 320 | 217 | 67.72% |
| Ashore, E7-E9, Female | 75 | 74 | 51 | 68.55% |
| Ashore WO1-WO5, Female | 29 | 29 | 21 | 73.00% |
| Ashore, O1-O3, Female | 163 | 162 | 82 | 50.71% |
| Ashore, O4 and above, Female | 104 | 103 | 63 | 61.07% |
| Afloat, E1-E4, Male | 2,830 | 2,807 | 365 | 13.00% |
| Afloat, E5-E6, Male | 1,038 | 1,030 | 365 | 35.45% |
| Afloat, E7-E9, Male | 198 | 196 | 113 | 57.53% |
| Afloat WO1-WO5, Male | 43 | 43 | 28 | 65.64% |
| Afloat, O1-O3, Male | 187 | 186 | 72 | 38.81% |
| Afloat, O4 and above, Male | 64 | 63 | 23 | 36.23% |
| Afloat, E1-E4, Female | 270 | 268 | 64 | 23.89% |
| Afloat, E5-E9, Female | 143 | 142 | 50 | 35.25% |
| Afloat, Officers, Female | 68 | 67 | 25 | 37.06% |
| Air, E1-E4, Male | 634 | 629 | 133 | 21.15% |
| Air, E5-E6, Male | 546 | 542 | 176 | 32.49% |
| Air, E7-E9, Male | 103 | 102 | 43 | 42.08% |
| Air WO1-WO5, Male | 16 | 16 | 6 | 37.80% |
| Air, O1-O3, Male | 193 | 191 | 70 | 36.56% |
| Air, O4 and above, Male | 45 | 45 | 34 | 76.16% |
| Air, E1-E4, Female | 103 | 102 | 21 | 20.55% |
| Air, E5-E9, Female | 82 | 81 | 14 | 17.21% |
| Air, Officers, Female | 12 | 12 | 6 | 50.40% |
| **Total** | 14,771 | 14,653 | 5,461 | 37.27% |

Note. Copied from "Final Report, 2011 Health Related Behaviors Survey of Active Duty Military Personnel", by Jeffery et al., 2013. No copyright. Pp.21-22.

Table A4.
Usable Respondents by Service Group for Selected Service Member Characteristics

Table 2.7 – Usable Respondents by Service Group for Selected Service Member Characteristics

| | Army | Navy | Marine Corps | Air Force | CG Site-focused | CG Distributed | All Services |
|---|---|---|---|---|---|---|---|
| **Work Setting** | | | | | | | |
| Ashore | | | | | 1,982 | 1,871 | 3,853 |
| Afloat | | | | | 408 | 697 | 1,105 |
| Air | | | | | 182 | 321 | 503 |
| **Gender** | | | | | | | |
| Male | 4,534 | 4,741 | 5,963 | 7,578 | 2,133 | 2,497 | 27,446 |
| Female | 2,398 | 2,830 | 2,376 | 3,996 | 439 | 392 | 12,431 |
| **Pay Grade** | | | | | | | |
| E1 - E4 | 1,879 | 1,613 | 3,059 | 4,323 | 481 | 1,098 | 12,453 |
| E5 - E6 | 1,692 | 2,349 | 2,309 | 3,243 | 853 | 1,111 | 11,557 |
| E7 - E9 | 987 | 1,500 | 1,211 | 1,815 | 421 | 252 | 6,186 |
| W1 - W5 | 698 | 315 | 415 | 0 | 148 | 102 | 1,678 |
| O1 - O3 | 660 | 1,055 | 722 | 1,378 | 304 | 219 | 4,338 |
| O4 and higher | 1,016 | 739 | 623 | 815 | 365 | 107 | 3,665 |
| **Total** | **6,932** | **7,571** | **8,339** | **11,574** | **2,572** | **2,889** | **39,877** |

Note. Copied from "Final Report, 2011 Health Related Behaviors Survey of Active Duty Military Personnel", by Jeffery et al., 2013. No copyright. P.23.

Table A5.
Summary of Weighting Efficiency and Consequent Confidence Intervals

Table 2.8 – Summary of Weighting Efficiency and Consequent Confidence Interval

| | Service | Total N of Usable Surveys | Weighting Efficiency - based on the variance of the weights | Effective N - Sample Size After Weighting | 95% Confidence Interval[1] |
|---|---|---|---|---|---|
| **2011** | Army | 6,932 | 61.3% | 4,249 | +/-1.50% |
| | Navy | 7,571 | 61.3% | 4,642 | +/-1.43% |
| | Marine Corps | 8,339 | 56.9% | 4,743 | +/-1.40% |
| | Air Force | 11,574 | 87.3% | 10,106 | +/-0.96% |
| | Coast Guard | 5,461 | 84.3% | 4,605 | +/-1.36% |
| **2008** | Army | 5,927 | 72.8% | 4,315 | +/-1.48% |
| | Navy | 6,637 | 68.5% | 4,548 | +/-1.44% |
| | Marine Corps | 5,117 | 64.4% | 3,297 | +/-1.69% |
| | Air Force | 7,009 | 78.8% | 5,523 | +/-1.31% |
| | Coast Guard | 3,856 | 68.0% | 2,621 | +/-1.85% |

[1] 95% of the time the population value will fall within this range of the sample estimate with a sample this size

Note. Copied from “Final Report, 2011 Health Related Behaviors Survey of Active Duty Military Personnel”, by Jeffery et al., 2013. No copyright. P.25.

## Appendix B. Descriptive Analysis Tables

Table B1.
Demographic Characteristics within Military Service Branch, Rank and Gender

| | Air Force | | | | Army | | | | Coast Guard | | | | Marine Corps | | | | Navy | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Gender | 80.5 | 19.5 | 80.9 | 19.1 | 86.2 | 13.8 | 81.7 | 18.3 | 87.3 | 12.7 | 81.8 | 18.2 | 92.7 | 7.3 | 93.7 | 6.3 | 83.4 | 16.6 | 83.3 | 16.7 |
| Marital Status | | | | | | | | | | | | | | | | | | | | |
| Not Married | 39.4 | 47.0 | 21.3 | 43.1 | 28.8 | 47.8 | 21.9 | 53.8 | 34.3 | 55.4 | 18.0 | 49.4 | 45.8 | 53.6 | 27.8 | 51.6 | 38.5 | 57.3 | 24.1 | 51.1 |
| Married | 60.6 | 53.0 | 78.7 | 56.9 | 71.2 | 52.2 | 78.1 | 46.2 | 65.7 | 44.6 | 82.0 | 50.6 | 54.2 | 46.4 | 72.2 | 48.4 | 61.5 | 42.7 | 75.9 | 48.9 |
| Service Commitment | | | | | | | | | | | | | | | | | | | | |
| Detached | 4.9 | 6.2 | 1.4 | 1.4 | 8.1 | 8.5 | 1.9 | 3.0 | 1.9 | 4.5 | 0.5 | 4.1 | 10.2 | 10.9 | 1.6 | 5.3 | 5.7 | 9.2 | 1.2 | 3.1 |
| Low | 17.0 | 18.9 | 8.3 | 14.3 | 20.3 | 24.5 | 10.4 | 15.7 | 9.6 | 16.3 | 5.6 | 11.1 | 23.9 | 27.0 | 8.7 | 15.2 | 16.2 | 18.8 | 7.5 | 17.3 |
| Moderate | 60.2 | 59.2 | 54.4 | 56.0 | 52.1 | 49.9 | 48.5 | 50.7 | 62.7 | 59.2 | 55.4 | 57.9 | 50.4 | 50.9 | 49.9 | 53.6 | 54.4 | 52.6 | 44.9 | 47.6 |
| High | 17.9 | 15.6 | 35.9 | 28.3 | 19.5 | 17.0 | 39.2 | 30.6 | 25.8 | 19.9 | 38.4 | 26.9 | 15.5 | 11.1 | 39.8 | 25.9 | 23.7 | 19.4 | 46.4 | 32.0 |

Notes: All results are presented as percentages and are based on population weighting. M = male; F = female

Table B2.

Alcohol Use Variables By Military Service Branch, Rank and Gender

| | Air Force | | | | Army | | | | Coast Guard | | | | Marine Corps | | | | Navy | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| Variable | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| NDD | | | | | | | | | | | | | | | | | | | | |
| N | 5172 | 2764 | 1295 | 719 | 3040 | 1661 | 1098 | 493 | 3277 | 571 | 771 | 167 | 4191 | 1831 | 1079 | 173 | 3149 | 1879 | 1063 | 640 |
| Mean | 47.8 | 31.8 | 64.6 | 56.8 | 64.6 | 44.1 | 82.4 | 58.4 | 76.3 | 57.9 | 89.5 | 77.8 | 82.1 | 48.5 | 88.8 | 65.9 | 71.9 | 48.4 | 83.8 | 72.8 |
| SD | 76.7 | 38.1 | 87.1 | 52.0 | 105.6 | 46.8 | 80.8 | 45.4 | 84.5 | 69.9 | 80.3 | 82.9 | 111.2 | 36.7 | 71.8 | 36.6 | 105.8 | 49.9 | 86.5 | 46.2 |
| HDD | | | | | | | | | | | | | | | | | | | | |
| N | 5978 | 3073 | 1376 | 765 | 3293 | 1813 | 1142 | 505 | 3718 | 641 | 804 | 173 | 4670 | 2082 | 1134 | 189 | 3516 | 2062 | 1106 | 655 |
| Mean | 10.7 | 4.0 | 4.8 | 2.5 | 20.8 | 10.4 | 10.3 | 3.9 | 19.7 | 9.6 | 8.9 | 3.6 | 37.6 | 18.0 | 14.9 | 7.0 | 25.7 | 13.2 | 9.1 | 5.9 |
| SD | 38.7 | 12.9 | 20.9 | 8.3 | 62.0 | 23.5 | 27.0 | 8.0 | 46.1 | 25.4 | 23.1 | 8.1 | 80.1 | 23.3 | 26.5 | 9.1 | 68.1 | 27.2 | 25.1 | 13.5 |
| DDD | | | | | | | | | | | | | | | | | | | | |
| N | 5995 | 3084 | 1378 | 763 | 3302 | 1813 | 1144 | 508 | 3733 | 643 | 810 | 175 | 4691 | 2096 | 1137 | 189 | 3531 | 2068 | 1106 | 656 |
| Mean | 2.5 | 1.9 | 1.6 | 1.6 | 3.2 | 2.4 | 1.9 | 1.7 | 2.9 | 2.4 | 2.0 | 1.6 | 4.5 | 3.2 | 2.3 | 2.1 | 3.3 | 2.5 | 1.9 | 1.6 |
| SD | 3.3 | 1.5 | 1.4 | 1.1 | 4.5 | 2.4 | 1.3 | 0.8 | 3.0 | 2.9 | 1.7 | 0.8 | 6.1 | 2.3 | 1.6 | 2.0 | 4.8 | 2.2 | 1.3 | 0.6 |

Notes: NDD = number of drinking days; HDD = heavy drinking days; DDD = drinks per drinking day; M = male; F = female; N = number; SD = standard deviation.

