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Overweight in the Military: Causes and Effects

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Introduction

Diet is a word that most people have encountered before, probably relatively often. The word "diet" is plastered over all kinds of magazines, articles, websites, television and other advertisements and they are all saying something different. Merriam-Webster's dictionary defines diet in two main ways: 1. "a habitual nourishment" and 2. "a regimen of eating and drinking sparingly so as to reduce one's weight ("Diet")." The second definition is what is usually referred to in these media - temporary changes in food intake usually motivated by a desire to look more attractive - as opposed to the first definition, which is more permanent and more significant. The excess of available information (not all of which is credible) focuses on quick, temporary fixes and can be confusing and/or frustrating for the public.

Diet or habitual nourishment is important because it is directly related to health. Poor diet and overweight (along with the comorbidities associated with them) are chronic diseases plaguing the United States. These issues of poor diet and overconsumption can begin even before a baby is born, occurring as early as gestation because the fetus is fed through the placenta in utero and thus negatively affected by the poor diet of the mother (Picone). These dietary issues continue into infancy, when the dietary patterns are first being formed: some infant formulas are 10.3% sucrose (soda is 10.5% sucrose) (Lustig).

There are multiple ways to distinguish populations other than by age, such as by socioeconomic status, geographic location, or ethnic/racial background. One particularly unique group is the United States armed forces population, and they are by no means immune to the effects of poor health. The military community is unfortunately often overlooked when

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representations of the population are constructed. The military is such an influential population that should be considered, particularly in regards to health because if the military becomes incapable of completing its responsibilities then the entire country could be in danger.

There has been a decline in the diet and lifestyle-related health of Americans, affecting both the civilian and military populations. This paper will investigate the rates, etiology, and effects of overweight in the military, in addition to offering possible solutions. However, before looking into the military directly, one must consider the general population as a whole.

The General Population and Overweight

One in two American adults has a BMI of twenty-five or above, meaning that they are either overweight or obese (Must et al 1523). Body Mass Index is a ratio of height to weight; it can be calculated by weight in kilograms divided by the square of height in meters. These numbers are then categorized as follows: under 18.5 is underweight, 18.5 to 25 is normal, twenty-five to thirty is overweight and anything above thirty qualifies as obese ("Body Mass Index"). The number of people who are either obese or overweight has been increasing over the past three decades by 25% (Must et al 1523). On average, Americans are approximately 25 pounds heavier than they were thirty years ago (Lustig). These rising numbers of overweight people are seen in every age group: infants, children, teenagers, young adults and the elderly (Dietary Guidelines for Americans 9).

The etiology of obesity is a very complex, multi-factorial issue. In short, obesity and overweight are caused by an imbalance of energy. Positive energy balance occurs when more energy is consumed (measured in Calories) than is expended. This positive energy balance results in weight gain and increased Body Mass Index (BMI). As people consume more Calories

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and fail to expend that energy, they gain weight, and if this continues, people progress into overweight category (BMI above 25.0) followed by obesity (BMI above 30.0) ("What Causes Overweight and Obesity?"). Daily energy intake has been increasing in all age groups compared to the preceding decade: for example, teen males have been consuming almost 300 more Calories; teen females have been consuming approximately 230 more Calories; adult males have been consuming almost 200 more Calories; and adult females consuming over 300 additional Calories according to the 2008 National Health and Nutrition Examination Survey (NHANES)* (Lustig).

Environment and Obesity

The environment plays a major role in obesity; there are many obstacles in a person's environment that contribute to weight gain. Our environment has increased the difficulty of eating healthfully in two major ways: food availability and portion size (Hill 1371). Countless opportunities for consumption of high-Calorie, inexpensive foods have emerged as the United States population has increased in weight. Going out to eat occurs commonly in American culture, and studies have shown that those who frequently eat out are at higher risk for weight gain (Dietary Guidelines for Americans 9). In addition to that, food portions are getting larger to satisfy the prevalent ideal of getting the best dollar value for food. Large portions are common in restaurants, but the greatest danger for obesity is evident within the fast food industry: value meals, dollar menus, and the "super-size" option all are particularly devastating. These options push people to eat more low-nutrient and high-fat foods simply because they cost less, are familiar, and are readily available (Hill 1371).

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The challenge of finding healthy choices is by no means exclusive to dining out. Even in grocery stores there are obstacles; Calories in all major sections of grocery stores have increased since 1970, with the greatest increases found in the areas of fat, refined grains, dairy products, and sweeteners (Dietary Guidelines for Americans 9). The choices for minimally processed, healthful, nutrient-dense foods are also often limited.

Discussion of Macronutrients: Carbohydrates

What is being consumed and in what amounts affects the metabolism and weight of an individual. According to a 2010 national survey, the average daily caloric intake of an American man is approximately 2640 Calories and the average daily caloric intake of an American woman is approximately 1785 Calories (Dietary Guidelines for Americans 11). There is reason to believe that the average may have continued to increase (Dietary Guidelines for Americans 11). Energy needs for weight maintenance are dependent upon an individual's gender, activity level, height, weight and age. They are currently estimated at between 2000-3000 Calories for men and 1600-2400 Calories for women (Dietary Guidelines for Americans 11). Food is not as simple as the amount of Calories; there are also nutrients to be considered. The three macronutrients are carbohydrates, protein, and fat. The current dietary guidelines suggest that the average American should consume forty-five to sixty-five percent of Calories from carbohydrates, ten to thirty-five percent of Calories from protein, and thirty to forty percent of Calories from fat (Dietary Guidelines for Americans 15).