Table B3.

Body Mass Index Category within Military Service Branch by Rank and Gender

| | Air Force | | | | Army | | | | Coast Guard | | | | Marine Corps | | | | Navy | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| BMI | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| Underweight | 0.6 | 1.4 | 0.2 | 1.3 | 0.5 | 1.0 | 0.3 | 0.6 | 0.3 | 1.5 | 0.1 | 0.4 | 0.5 | 2.4 | 0.2 | 1.2 | 0.4 | 2.5 | 0.2 | 2.3 |
| Healthy | 37.4 | 57.4 | 33.9 | 69.3 | 28.4 | 52.0 | 25.4 | 65.5 | 27.8 | 54.6 | 27.1 | 65.4 | 39.2 | 81.8 | 32.9 | 90.3 | 29.2 | 50.4 | 30.6 | 62.7 |
| Overweight | 50.7 | 35.0 | 57.7 | 26.0 | 53.1 | 39.2 | 61.5 | 29.3 | 60.3 | 37.9 | 60.3 | 33.8 | 54.9 | 14.9 | 63.5 | 7.8 | 53.4 | 38.4 | 57.1 | 30.0 |
| Obese | 11.3 | 6.3 | 8.1 | 3.4 | 18.0 | 7.7 | 12.8 | 4.7 | 11.6 | 5.9 | 12.6 | 0.4 | 5.4 | 1.0 | 3.4 | 0.6 | 17.0 | 8.7 | 12.1 | 5.1 |

Notes: BMI = body mass index; M = male; F = female; Underweight = less than 18 BMI, Healthy = BMI greater than 18 but less than 25, Overweight = BMI greater than or equal to 25 but less than 30; Obese = BMI greater than 30.

Table B4.

Body Mass Index Category within Military Service Branch by Marital Status and Gender

| | Air Force | | | | Army | | | | Coast Guard | | | | Marine Corps | | | | Navy | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Not Married | | Married | | Not Married | | Married | | Not Married | | Married | | Not Married | | Married | | Not Married | | Married | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| BMI | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| Underweight | 0.6 | 0.3 | 0.3 | 0.3 | 0.2 | 0.2 | 0.5 | 0.1 | 0.3 | 0.4 | 0.2 | 0.1 | 0.5 | 0.2 | 0.4 | 0.1 | 0.4 | 0.7 | 0.2 | 0.2 |
| Healthy | 37.5 | 15.6 | 24.6 | 9.6 | 30.4 | 12.6 | 21.0 | 5.8 | 29.4 | 12.7 | 21.0 | 5.0 | 43.2 | 7.4 | 29.8 | 4.8 | 29.2 | 12.9 | 21.6 | 5.8 |
| Overweight | 32.0 | 7.3 | 47.8 | 6.1 | 38.5 | 8.2 | 50.1 | 4.1 | 43.9 | 6.7 | 56.6 | 4.1 | 44.5 | 1.0 | 57.6 | 1.0 | 37.0 | 8.5 | 50.5 | 4.5 |
| Obese | 5.4 | 1.3 | 10.4 | 1.0 | 8.2 | 1.7 | 17.6 | 0.7 | 6.1 | 0.7 | 12.4 | 0.6 | 3.1 | 0.1 | 6.2 | 0.1 | 9.8 | 1.5 | 15.9 | 1.2 |

Notes: BMI = body mass index; M = male; F = female; Underweight = less than 18 BMI, Healthy = BMI greater than 18 but less than 25, Overweight = BMI greater than or equal to 25 but less than 30; Obese = BMI greater than 30. Percentages are based on weights for the military population.

Table B5.
Consumption of Healthy Food Groups by Rank and Gender for All Service Branches

| | All Service Branches % | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| | Male | Female | Male | Female |
| Fruit | | | | |
| Rarely/Never | 5.47 | 4.05 | 2.34 | 1.73 |
| 1-2 times per week | 15.91 | 14.00 | 10.41 | 8.75 |
| 3-6 times per week | 21.06 | 20.44 | 18.72 | 13.83 |
| 1 time per day | 25.54 | 22.07 | 29.75 | 25.63 |
| 2 times per day | 21.62 | 24.78 | 27.57 | 31.09 |
| 3 or more times per day | 10.41 | 14.65 | 11.22 | 18.97 |
| Vegetables | | | | |
| Rarely/Never | 3.80 | 3.23 | 1.16 | 1.52 |
| 1-2 times per week | 10.48 | 10.05 | 5.94 | 4.99 |
| 3-6 times per week | 21.18 | 21.11 | 17.27 | 13.17 |
| 1 time per day | 25.29 | 22.15 | 30.43 | 21.28 |
| 2 times per day | 27.28 | 27.59 | 32.82 | 37.59 |
| 3 or more times per day | 11.96 | 15.87 | 12.40 | 21.45 |
| Whole Grains | | | | |
| Rarely/Never | 3.25 | 5.39 | 2.39 | 3.80 |
| 1-2 times per week | 10.77 | 13.24 | 7.91 | 9.24 |
| 3-6 times per week | 19.95 | 20.77 | 16.72 | 16.78 |
| 1 time per day | 25.43 | 22.66 | 28.50 | 22.88 |
| 2 times per day | 27.71 | 25.41 | 33.08 | 32.90 |
| 3 or more times per day | 12.89 | 12.54 | 11.40 | 14.41 |
| Dairy | | | | |
| Rarely/Never | 4.08 | 4.52 | 2.64 | 2.82 |
| 1-2 times per week | 10.80 | 11.62 | 8.29 | 8.35 |
| 3-6 times per week | 18.43 | 18.63 | 14.64 | 11.80 |
| 1 time per day | 28.39 | 25.18 | 31.96 | 25.06 |
| 2 times per day | 25.78 | 26.15 | 32.18 | 37.05 |
| 3 or more times per day | 12.53 | 13.89 | 10.28 | 14.91 |
| Lean Protein | | | | |
| Rarely/Never | 2.27 | 2.96 | 0.78 | 0.92 |
| 1-2 times per week | 9.80 | 11.87 | 6.81 | 5.33 |
| 3-6 times per week | 21.20 | 22.83 | 18.01 | 16.15 |
| 1 time per day | 25.15 | 23.79 | 29.27 | 26.30 |
| 2 times per day | 27.47 | 26.61 | 33.24 | 35.84 |
| 3 or more times per day | 14.11 | 11.95 | 11.89 | 15.46 |

Notes: Percentages are based on weights for the military population.

Table B6.
Frequency of Healthy Food Items within Military Service Branch by Rank and Gender

| | Air Force % | | | | Army % | | | | Coast Guard % | | | | Marine Corp % | | | | Navy % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Fruit | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 4.8 | 3.6 | 2.3 | 2.0 | 8.2 | 5.3 | 2.8 | 2.7 | 3.1 | 1.9 | 2.2 | 0.0 | 6.0 | 4.6 | 2.5 | 4.1 | 4.9 | 4.7 | 2.0 | 1.1 |
| 1-2 times / week | 15.4 | 13.8 | 9.6 | 8.4 | 17.7 | 15.4 | 13.1 | 10.8 | 13.0 | 10.3 | 8.3 | 7.4 | 17.2 | 15.5 | 11.8 | 11.5 | 15.4 | 14.5 | 10.1 | 8.0 |
| 3-6 times / week | 21.2 | 20.2 | 19.3 | 14.5 | 21.1 | 21.5 | 21.2 | 17.7 | 19.8 | 16.2 | 16.4 | 7.5 | 21.5 | 21.4 | 19.4 | 12.3 | 21.3 | 21.9 | 16.7 | 13.9 |
| 1 time / day | 24.9 | 22.0 | 28.7 | 26.6 | 24.0 | 22.5 | 30.5 | 23.2 | 28.8 | 25.1 | 32.7 | 27.6 | 25.7 | 22.9 | 28.4 | 29.2 | 25.2 | 19.7 | 30.0 | 23.5 |
| 2 times / day | 23.1 | 25.6 | 28.5 | 29.9 | 18.7 | 21.4 | 23.2 | 28.3 | 24.8 | 29.5 | 28.0 | 34.0 | 19.8 | 22.1 | 27.1 | 33.0 | 22.2 | 24.8 | 29.5 | 33.6 |
| 3 + times / day | 10.5 | 14.7 | 11.6 | 18.6 | 10.3 | 13.9 | 9.1 | 17.5 | 10.5 | 17.0 | 12.4 | 23.5 | 9.9 | 13.5 | 10.9 | 10.0 | 11.0 | 14.4 | 11.7 | 20.0 |
| Vegetables | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 3.3 | 2.6 | 1.3 | 1.8 | 4.3 | 3.4 | 1.2 | 1.0 | 2.1 | 2.5 | 0.8 | 1.1 | 4.7 | 5.7 | 1.1 | 3.5 | 4.2 | 3.2 | 1.2 | 1.2 |
| 1-2 times / week | 9.6 | 9.9 | 6.1 | 5.3 | 10.0 | 10.9 | 6.9 | 7.2 | 7.9 | 5.7 | 4.5 | 2.3 | 12.6 | 13.1 | 7.6 | 9.2 | 11.4 | 10.5 | 4.7 | 3.3 |
| 3-6 times / week | 21.4 | 20.5 | 16.0 | 13.1 | 22.1 | 21.8 | 21.8 | 17.9 | 18.4 | 16.0 | 15.5 | 8.8 | 21.4 | 21.2 | 16.6 | 10.4 | 21.8 | 24.5 | 17.5 | 12.8 |
| 1 time / day | 24.6 | 22.2 | 30.1 | 22.0 | 26.0 | 22.6 | 28.8 | 20.0 | 27.0 | 23.6 | 30.8 | 18.6 | 26.2 | 24.1 | 33.3 | 27.5 | 23.0 | 19.9 | 30.0 | 21.3 |
| 2 times / day | 28.7 | 28.5 | 32.9 | 36.4 | 25.1 | 27.1 | 28.2 | 34.9 | 32.1 | 33.6 | 36.1 | 42.1 | 25.3 | 22.3 | 31.5 | 33.6 | 26.3 | 25.8 | 35.3 | 40.2 |
| 3 + times / day | 12.4 | 16.3 | 13.6 | 21.3 | 12.4 | 14.2 | 13.1 | 19.0 | 12.6 | 18.5 | 12.4 | 27.1 | 9.8 | 13.6 | 10.0 | 15.8 | 13.3 | 16.2 | 11.4 | 21.2 |
| Whole Grains | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 2.1 | 5.0 | 2.0 | 4.0 | 4.1 | 6.9 | 3.8 | 3.4 | 3.1 | 3.9 | 2.1 | 3.0 | 3.1 | 5.6 | 1.9 | 5.0 | 4.4 | 5.6 | 2.5 | 4.0 |
| 1-2 times / week | 9.3 | 12.4 | 8.1 | 10.3 | 12.1 | 14.5 | 8.7 | 9.3 | 8.1 | 10.5 | 5.5 | 4.7 | 11.6 | 15.0 | 8.1 | 9.9 | 12.5 | 14.3 | 8.3 | 10.0 |
| 3-6 times / week | 20.0 | 19.7 | 15.2 | 16.3 | 20.5 | 21.3 | 19.2 | 20.6 | 19.7 | 18.0 | 16.2 | 13.9 | 20.1 | 22.8 | 18.0 | 18.5 | 19.4 | 22.7 | 16.8 | 16.0 |
| 1 time / day | 25.6 | 23.2 | 28.0 | 20.4 | 24.1 | 21.4 | 25.4 | 25.5 | 26.9 | 24.5 | 30.0 | 28.1 | 26.5 | 23.3 | 28.5 | 24.7 | 23.9 | 21.3 | 30.9 | 21.6 |
| 2 times/ day | 30.1 | 26.7 | 34.9 | 34.5 | 26.3 | 24.1 | 32.3 | 27.7 | 30.0 | 30.4 | 33.7 | 36.2 | 26.1 | 22.8 | 32.5 | 30.7 | 26.0 | 22.8 | 30.5 | 32.5 |
| 3 + times / day | 12.9 | 13.0 | 11.8 | 14.6 | 12.9 | 11.8 | 10.6 | 13.6 | 12.2 | 12.7 | 12.5 | 14.0 | 12.6 | 10.5 | 11.0 | 11.2 | 13.7 | 13.2 | 10.9 | 15.9 |

Notes: M = Male, F = Female; Percentages are based on weights for the military population.

Table B6.
Frequency of Healthy Food Items within Military Service Branch by Rank and Gender (continued)

| | Air Force % | | | | Army % | | | | Coast Guard % | | | | Marine Corp % | | | | Navy % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Lean Protein | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 1.5 | 2.6 | 0.7 | 1.0 | 3.2 | 3.0 | 0.9 | 1.7 | 1.3 | 1.6 | 0.5 | 0.3 | 2.5 | 5.1 | 0.8 | 1.5 | 3.0 | 3.2 | 0.9 | 0.3 |
| 1-2 times / week | 8.8 | 11.5 | 6.5 | 5.4 | 10.7 | 13.6 | 7.8 | 7.4 | 7.6 | 7.3 | 5.8 | 1.6 | 10.0 | 13.3 | 6.2 | 8.3 | 11.7 | 13.0 | 7.8 | 5.2 |
| 3-6 times / week | 21.3 | 21.8 | 16.9 | 17.6 | 22.5 | 24.9 | 18.3 | 17.6 | 19.6 | 20.6 | 20.7 | 13.1 | 21.0 | 23.0 | 17.1 | 18.6 | 21.3 | 24.0 | 18.7 | 13.3 |
| 1 time / day | 24.6 | 23.9 | 31.9 | 25.8 | 24.4 | 22.9 | 27.2 | 26.2 | 26.8 | 26.8 | 28.4 | 25.8 | 25.7 | 24.3 | 27.6 | 32.1 | 24.7 | 22.4 | 28.0 | 26.4 |
| 2 times / day | 29.5 | 28.1 | 33.1 | 35.5 | 25.5 | 24.4 | 33.3 | 33.2 | 31.0 | 29.7 | 35.3 | 41.5 | 26.1 | 23.9 | 32.5 | 26.4 | 25.6 | 25.4 | 32.7 | 37.1 |
| 3 + times / day | 14.3 | 12.2 | 10.9 | 14.6 | 13.7 | 11.1 | 12.5 | 13.9 | 13.7 | 13.9 | 9.3 | 17.6 | 14.8 | 10.4 | 15.8 | 13.2 | 13.7 | 11.9 | 12.0 | 17.7 |
| Dairy | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 2.9 | 3.7 | 2.2 | 2.5 | 4.9 | 5.0 | 3.7 | 1.9 | 2.5 | 4.0 | 2.7 | 2.7 | 4.3 | 5.5 | 3.0 | 5.4 | 5.9 | 5.4 | 2.3 | 2.8 |
| 1-2 times / week | 10.0 | 10.5 | 8.2 | 8.0 | 11.4 | 13.4 | 9.2 | 9.0 | 8.2 | 8.9 | 5.6 | 5.6 | 11.8 | 13.2 | 9.7 | 10.2 | 12.1 | 12.9 | 8.5 | 9.4 |
| 3-6 times / week | 18.4 | 17.7 | 14.5 | 12.4 | 19.2 | 19.9 | 15.2 | 14.7 | 16.1 | 17.2 | 13.2 | 13.2 | 18.6 | 20.6 | 13.7 | 10.2 | 19.4 | 19.1 | 16.2 | 13.0 |
| 1 time / day | 29.1 | 25.0 | 32.5 | 25.4 | 26.5 | 25.7 | 30.3 | 28.3 | 29.2 | 25.7 | 34.0 | 34.0 | 29.3 | 26.1 | 33.4 | 29.5 | 27.4 | 24.3 | 29.9 | 19.8 |
| 2 times / day | 27.6 | 29.3 | 34.0 | 36.7 | 24.8 | 22.9 | 28.8 | 30.3 | 30.6 | 28.7 | 33.6 | 33.6 | 23.7 | 22.4 | 30.1 | 33.3 | 23.3 | 23.9 | 32.3 | 39.1 |
| 3 + times / day | 12.1 | 13.9 | 8.7 | 15.0 | 13.2 | 13.2 | 12.8 | 15.8 | 13.4 | 15.5 | 10.8 | 10.8 | 12.4 | 12.2 | 10.1 | 11.4 | 12.0 | 14.5 | 10.9 | 15.8 |

Notes: M = Male, F = Female; Percentages are based on weights for the military population.

Table B7.
Frequency of Less Healthy Food Items for All Service Branches by Rank and Gender

| | All Service Branches % | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| | Male | Female | Male | Female |
| Starchy Vegetables | | | | |
| Rarely/Never | 5.78 | 10.12 | 4.81 | 10.98 |
| 1-2 times per week | 21.84 | 29.39 | 23.70 | 33.29 |
| 3-6 times per week | 26.34 | 25.28 | 26.80 | 23.58 |
| 1 time per day | 26.40 | 20.98 | 30.09 | 22.73 |
| 2 times per day | 15.07 | 10.93 | 12.53 | 8.13 |
| 3 or more times per day | 4.57 | 3.30 | 2.06 | 1.29 |
| Snack Foods | | | | |
| Rarely/Never | 20.35 | 26.35 | 18.12 | 26.83 |
| 1-2 times per week | 33.55 | 35.65 | 34.89 | 36.21 |
| 3-6 times per week | 20.64 | 17.61 | 21.75 | 16.81 |
| 1 time per day | 16.06 | 12.69 | 19.35 | 14.53 |
| 2 times per day | 6.59 | 5.49 | 4.96 | 5.02 |
| 3 or more times per day | 2.81 | 2.21 | 0.93 | 0.60 |
| Sweets | | | | |
| Rarely/Never | 26.24 | 22.39 | 17.17 | 14.53 |
| 1-2 times per week | 33.25 | 35.34 | 33.86 | 34.28 |
| 3-6 times per week | 17.13 | 19.03 | 20.90 | 19.51 |
| 1 time per day | 14.66 | 14.59 | 20.38 | 22.76 |
| 2 times per day | 5.83 | 6.07 | 6.23 | 6.87 |
| 3 or more times per day | 2.88 | 2.59 | 1.46 | 2.05 |
| Sugary Drinks | | | | |
| Rarely/Never | 22.11 | 34.52 | 39.28 | 57.39 |
| 1-2 times per week | 21.60 | 23.06 | 23.83 | 19.17 |
| 3-6 times per week | 17.03 | 14.95 | 12.70 | 8.72 |
| 1 time per day | 17.92 | 14.36 | 14.55 | 10.16 |
| 2 times per day | 12.35 | 8.09 | 7.16 | 3.24 |
| 3 or more times per day | 8.99 | 5.02 | 2.47 | 1.33 |
| Fried Food | | | | |
| Rarely/Never | 20.79 | 33.60 | 24.20 | 44.87 |
| 1-2 times per week | 42.63 | 40.47 | 48.14 | 40.75 |
| 3-6 times per week | 19.28 | 14.70 | 17.89 | 9.03 |
| 1 time per day | 11.01 | 7.13 | 7.34 | 4.02 |
| 2 times per day | 4.41 | 3.01 | 1.96 | 1.08 |
| 3 or more times per day | 1.88 | 1.10 | 0.47 | 0.26 |

Notes: Percentages are weighted for the final population.