Carbohydrates are the main source of energy for the body; they break down into glucose, which is needed by each cell in the body, especially the brain (Denniston et al. 548). Each gram

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of carbohydrate contains four Calories (Dietary Guidelines for Americans 14). Carbohydrates are present in the diet in a myriad of forms and occur naturally in grains, fruits, vegetables, nuts, seeds, legumes, and some dairy products. However, Americans recently have been consuming excessive amounts of refined grains, which lack fiber (indigestible carbohydrates) and have a negative effect on blood glucose, weight, and insulin sensitivity (Dietary Guidelines for Americans 14). People should be consuming more whole grains in order to provide the body with diverse nutrients as well as fiber (Eaton 47). Fiber acts to maintain the health of the gastrointestinal tract in addition being a component of foods that provide glucose that all of our cells need to survive and function (Eaton 47). Before the advent of processed foods, the average adult consumed approximately one hundred grams of fiber daily; now that number has dropped to twelve grams due to the increased consumption of refined grains and sugars (Lustig). These refined grains are broken down into sugar and, despite providing the preferred energy source (glucose), they do not give the body any of the vitamins, minerals, fiber, or protein it needs (Eaton 46).

When grains are refined, the germ and the bran are removed, leaving only the endosperm as a source of carbohydrates ("Choose My Plate"). However, this effectively reduces the amount of nutritional value in the food product (Eaton 44). For example a cup of white rice contains less protein and about half the amount of fiber as a cup of brown rice ("Calorie King"). Fiber increases satiety, reduces the insulin response, and cleanses the colon (Lustig). Fiber has also been shown to be negatively associated with the occurrence of cardiovascular disease and diverticular disease. (Eaton 83).

American consumption of sugars has skyrocketed, accounting for much of the increase in Calorie intake. It is estimated that the average American currently consumes 156 pounds of table

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sugar (cane sugar and beet sugar) annually (Casey). Table sugar (sucrose) is a disaccharide made up of two monosaccharides bound together: glucose and fructose (Eaton 45). The sugar is largely consumed through soft drinks, fruit juices and fruit-flavored drinks; such consumption has increased by forty one percent and thirty-five percent respectively in the past two to three decades (Lustig). One twelve-ounce can of soda contains 66 grams of sucrose and 150 Calories, and if consumed on a daily basis, is enough Calories to cause a person to gain over fifteen and a half pounds over the course of a year (Webb).

Additionally, as time has gone on, the sizes of these sugary beverages have become larger. A twenty-ounce bottle is now standard size for Coca-Cola. Although the label states that this bottle is two and a half servings, it is normally consumed in a single sitting. If the excess Calories provided from this amount of sugar is consumed on a daily basis, it would cause a person to gain twenty-six pounds over the course of a year (Lustig). "Each additional sugar – sweetened beverage (SSB) will cause a BMI increase of .24 over the course of nineteen months if consumed in large enough quantities" (Lustig). Experts in California suspected these sugary beverages as the culprits for the increased obesity observed in school children (Lustig). After select schools proactively removed SSBs from school vending machines, obesity rates in those schools stayed constant while obesity rates increased in the schools that still offered SSBs (Lustig). Many of these sports drinks, sodas, and juice drinks also contain salt, a substance that stimulates thirst and, in turn, increases the amount that people consume (Lustig).

The issue with sugar does not end with the fact that it is a source of empty Calories. Both sucrose and high fructose corn syrup have something in common: fructose. Fructose has a negative effect on leptin, the satiety hormone (Shapiro et al.). Excessively high leptin levels are associated with leptin resistance, and excess fructose consumption leads to increased leptin

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production (Shapiro et al.). While overconsumption typically causes a person to feel full, when people who consume too much fructose may not feel full and can continue to consume more (Shapiro et al.). Fructose also does not suppress grehlin, the hunger hormone, so it is difficult for people to realize how much they have already consumed (Shapiro et al). Fructose is not always bad since it is the same sugar found in fruits, but the quantity consumed is the issue. If consuming fructose only in the form of fruits and vegetables, one would consume approximately fifteen grams, but as of 2009, Americans have typically consumed approximately 73 grams of fructose (or twelve percent of their total daily Calories). This increase is due to where the fructose originates. Instead of fruits, which provide fructose in addition to water, fiber, and vitamins, the fructose is coming from consumption of SSBs, fruit drinks and juices, desserts and other processed foods which contain more fructose and lack the fiber and vitamins (Lustig). However, in these extremely high amounts, this sweet tasting monosaccharide has toxic properties that cause many of the same long-term ailments that alcohol causes (Gersch et al.). Similar to alcohol, fructose is only metabolized in the liver and has many of the same chronic exposure effects: obesity, malnutrition, hypertension, cardiomyopathy, cardiac dilation, and dyslipidemia, although it has no acute effects on the body (Krilanovich). The dyslipidemia occurs because thirty percent of the Calories consumed from fructose are ultimately converted and stored as fat, which causes increased triglyceride, free fatty acid, and inflammation levels (Gersch et al). Chronic fructose exposure may also lead to kidney disease through its effect on hypertension, insulin resistance and hyperurcemia (Gersch et al). These affected metabolic processes also may lead to myocardial infarction, pancreatitis, steatohepatitis and metabolic syndrome, many of which are also consequences of chronic alcohol overconsumption (Shapiro et al.).