Table B8.
Frequency of Less Healthy Food Items within Military Service Branch by Rank and Gender

| | Air Force % | | | | Army % | | | | Coast Guard % | | | | Marine Corp % | | | | Navy % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Starchy Vegetables | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 4.9 | 9.3 | 4.9 | 11.7 | 6.7 | 10.4 | 4.7 | 10.2 | 4.7 | 8.8 | 3.9 | 8.9 | 6.5 | 11.4 | 5.2 | 12.0 | 6.0 | 11.4 | 5.1 | 11.5 |
| 1-2 times / wk. | 22.1 | 29.8 | 23.9 | 32.2 | 22.0 | 29.2 | 25.2 | 31.0 | 20.6 | 31.5 | 23.2 | 38.0 | 21.4 | 28.0 | 24.3 | 34.4 | 22.8 | 28.5 | 22.0 | 34.0 |
| 3-6 times / wk. | 27.6 | 25.4 | 27.2 | 24.3 | 25.7 | 25.9 | 26.5 | 23.9 | 26.6 | 23.5 | 25.6 | 24.3 | 25.9 | 25.8 | 26.1 | 22.8 | 25.4 | 25.2 | 27.7 | 21.4 |
| 1 time / day | 26.9 | 21.0 | 28.4 | 22.6 | 25.5 | 20.7 | 28.9 | 26.1 | 29.0 | 22.2 | 31.5 | 17.0 | 25.7 | 20.3 | 30.7 | 22.5 | 25.5 | 20.8 | 32.8 | 24.2 |
| 2 times / day | 14.3 | 11.5 | 13.8 | 8.3 | 15.2 | 10.5 | 11.9 | 7.6 | 15.5 | 10.2 | 13.0 | 9.2 | 15.5 | 10.9 | 11.6 | 5.9 | 15.2 | 10.6 | 11.1 | 8.0 |
| 3 + times / day | 4.1 | 3.0 | 1.8 | 0.9 | 4.9 | 3.3 | 2.9 | 1.2 | 3.6 | 3.9 | 2.8 | 2.7 | 5.0 | 3.5 | 2.1 | 2.4 | 5.1 | 3.5 | 1.4 | 1.0 |
| Snack Foods | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 20.7 | 25.8 | 17.1 | 27.0 | 23.0 | 29.7 | 21.3 | 27.4 | 18.5 | 26.6 | 15.1 | 26.0 | 19.6 | 26.0 | 18.8 | 25.7 | 19.7 | 24.8 | 19.0 | 26.8 |
| 1-2 times / wk. | 35.4 | 36.6 | 33.5 | 36.4 | 33.9 | 33.7 | 36.1 | 36.2 | 33.1 | 37.9 | 39.3 | 35.4 | 31.2 | 32.9 | 33.6 | 37.4 | 34.1 | 35.6 | 34.5 | 36.2 |
| 3-6 times / wk. | 20.7 | 17.9 | 22.6 | 17.7 | 19.8 | 16.8 | 18.0 | 16.1 | 21.3 | 17.3 | 22.4 | 13.8 | 21.5 | 16.7 | 22.4 | 14.3 | 19.7 | 18.4 | 22.4 | 18.5 |
| 1 time / day | 15.4 | 12.7 | 20.9 | 13.5 | 14.6 | 11.9 | 19.7 | 13.4 | 18.0 | 13.9 | 16.9 | 17.8 | 16.8 | 14.4 | 19.5 | 17.8 | 16.0 | 11.7 | 17.8 | 14.4 |
| 2 times / day | 5.8 | 5.3 | 5.2 | 5.1 | 5.5 | 5.6 | 4.1 | 5.6 | 6.8 | 2.9 | 5.5 | 5.8 | 7.4 | 5.9 | 4.9 | 4.8 | 7.5 | 6.9 | 5.0 | 3.9 |
| 3 + times / day | 2.0 | 1.7 | 0.8 | 0.4 | 3.2 | 2.2 | 0.8 | 1.3 | 2.3 | 1.4 | 0.9 | 1.2 | 3.6 | 4.0 | 0.9 | 0.0 | 3.0 | 2.6 | 1.3 | 0.1 |
| Sweets | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 26.4 | 21.9 | 16.0 | 14.7 | 26.8 | 25.5 | 18.8 | 14.6 | 24.4 | 20.1 | 14.2 | 12.2 | 28.0 | 24.0 | 20.9 | 19.9 | 24.6 | 21.1 | 17.2 | 14.4 |
| 1-2 times / wk. | 35.1 | 37.6 | 32.0 | 36.8 | 33.0 | 33.5 | 35.8 | 30.8 | 34.4 | 34.4 | 36.2 | 34.4 | 30.5 | 31.9 | 33.5 | 31.6 | 33.7 | 35.2 | 34.4 | 32.6 |
| 3-6 times / wk. | 18.0 | 19.4 | 22.2 | 19.6 | 17.3 | 18.6 | 19.0 | 21.8 | 16.7 | 20.2 | 21.3 | 15.5 | 16.3 | 17.5 | 20.4 | 19.5 | 17.3 | 18.8 | 20.3 | 20.2 |
| 1 time / day | 13.7 | 13.5 | 20.8 | 22.0 | 13.8 | 13.8 | 19.1 | 20.0 | 16.7 | 17.3 | 21.6 | 27.8 | 14.9 | 16.0 | 18.6 | 21.3 | 15.0 | 14.8 | 21.2 | 23.7 |
| 2 times / day | 5.0 | 5.7 | 7.3 | 5.5 | 5.8 | 5.5 | 5.7 | 9.2 | 5.6 | 6.8 | 6.0 | 7.5 | 6.6 | 6.2 | 5.3 | 6.6 | 6.2 | 6.7 | 5.6 | 7.4 |
| 3 + times / day | 1.9 | 1.9 | 1.8 | 1.4 | 3.4 | 3.1 | 1.6 | 3.6 | 2.3 | 1.2 | 0.6 | 2.6 | 3.7 | 4.3 | 1.4 | 1.2 | 3.2 | 3.3 | 1.4 | 1.8 |

Notes: M = Male, F = Female; Percentages are based on weights for the military population.

Table B8.
Frequency of Less Healthy Food Items within Military Service Branch by Rank and Gender (continued)

| | Air Force % | | | | Army % | | | | Coast Guard % | | | | Marine Corp % | | | | Navy % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Sugary Drinks | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 23.1 | 37.1 | 40.2 | 59.4 | 21.8 | 31.6 | 37.7 | 49.8 | 30.3 | 43.7 | 44.4 | 59.0 | 17.1 | 27.3 | 34.0 | 55.7 | 21.4 | 31.1 | 39.5 | 59.3 |
| 1-2 times / wk. | 23.0 | 23.2 | 23.1 | 18.4 | 20.3 | 22.2 | 22.8 | 21.3 | 21.0 | 23.9 | 23.0 | 20.0 | 19.5 | 20.4 | 25.6 | 16.4 | 24.1 | 24.3 | 25.2 | 18.9 |
| 3-6 times / wk. | 17.2 | 14.8 | 12.6 | 8.5 | 16.8 | 15.1 | 14.0 | 10.5 | 15.5 | 11.1 | 10.0 | 9.6 | 18.5 | 16.3 | 13.4 | 9.8 | 16.3 | 16.6 | 13.1 | 6.7 |
| 1 time / day | 18.7 | 14.2 | 14.6 | 10.0 | 16.3 | 14.8 | 15.7 | 9.7 | 17.2 | 13.0 | 13.5 | 8.7 | 19.6 | 18.4 | 16.1 | 13.0 | 16.6 | 13.0 | 13.2 | 11.2 |
| 2 times / day | 10.9 | 7.0 | 7.1 | 2.7 | 13.1 | 10.0 | 7.8 | 5.5 | 10.2 | 5.6 | 7.0 | 2.4 | 14.2 | 9.3 | 8.0 | 4.4 | 12.8 | 9.2 | 6.2 | 2.7 |
| 3 + times / day | 7.1 | 3.8 | 2.3 | 1.0 | 11.8 | 6.3 | 2.1 | 3.2 | 5.8 | 2.7 | 2.0 | 0.4 | 11.1 | 8.3 | 3.0 | 0.6 | 8.7 | 5.8 | 2.9 | 1.1 |
| Fried Food | | | | | | | | | | | | | | | | | | | | |
| Rarely/Never | 21.0 | 33.6 | 21.9 | 44.7 | 22.0 | 33.0 | 25.3 | 42.2 | 23.2 | 42.8 | 25.7 | 48.2 | 19.9 | 30.3 | 27.4 | 49.0 | 18.7 | 30.7 | 24.1 | 44.2 |
| 1-2 times / wk. | 44.6 | 43.1 | 50.3 | 41.7 | 43.8 | 39.8 | 45.5 | 41.7 | 42.6 | 35.9 | 46.2 | 40.3 | 39.4 | 38.4 | 47.2 | 40.3 | 43.1 | 40.2 | 48.3 | 38.3 |
| 3-6 times / wk. | 18.9 | 13.7 | 17.7 | 8.3 | 17.8 | 14.8 | 18.5 | 8.7 | 18.3 | 12.3 | 18.4 | 6.7 | 20.8 | 16.6 | 17.6 | 8.5 | 19.9 | 16.6 | 17.7 | 12.6 |
| 1 time / day | 10.3 | 6.4 | 7.7 | 4.0 | 10.0 | 7.8 | 8.6 | 5.7 | 11.0 | 5.8 | 7.5 | 3.7 | 12.4 | 9.7 | 5.6 | 1.1 | 11.0 | 7.3 | 6.9 | 3.5 |
| 2 times / day | 3.9 | 2.6 | 2.2 | 1.0 | 4.3 | 3.1 | 1.5 | 1.2 | 3.7 | 2.4 | 1.6 | 0.8 | 4.8 | 3.2 | 1.8 | 1.2 | 5.4 | 3.8 | 2.3 | 1.2 |
| 3 + times / day | 1.3 | 0.6 | 0.2 | 0.3 | 2.1 | 1.5 | 0.7 | 0.4 | 1.2 | 0.8 | 0.6 | 0.3 | 2.7 | 1.9 | 0.3 | 0.0 | 1.9 | 1.5 | 0.7 | 0.2 |

Notes: M = Male, F = Female; Percentages are based on weights for the military population.

Table B9.
Physical Activity for All Military Service Branches by Rank and Gender

| | All Service Branches % | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| Exercise Type | Male | Female | Male | Female |
| Vigorous Cardiovascular Activity Frequency | | | | |
| Not at all | 8.90 | 15.04 | 6.22 | 10.84 |
| <1 day week | 9.91 | 11.90 | 10.00 | 12.67 |
| 1-2 days week | 27.55 | 27.91 | 30.27 | 29.21 |
| 3-4 days week | 32.74 | 30.80 | 35.80 | 32.16 |
| 5-6 days week | 13.52 | 9.96 | 12.93 | 10.89 |
| Everyday | 7.39 | 4.38 | 4.78 | 4.24 |
| Moderate Cardiovascular Activity Frequency | | | | |
| Not at all | 4.07 | 5.32 | 2.47 | 2.59 |
| <1 day week | 4.84 | 5.26 | 6.21 | 6.22 |
| 1-2 days week | 17.13 | 19.42 | 24.21 | 24.06 |
| 3-4 days week | 33.11 | 37.46 | 32.97 | 34.51 |
| 5-6 days week | 19.06 | 15.94 | 17.13 | 15.33 |
| Everyday | 21.78 | 16.60 | 17.01 | 17.28 |
| Strength Training Frequency | | | | |
| Not at all | 12.90 | 18.19 | 12.74 | 15.41 |
| <1 day week | 12.98 | 15.30 | 16.61 | 18.21 |
| 1-2 days week | 25.70 | 30.69 | 31.24 | 36.33 |
| 3-4 days week | 28.30 | 25.06 | 27.57 | 22.61 |
| 5-6 days week | 12.69 | 6.98 | 8.58 | 5.28 |
| Everyday | 7.43 | 3.79 | 3.26 | 2.16 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

Table B10.
Physical Activity within Military Service Branch by Rank and Gender

| | Air Force % | | | | Army % | | | | Coast Guard % | | | | Marine Corps % | | | | Navy % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Vigorous Cardiovascular Activity Frequency | | | | | | | | | | | | | | | | | | | | |
| Not at all | 6.7 | 13.0 | 5.5 | 10.2 | 11.1 | 15.8 | 6.1 | 12.6 | 7.9 | 12.5 | 7.2 | 8.9 | 8.3 | 16.4 | 4.6 | 7.2 | 11.5 | 18.7 | 8.1 | 13.0 |
| <1 day wk. | 7.7 | 10.9 | 8.9 | 10.4 | 8.0 | 9.9 | 6.3 | 11.6 | 15.1 | 14.8 | 15.6 | 17.7 | 8.6 | 10.7 | 7.9 | 7.5 | 12.6 | 14.4 | 13.0 | 16.1 |
| 1-2 days wk. | 28.3 | 29.1 | 33.5 | 31.7 | 22.9 | 25.0 | 26.8 | 26.8 | 32.4 | 31.0 | 30.7 | 24.6 | 26.3 | 25.5 | 27.1 | 28.8 | 28.9 | 27.8 | 29.2 | 29.7 |
| 3-4 days wk. | 39.9 | 35.8 | 37.3 | 35.0 | 30.3 | 28.1 | 36.6 | 30.6 | 27.6 | 28.2 | 31.3 | 27.3 | 31.1 | 27.9 | 37.0 | 37.4 | 31.0 | 27.2 | 34.4 | 29.8 |
| 5-6 days wk. | 12.7 | 9.0 | 11.0 | 9.6 | 16.9 | 13.9 | 16.5 | 14.0 | 11.6 | 9.1 | 11.6 | 12.8 | 15.6 | 11.7 | 17.4 | 15.0 | 10.1 | 8.1 | 11.0 | 8.3 |
| Everyday | 4.8 | 2.3 | 3.7 | 3.2 | 10.8 | 7.3 | 7.7 | 4.5 | 5.3 | 4.4 | 3.5 | 8.6 | 10.1 | 7.8 | 6.0 | 4.1 | 5.8 | 3.8 | 4.2 | 3.0 |
| Moderate Cardiovascular Activity Frequency | | | | | | | | | | | | | | | | | | | | |
| Not at all | 3.4 | 4.2 | 2.5 | 2.5 | 5.0 | 6.5 | 2.2 | 2.9 | 2.9 | 3.3 | 2.1 | 2.1 | 4.4 | 6.2 | 1.9 | 3.1 | 4.5 | 7.1 | 3.4 | 2.6 |
| <1 day wk. | 3.7 | 4.7 | 6.6 | 6.3 | 3.9 | 3.2 | 5.6 | 4.1 | 6.7 | 6.7 | 7.3 | 6.2 | 4.9 | 5.8 | 5.9 | 6.5 | 5.9 | 6.8 | 5.5 | 7.9 |
| 1-2 days wk. | 17.8 | 22.5 | 25.4 | 27.1 | 12.9 | 13.1 | 19.9 | 18.8 | 21.6 | 21.3 | 26.1 | 19.9 | 15.8 | 18.2 | 22.1 | 22.7 | 18.7 | 18.6 | 25.8 | 26.0 |
| 3-4 days wk. | 39.8 | 43.3 | 36.0 | 35.7 | 24.8 | 29.6 | 29.3 | 32.4 | 33.4 | 34.9 | 31.3 | 34.3 | 28.9 | 31.1 | 29.1 | 27.3 | 37.2 | 38.3 | 34.3 | 36.0 |
| 5-6 days wk. | 18.7 | 14.1 | 16.8 | 13.9 | 24.9 | 23.7 | 21.1 | 20.1 | 17.2 | 16.3 | 16.4 | 15.8 | 19.2 | 16.2 | 18.0 | 17.4 | 15.2 | 12.8 | 14.4 | 13.0 |
| Everyday | 16.6 | 11.3 | 12.7 | 14.5 | 28.6 | 23.9 | 21.9 | 21.7 | 18.3 | 17.5 | 16.8 | 21.7 | 26.9 | 22.6 | 23.0 | 23.1 | 18.5 | 16.4 | 16.6 | 14.3 |
| Strength Training Frequency | | | | | | | | | | | | | | | | | | | | |
| Not at all | 10.2 | 15.4 | 11.3 | 12.5 | 13.4 | 17.4 | 10.6 | 15.3 | 15.1 | 16.0 | 16.6 | 23.0 | 11.9 | 19.1 | 8.1 | 9.8 | 15.9 | 24.4 | 17.9 | 17.5 |
| <1 day wk. | 11.6 | 14.1 | 17.7 | 16.0 | 10.7 | 13.4 | 12.1 | 18.1 | 15.8 | 16.7 | 18.9 | 18.1 | 12.7 | 16.3 | 14.9 | 16.8 | 15.5 | 17.6 | 18.2 | 23.4 |
| 1-2 days wk. | 27.7 | 33.8 | 33.9 | 40.9 | 26.9 | 30.7 | 31.8 | 32.7 | 25.9 | 33.1 | 31.1 | 30.1 | 23.1 | 27.0 | 27.8 | 34.0 | 25.0 | 25.8 | 28.6 | 35.1 |
| 3-4 days wk. | 33.0 | 27.9 | 28.2 | 23.8 | 26.5 | 23.0 | 27.2 | 25.0 | 26.6 | 23.7 | 24.7 | 21.0 | 26.8 | 23.2 | 31.5 | 26.3 | 26.8 | 23.5 | 25.7 | 18.3 |
| 5-6 days wk. | 12.6 | 6.6 | 6.4 | 5.8 | 13.1 | 9.6 | 12.9 | 6.8 | 11.5 | 6.6 | 5.9 | 2.5 | 14.5 | 8.0 | 13.7 | 8.2 | 11.0 | 5.3 | 6.9 | 4.0 |
| Everyday | 5.0 | 2.2 | 2.4 | 1.1 | 9.5 | 5.9 | 5.5 | 2.2 | 5.1 | 3.8 | 2.7 | 5.3 | 11.1 | 6.4 | 4.0 | 4.8 | 5.9 | 3.5 | 2.8 | 1.6 |

Notes. Min. = minutes; M = Male; F = Female. Percentages are based on weighting to the total population for all service branches.

Table B11.
Physical Activity Duration for All Military Service Branches by Rank and Gender

| | All Service Branches % | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| Exercise Type | Male | Female | Male | Female |
| Vigorous Cardiovascular Activity Duration | | | | |
| Never past month | 8.87 | 15.06 | 6.36 | 11.86 |
| < 20 min | 12.46 | 13.41 | 11.67 | 12.36 |
| 20-29 min | 21.95 | 22.14 | 24.91 | 22.76 |
| 30-59 min | 38.75 | 38.32 | 43.96 | 40.89 |
| 60 min or more | 17.98 | 11.07 | 13.09 | 12.13 |
| Moderate Cardiovascular Activity Duration | | | | |
| Never past month | 4.19 | 5.15 | 2.28 | 2.79 |
| < 20 min | 7.06 | 7.11 | 9.01 | 6.73 |
| 20-29 min | 16.04 | 16.58 | 19.96 | 17.53 |
| 30-59 min | 42.99 | 48.93 | 47.70 | 52.05 |
| 60 min or more | 29.72 | 22.22 | 21.05 | 20.90 |
| Strength Training Duration | | | | |
| Never past month | 13.39 | 18.63 | 13.26 | 16.46 |
| < 20 min | 13.12 | 18.15 | 18.53 | 23.03 |
| 20-29 min | 17.40 | 22.83 | 21.01 | 23.46 |
| 30-59 min | 32.98 | 30.63 | 34.81 | 29.56 |
| 60 min or more | 23.12 | 9.76 | 12.38 | 7.50 |

Notes: Min. = minutes. Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

Table B12.
Physical Activity Duration within Military Service Branch by Rank and Gender

| | Air Force % | | | | Army % | | | | Coast Guard % | | | | Marine Corps % | | | | Navy % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Vigorous Cardiovascular Activity Duration | | | | | | | | | | | | | | | | | | | | |
| Never / month | 6.9 | 13.3 | 5.3 | 10.8 | 10.6 | 15.7 | 5.9 | 12.7 | 8.6 | 13.1 | 8.7 | 13.4 | 7.9 | 16.1 | 4.6 | 8.5 | 11.5 | 18.1 | 8.5 | 13.2 |
| < 20 min | 12.2 | 12.5 | 11.7 | 12.1 | 11.4 | 11.4 | 9.3 | 10.7 | 17.2 | 16.9 | 14.8 | 13.6 | 9.3 | 11.5 | 9.3 | 8.5 | 14.5 | 15.5 | 13.3 | 14.6 |
| 20-29 min | 24.0 | 23.2 | 29.2 | 23.5 | 17.3 | 21.1 | 20.8 | 23.0 | 24.7 | 25.4 | 21.8 | 20.3 | 20.8 | 18.4 | 23.1 | 17.2 | 22.9 | 21.3 | 23.9 | 24.2 |
| 30-59 min | 41.9 | 41.5 | 43.0 | 43.8 | 39.3 | 37.3 | 47.9 | 40.6 | 34.4 | 32.6 | 42.5 | 34.7 | 41.3 | 40.5 | 47.3 | 47.0 | 33.6 | 35.9 | 40.8 | 38.0 |
| 60 min + | 15.0 | 9.5 | 10.8 | 9.8 | 21.5 | 14.6 | 16.1 | 13.0 | 15.1 | 12.0 | 12.1 | 18.1 | 20.7 | 13.6 | 15.7 | 18.8 | 17.4 | 9.2 | 13.5 | 10.1 |
| Moderate Cardiovascular Activity Duration | | | | | | | | | | | | | | | | | | | | |
| Never / month | 3.5 | 4.0 | 2.1 | 2.8 | 5.1 | 6.1 | 2.1 | 3.0 | 3.4 | 3.7 | 2.0 | 2.1 | 4.5 | 6.2 | 2.2 | 4.3 | 4.4 | 6.7 | 3.0 | 2.7 |
| < 20 min | 7.4 | 6.6 | 10.5 | 6.8 | 5.7 | 6.3 | 5.9 | 4.9 | 10.0 | 8.6 | 10.8 | 7.6 | 5.8 | 7.9 | 7.0 | 4.7 | 7.4 | 7.5 | 9.2 | 8.2 |
| 20-29 min | 17.9 | 16.9 | 23.5 | 18.7 | 11.3 | 12.4 | 16.2 | 16.5 | 19.4 | 20.3 | 20.1 | 16.7 | 13.6 | 15.0 | 17.1 | 13.5 | 18.6 | 18.0 | 18.6 | 17.6 |
| 30-59 min | 46.3 | 53.6 | 47.0 | 53.5 | 43.4 | 45.8 | 46.8 | 51.2 | 39.8 | 47.5 | 48.2 | 49.5 | 42.5 | 45.5 | 50.2 | 50.2 | 41.0 | 46.0 | 47.6 | 52.0 |
| 60 min + | 24.9 | 19.0 | 16.8 | 18.2 | 34.4 | 29.4 | 29.0 | 24.4 | 27.4 | 20.0 | 19.0 | 24.0 | 33.6 | 25.3 | 23.5 | 27.4 | 28.6 | 21.8 | 21.7 | 19.4 |
| Strength Training Duration | | | | | | | | | | | | | | | | | | | | |
| Never / month | 10.7 | 16.0 | 11.4 | 13.9 | 13.5 | 17.3 | 11.2 | 15.8 | 15.9 | 17.0 | 18.1 | 25.4 | 12.2 | 19.8 | 8.2 | 10.8 | 16.7 | 24.5 | 18.9 | 17.5 |
| < 20 min | 14.7 | 18.1 | 23.4 | 24.2 | 11.2 | 15.8 | 13.2 | 18.6 | 15.7 | 21.0 | 18.3 | 21.5 | 10.5 | 16.5 | 14.8 | 16.4 | 14.2 | 19.4 | 17.0 | 27.2 |
| 20-29 min | 18.9 | 23.4 | 22.0 | 25.4 | 15.8 | 21.5 | 19.2 | 23.5 | 19.7 | 27.7 | 22.1 | 19.6 | 15.3 | 19.7 | 19.3 | 24.6 | 17.8 | 21.7 | 21.2 | 21.7 |
| 30-59 min | 35.2 | 33.7 | 33.5 | 30.1 | 35.0 | 32.8 | 38.9 | 33.3 | 29.9 | 25.8 | 33.0 | 23.5 | 33.4 | 31.6 | 40.0 | 36.9 | 29.7 | 25.8 | 31.1 | 27.4 |
| 60 min + | 20.5 | 8.7 | 9.7 | 6.3 | 24.4 | 12.6 | 17.5 | 8.7 | 18.8 | 8.5 | 8.5 | 10.1 | 28.6 | 12.4 | 17.6 | 11.3 | 21.7 | 8.6 | 11.7 | 6.2 |

Notes. Min. = minutes; M = Male; F = Female. Percentages are based on weighting to the total population for all service branches.

Table B13.
Healthy People 2020 Goals for Physical Activity for All Military Service Branches by Rank and Gender

| | All Service Branches % | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| HP 2020 Goals | Male | Female | Male | Female |
| Vigorous Cardiovascular Activity | | | | |
| Less than 75 minutes per week | 45.98 | 55.25 | 45.93 | 52.44 |
| 75 minutes or more per week | 11.28 | 9.89 | 12.26 | 10.48 |
| 150 minutes or more per week | 42.74 | 34.86 | 41.81 | 37.08 |
| Moderate Cardiovascular Activity | | | | |
| Less than 150 min/week | 36.77 | 40.55 | 45.23 | 43.30 |
| 150 min or more /week | 37.15 | 39.93 | 36.07 | 38.46 |
| 300 min or more/week | 26.08 | 19.52 | 18.69 | 18.24 |
| Strength Training | | | | |
| Less than 1 day per week | 25.87 | 33.48 | 29.35 | 33.62 |
| 1 to 2 days per week | 25.70 | 30.69 | 31.24 | 36.33 |
| 3 or more days per week | 48.42 | 35.83 | 39.41 | 30.05 |

Notes: Percentages are based on weighting to the total population for all each service branch.

Table B14.
Healthy People Goals within Military Service Branch by Rank and Gender

| | Air Force % | | | | Army % | | | | Coast Guard % | | | | Marine Corps % | | | | Navy % | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Vigorous Cardiovascular Activity | | | | | | | | | | | | | | | | | | | | |
| < 75 min. / wk. | 42.7 | 53.2 | 47.6 | 51.6 | 42.1 | 51.0 | 38.4 | 50.7 | 54.6 | 59.1 | 53.8 | 51.4 | 42.5 | 53.1 | 38.7 | 41.9 | 52.4 | 61.2 | 49.3 | 59.2 |
| 75 min. + / wk. | 13.6 | 10.7 | 12.8 | 11.2 | 10.4 | 10.7 | 12.4 | 11.5 | 10.6 | 9.7 | 8.8 | 9.1 | 10.8 | 8.8 | 12.9 | 9.6 | 10.0 | 8.6 | 13.0 | 9.1 |
| 150 min +/ wk. | 43.7 | 36.2 | 39.7 | 37.1 | 47.5 | 38.3 | 49.1 | 37.8 | 34.9 | 31.2 | 37.3 | 39.5 | 46.7 | 38.1 | 48.4 | 48.5 | 37.6 | 30.2 | 37.7 | 31.6 |
| Moderate Cardiovascular Activity | | | | | | | | | | | | | | | | | | | | |
| < 150 min. /wk. | 37.8 | 42.0 | 49.4 | 46.1 | 29.8 | 32.7 | 37.8 | 36.6 | 43.4 | 41.8 | 48.4 | 39.9 | 33.9 | 40.1 | 39.3 | 40.8 | 40.8 | 43.7 | 46.0 | 46.6 |
| 150 + min. /wk. | 41.6 | 44.0 | 36.3 | 37.9 | 35.5 | 36.4 | 35.9 | 40.6 | 34.5 | 40.4 | 34.5 | 39.1 | 35.3 | 35.2 | 37.1 | 34.4 | 36.9 | 37.9 | 36.2 | 38.2 |
| 300 + min. /wk. | 20.5 | 14.0 | 14.4 | 16.0 | 34.8 | 31.0 | 26.3 | 22.7 | 22.1 | 17.8 | 17.1 | 21.1 | 30.8 | 24.8 | 23.6 | 24.8 | 22.4 | 18.3 | 17.8 | 15.1 |
| Strength Training | | | | | | | | | | | | | | | | | | | | |
| < 1 day / wk. | 21.7 | 29.5 | 29.0 | 28.5 | 24.0 | 30.8 | 22.7 | 33.4 | 30.9 | 32.7 | 35.5 | 41.1 | 24.6 | 35.4 | 23.0 | 26.6 | 31.4 | 41.9 | 36.1 | 41.0 |
| 1 to 2 days / wk. | 27.7 | 33.8 | 33.9 | 40.9 | 26.9 | 30.7 | 31.8 | 32.7 | 25.9 | 33.1 | 31.1 | 30.1 | 23.1 | 27.0 | 27.8 | 34.0 | 25.0 | 25.8 | 28.6 | 35.1 |
| 3 + days / wk. | 50.5 | 36.7 | 37.0 | 30.6 | 49.1 | 38.5 | 45.5 | 33.9 | 43.2 | 34.1 | 33.3 | 28.8 | 52.3 | 37.6 | 49.2 | 39.4 | 43.7 | 32.3 | 35.4 | 23.9 |

Notes. Wk. = week; / = per; M = male; F = female. All percentages are based on population weighting for each service branch.

Table B15.
Physical Fitness Test and Ability to Deploy by Rank and Gender for All Military Service Branches

| | All Service Branches | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| Variable | Male % | Female % | Male % | Female % |
| Passed Most Recent Physical Fitness Test | | | | |
| No | 4.13 | 5.95 | 1.31 | 1.90 |
| Yes | 95.87 | 94.05 | 98.69 | 98.10 |
| Able to Deploy Last 12 Months | | | | |
| No | 15.41 | 27.74 | 7.47 | 17.43 |
| Yes | 84.59 | 72.26 | 92.53 | 82.57 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

Table B16.
Medical Readiness Variable Percentages for all Military Service Branches by Rank and Gender

| | All Service Branches | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| Medical Readiness Variables | Male % | Female % | Male % | Female % |
| High Blood Pressure | | | | |
| Yes | 14.57 | 7.58 | 14.66 | 7.77 |
| No | 85.43 | 92.42 | 85.34 | 92.23 |
| High Blood Sugar | | | | |
| Yes | 1.48 | 1.89 | 1.77 | 1.36 |
| No | 98.52 | 98.11 | 98.23 | 98.64 |
| High Cholesterol | | | | |
| Yes | 12.40 | 7.07 | 20.91 | 13.16 |
| No | 87.60 | 92.93 | 79.09 | 86.84 |
| Low HDL Cholesterol | | | | |
| Yes | 5.70 | 2.77 | 11.13 | 3.95 |
| No | 94.30 | 97.23 | 88.87 | 96.05 |
| High Triglycerides | | | | |
| Yes | 5.41 | 2.57 | 9.77 | 4.35 |
| No | 94.59 | 97.43 | 90.23 | 95.65 |

Notes: Percentages are based on weighting to the total population.

Table B17.
Medical Readiness within Military Service Branch by Rank and Gender

| | Air Force | | | | Army | | | | Coast Guard | | | | Marine Corps | | | | Navy | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Variable | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| High Blood Pressure | | | | | | | | | | | | | | | | | | | | |
| Yes | 13.1 | 7.1 | 13.2 | 7.7 | 18.9 | 12.3 | 18.8 | 9.5 | 13.1 | 2.6 | 13.8 | 4.4 | 13.5 | 6.9 | 13.6 | 4.3 | 15.0 | 7.8 | 15.3 | 9.7 |
| No | 86.9 | 92.9 | 86.8 | 92.3 | 81.1 | 87.7 | 81.2 | 90.5 | 86.9 | 97.4 | 86.2 | 95.6 | 86.5 | 93.1 | 86.4 | 95.7 | 85.0 | 92.2 | 84.7 | 90.3 |
| High Blood Sugar | | | | | | | | | | | | | | | | | | | | |
| Yes | 0.9 | 1.5 | 1.2 | 0.8 | 1.9 | 2.5 | 1.7 | 1.0 | 1.8 | 2.1 | 2.7 | 1.7 | 1.1 | 1.5 | 0.9 | 2.1 | 2.1 | 2.2 | 3.0 | 2.6 |
| No | 99.1 | 98.5 | 98.8 | 99.2 | 98.1 | 97.5 | 98.3 | 99.0 | 98.2 | 97.9 | 97.3 | 98.3 | 98.9 | 98.5 | 99.1 | 97.9 | 97.9 | 97.8 | 97.0 | 97.4 |
| High Cholesterol | | | | | | | | | | | | | | | | | | | | |
| Yes | 11.5 | 7.3 | 20.8 | 12.9 | 14.5 | 9.4 | 21.8 | 12.1 | 15.8 | 4.7 | 24.5 | 12.8 | 7.7 | 4.6 | 14.3 | 10.1 | 15.2 | 7.5 | 22.9 | 15.8 |
| No | 88.5 | 92.7 | 79.2 | 87.1 | 85.5 | 90.6 | 78.2 | 87.9 | 84.2 | 95.3 | 75.5 | 87.2 | 92.3 | 95.4 | 85.7 | 89.9 | 84.8 | 92.5 | 77.1 | 84.2 |
| Low HDL Cholesterol | | | | | | | | | | | | | | | | | | | | |
| Yes | 5.2 | 3.0 | 11.8 | 4.0 | 7.0 | 3.8 | 12.0 | 5.1 | 8.1 | 2.0 | 12.6 | 2.8 | 2.6 | 1.5 | 4.6 | 2.2 | 7.4 | 2.7 | 13.0 | 3.9 |
| No | 94.8 | 97.0 | 88.2 | 96.0 | 93.0 | 96.2 | 88.0 | 94.9 | 91.9 | 98.0 | 87.4 | 97.2 | 97.4 | 98.5 | 95.4 | 97.8 | 92.6 | 97.3 | 87.0 | 96.1 |
| High Triglycerides | | | | | | | | | | | | | | | | | | | | |
| Yes | 5.4 | 2.7 | 10.4 | 4.7 | 6.0 | 2.8 | 9.4 | 4.1 | 8.1 | 2.6 | 13.5 | 4.5 | 2.2 | 1.1 | 3.7 | 0.7 | 7.0 | 2.9 | 11.0 | 4.6 |
| No | 94.6 | 97.3 | 89.6 | 95.3 | 94.0 | 97.2 | 90.6 | 95.9 | 91.9 | 97.4 | 86.5 | 95.5 | 97.8 | 98.9 | 96.3 | 99.3 | 93.0 | 97.1 | 89.0 | 95.4 |

Notes: M = Male; F = Female. Percentages are weighted to the total population for each service branch. No response = increased military readiness.

Table B18.
Job Performance for All Military Service Branches by Rank and Gender

| | All Service Branches | | | |
|---|---|---|---|---|
| | Enlisted | | Officer | |
| | Male | Female | Male | Female |
| Job Performance Variable | % | % | % | % |
| Absence Due to Job Accident | | | | |
| None | 90.64 | 91.55 | 96.31 | 97.01 |
| 1 to 6 days | 5.20 | 4.99 | 2.33 | 1.88 |
| 7 or more days | 4.15 | 3.46 | 1.35 | 1.11 |
| Absence Due to Illness | | | | |
| None | 75.77 | 55.34 | 71.08 | 58.75 |
| 1 to 6 days | 20.92 | 35.67 | 26.78 | 35.53 |
| 7 or more days | 3.30 | 8.98 | 2.14 | 5.72 |
| Absence Due to Personal Accident | | | | |
| None | 93.71 | 91.96 | 96.91 | 95.44 |
| 1 to 6 days | 4.49 | 6.12 | 2.53 | 3.39 |
| 7 or more days | 1.80 | 1.91 | 0.56 | 1.18 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch.

Table B19.
Absence by Category within Military Service Branch by Rank and Gender

| | Air Force | | | | Army | | | | Coast Guard | | | | Marine Corps | | | | Navy | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | | Enlisted | | Officer | |
| | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F | M | F |
| Variable | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % | % |
| Absence Due to Job Accident | | | | | | | | | | | | | | | | | | | | |
| None | 93.07 | 94.74 | 96.79 | 98.18 | 86.29 | 86.96 | 93.83 | 93.48 | 90.99 | 90.06 | 97.17 | 98.11 | 89.90 | 88.64 | 95.44 | 95.29 | 92.13 | 92.00 | 97.58 | 97.36 |
| 1 - 6 days | 3.80 | 3.31 | 2.15 | 1.30 | 7.00 | 7.22 | 3.80 | 3.69 | 5.10 | 6.84 | 2.20 | 1.89 | 5.49 | 6.10 | 2.72 | 2.11 | 5.14 | 4.51 | 1.26 | 1.41 |
| 7 + days | 3.13 | 1.94 | 1.06 | 0.52 | 6.71 | 5.82 | 2.37 | 2.83 | 3.90 | 3.10 | 0.63 | 0.00 | 4.60 | 5.26 | 1.83 | 2.60 | 2.73 | 3.50 | 1.17 | 1.24 |
| Absence Due to Illness | | | | | | | | | | | | | | | | | | | | |
| None | 72.55 | 53.78 | 68.89 | 58.51 | 75.82 | 56.79 | 76.09 | 62.56 | 71.22 | 50.72 | 59.56 | 50.94 | 79.85 | 58.34 | 78.23 | 74.27 | 78.40 | 57.93 | 73.30 | 57.66 |
| 1 - 6 days | 24.50 | 37.38 | 29.34 | 37.34 | 19.08 | 33.30 | 20.67 | 30.02 | 25.96 | 42.13 | 38.29 | 39.94 | 17.23 | 33.03 | 19.82 | 22.34 | 18.64 | 32.34 | 24.67 | 36.73 |
| 7 + days | 2.94 | 8.84 | 1.77 | 4.15 | 5.10 | 9.91 | 3.24 | 7.42 | 2.83 | 7.15 | 2.16 | 9.12 | 2.92 | 8.64 | 1.96 | 3.39 | 2.96 | 9.73 | 2.03 | 5.61 |
| Absence Due to Personal Accident | | | | | | | | | | | | | | | | | | | | |
| None | 94.56 | 92.58 | 97.68 | 97.15 | 94.39 | 92.35 | 96.52 | 94.76 | 92.60 | 91.80 | 95.19 | 91.59 | 93.13 | 90.51 | 97.07 | 97.89 | 93.51 | 91.45 | 96.86 | 94.62 |
| 1 - 6 days | 3.90 | 5.41 | 1.86 | 2.48 | 4.09 | 6.18 | 3.11 | 4.05 | 5.56 | 6.09 | 4.11 | 5.26 | 4.46 | 6.98 | 2.34 | 1.53 | 4.91 | 6.88 | 2.34 | 3.80 |
| 7 + days | 1.54 | 2.01 | 0.46 | 0.37 | 1.53 | 1.47 | 0.37 | 1.20 | 1.85 | 2.12 | 0.71 | 3.15 | 2.42 | 2.51 | 0.59 | 0.58 | 1.58 | 1.67 | 0.80 | 1.57 |

Notes: Percentages are based on weighting to the total population for all services and weighted for the total population for each branch. M = male, F = Female.

## Appendix C. Structural Equation Model Tables

Table C1.
SEM Coefficients: Proportion of Drinking Days (PDD) and Deployability

| Variable | Estimate | S.E. | P Value |
|---|---|---|---|
| Covariates | | | |
| Branch | -0.009 | 0.001 | <.01 |
| Rank | 0.039 | 0.004 | <.01 |
| Gender | -0.066 | 0.004 | <.01 |
| Peer Drinking | 0.099 | 0.003 | <.01 |
| Alc. Disc. | -0.010 | 0.002 | <.01 |
| Mediator Effect of PDD - BMI - Deployment | | | |
| IND Effect | -0.030 | 0.007 | <.01 |
| Dir. Effect | 0.422 | 0.058 | <.01 |
| Moderators BMI - Deployment | | | |
| FA | 0.245 | 0.013 | <.01 |

Notes: SEM = structural equation model; S.E. = standard error; Alc. Disc. = Alcohol Discouragement; PDD = Proportion of Drinking Days; IND = Indirect; Dir. = Direct effect; FA = Activity factor which includes healthy people goals by vigorous cardiovascular, moderate cardiovascular and strength training; BMI = body mass index.

Table C2.
SEM: Proportion of Heavy Drinking Days (PHDD) and Deployability

| Variable | Estimate | S.E. | P Value |
|---|---|---|---|
| Covariates | | | |
| Branch | -0.004 | 0.000 | <.01 |
| Gender | -0.033 | 0.002 | <.01 |
| Marital status | 0.008 | 0.001 | <.01 |
| Peer Drinking | 0.006 | 0.001 | <.01 |
| Service Commit. | 0.310 | 0.006 | <.01 |
| Mediator Effect of PHDD - BMI - Deployment | | | |
| IND Effect | -1.722 | 0.405 | <.01 |
| Dir. Effect | 13.713 | 1.285 | <.01 |
| Moderators BMI - Deployment | | | |
| FA | 0.351 | 0.034 | <.01 |

Notes: SEM = structural equation model; S.E. = standard error; Alc. Disc. = Alcohol Discouragement; PHDD = Proportional Number of Heavy Drinking Days; IND = Indirect; Dir. = Direct effect; FA = Activity factor which includes healthy people goals by vigorous cardiovascular, moderate cardiovascular and strength training; BMI = body mass index.

Table C3.
SEM: Proportion of Drinking Days (PDD) and Fitness Test

| Variable | Estimate | S.E. | P Value |
|---|---|---|---|
| Covariates | | | |
| Branch | -0.009 | 0.001 | <.01 |
| Rank | 0..037 | 0.004 | <.01 |
| Gender | -0.061 | 0.004 | <.01 |
| Peer Drinking | 0.099 | 0.003 | <.01 |
| Alc. discouragement | -0.010 | 0.002 | <.01 |
| Mediator Effect of PDD - BMI – Fitness Test | | | |
| IND Effect | -0.030 | 0.007 | <.01 |
| Dir. Effect | 0.422 | 0.058 | <.01 |

Notes: SEM = structural equation model; S.E. = standard error; Alc. Disc. = Alcohol Discouragement; PDD = Proportion of Drinking Days; IND = Indirect; Dir. = Direct effect; BMI = body mass index.

Table C4.
SEM: Drinks per Drinking Days (DDD) and Fitness Test

| Variable | Estimate | S.E. | P Value |
|---|---|---|---|
| Covariates | | | |
| Branch | -0.710 | 0.080 | <.01 |
| Rank | -1.610 | 0.245 | <.01 |
| Gender | -5.540 | 0.440 | <.01 |
| Marital status | 1.900 | 0.240 | <.01 |
| Peer Drinking | 1.360 | 0.174 | <.01 |
| Alc. discouragement | 3.940 | 0.090 | <.01 |
| Mediator Effect DDD - BMI - Fitness Test | | | |
| IND Effect | -0.202 | 0.022 | <.01 |
| Dir. Effect | 0.004 | 0.007 | 0.57 |
| Moderators DDD to BMI | | | |
| Healthy food | 0.008 | 0.002 | <.01 |
| Less Healthy food | -0.020 | 0.002 | <.01 |

Notes: SEM = structural equation model; S.E. = standard error; Alc. Disc. = Alcohol Discouragement; DDD = Drinks per Drinking Day; IND = Indirect; Dir. = Direct effect; BMI = body mass index.

Table C5.
SEM: Drinks per Drinking Day (DDD) and Medical Readiness Score

| Variable | Estimate | S.E. | P Value |
|---|---|---|---|
| Covariates | | | |
| Branch | -0.100 | 0.024 | <.01 |
| Rank | -1.263 | 0.117 | <.01 |
| Gender | -0.852 | 0.061 | <.01 |
| Marital Status | -0.489 | 0.059 | <.01 |
| Peer Drinking | 0.937 | 0.045 | <.01 |
| Alc. Discouragement | -0.112 | 0.023 | <.01 |
| Mediator Effect of DDD - BMI – Medical Readiness Score | | | |
| IND Effect | -0.003 | 0.000 | <.01 |
| Dir. Effect | 0.008 | 0.002 | <.01 |

Notes: SEM = structural equation model; S.E. = standard error; Alc. Disc. = Alcohol Discouragement; DDD = Drinks per Drinking Day; IND = Indirect; Dir. = Direct effect; BMI = body mass index.

Table C6.
SEM: Proportion of Heavy Drinking Days (PHDD) and Medical Readiness Score

| Variable | Estimate | S.E. | P Value |
|---|---|---|---|
| Covariates | | | |
| Branch | -0.040 | 0.005 | <.01 |
| Rank | -0.024 | 0.011 | 0.02 |
| Gender | -0.288 | 0.030 | <.01 |
| Marital Status | 0.141 | 0.018 | <.01 |
| Peer Drinking | 0.040 | 0.008 | <.01 |
| Service Commit. | 0.027 | 0.005 | <.01 |
| Mediator Effect of PHDD - BMI – Medical Readiness Score | | | |
| IND Effect | -5.620 | 0.580 | <.01 |
| Dir. Effect | 0.004 | 0.002 | 0.08 |
| Moderators DDD to BMI | | | |
| Healthy Food | 0.009 | 0.002 | <.01 |
| Less Healthy Food | -0.018 | 0.002 | <.01 |
| Moderators BMI – Medical Readiness Score | | | |
| FA | 0.157 | 0.018 | <.01 |

Notes: SEM = structural equation model; S.E. = standard error; Alc. Disc. = Alcohol Discouragement; PHDD = Proportional Number of Heavy Drinking Days; IND = Indirect; Dir. = Direct effect; BMI = body mass index; FA = Activity factor which includes healthy people goals by vigorous cardiovascular, moderate cardiovascular and strength training.

Table C7.
SEM: Proportional of Drinking Days (PDD) and Medical Readiness Score

| Variable | Estimate | S.E. | P Value |
|---|---|---|---|
| Covariates | | | |
| Branch | -0.035 | 0.003 | <.01 |
| Rank | 0.036 | 0.008 | <.01 |
| Gender | -0.246 | 0.011 | <.01 |
| Marital Status | 0.115 | 0.009 | <.01 |
| Peer Drinking | 0.100 | 0.007 | <.01 |
| Service Commit. | 0.028 | 0.006 | <.01 |
| Mediator Effect of PDD - BMI – Medical Readiness Score | | | |
| IND Effect | -1.349 | 0.075 | <.01 |
| Moderators PDD to BMI | | | |
| Less Healthy Food | -0.010 | 0.001 | <.01 |
| Moderators BMI – Medical Readiness Score | | | |
| FA | 0.169 | 0.017 | <.01 |

Notes: SEM = structural equation model; S.E. = standard error; Alc. Disc. = Alcohol Discouragement; PNDD = Proportional Number of Drinking Days; IND = Indirect; Dir. = Direct effect; BMI = body mass index; FA = Activity factor which includes healthy people goals by vigorous cardiovascular, moderate cardiovascular and strength training.