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Excess fructose consumption leads to excess dietary carbohydrates, which can contribute to cardiac disease as well as obesity. Carbohydrates increase the amount of pattern b Low Density Lipoprotein (LDL), which is the carrier of cholesterol that gets underneath endothelial cells in the blood vessels, initiates plaque formation, and contributes to cardiovascular disease (Lustig). Sugar can chemically bind to protein (protein glycation), causing cross-linking (Lustig). Cross-linking is the attachment of two polymers (sugar to protein) joining through primary chemical bonds that result in compounds that are very stable such as plaque ("Cross-linking").This plaque buildup can also contribute to atherosclerosis or hardening of the arteries (Lustig). There are multiple health issues including obesity that data show to be associated with excessive sugar consumption and because of this the 2015 Dietary Guidelines for Americans will be encouraging people to limit their intake (Thompson). However, obesity and overweight is not linked solely with the consumption of carbohydrates; the other macronutrients contribute as well.

Discussion of Macronutrients: Protein

The macronutrient that is typically not considered to contribute to obesity is protein; however, exceptions exist. Proteins are used primarily for building tissue, as they are digested and broken into subunits, amino acids, which are required to produce many necessary structures in the body; proteins are the sole providers of the elements sulfur and nitrogen (Denniston et al. 618). However, protein does add Calories to the diet, providing four Calories per gram (Denniston et al. 778). Protein, if eaten to excess without an adequate amount of exercise expended, will be converted to glucose through a process known as gluconeogenesis, and excess sugar will be stored as fat (Denniston et al. 778). However, protein can be consumed up to double the recommended daily allowance to prevent muscle wasting, provided there is adequate energy expenditure (Pasaikos et al 2013). The final macronutrient to be discussed is fat.

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Discussion of Macronutrients: Fat

Fat is the most energy dense macronutrient, yielding nine Calories per gram, more than twice the amount of both carbohydrates and protein (Dietary Guidelines for Americans 15). Fat is necessary in the diet to assist with the absorption of fat soluble vitamins A, D, E, and K, in addition to providing energy (Dietary Guidelines for Americans 24). High-fat diets are associated with weight gain, particularly when paired with a low amount of activity (Hill 1371). Those people whose intakes exceed the amount of fat recommended (thirty-five percent of Calories) typically experience an increase in body fat and body weight (Hill 1371). Additionally, as fats contain more than twice as much energy as other macronutrients, an increased consumption of fats will be accompanied by a significant increase in Calories (Hill 1372). Although it is not always recommended to adopt low fat diets, some studies show that moderate fat diets can be more effective because the fat helps with satiety (Sacks et al). A reduction in dietary fat consumption has not been shown to be effective in the reversal of obesity, but it has been effective in preventing excess weight gain and may help to prevent obesity from developing (Hill 1372).

Fat is made up a few distinct types of fatty acids: poly-unsaturated fatty acids, mono-unsaturated fatty acids, saturated fatty acids, and trans-fatty acids (Dietary Guidelines for Americans 25). Polyunsaturated fatty acids are hydrocarbon chains with more than one double bond (“Polyunsaturated Fatty acid”). Studies show that sufficient physical activity counteracts the negative effects of higher fat diet because energy balance is determined by both activity level and dietary intake level (Hill 1373)

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There are multiple types of fat, categorized by the amount of double bonds in the hydrocarbon chains (Calder S14). Saturated fats have no double bonds, monounsaturated fats have one double bond, and polyunsaturated fats have more than one (Calder S14). The Western diet is high in fat, particularly saturated fatty acids (Calder S14). The polyunsaturated fatty acids are linoleic acid (omega-6) and linolenic acid (omega-3); linoleic acid is the most prominent in most people's diet (Calder S15). Linoleic acid is found in sunflower, safflower, soybean, and corn oils (Calder S14). Both linolenic acid and linoleic acid feed into the same biochemical pathway and, therefore, compete against each other for the enzymes necessary for their metabolism (Calder S15). When linoleic acid is metabolized, it is converted into arachidonic acid, an eicosanoid precursor, both of which are involved in modulating intensity and the duration of inflammatory response (Calder S16). The conversion of Omega-6 fatty acids into a usable form is slow and results in the production of prostaglandins, thromboxanes, leukotrienes, hydroxy fatty acids, and lipoxins (Simopoulos 677). These pro-inflamatory cytokines are molecules that stimulate inflammation throughout the body (Simopoulos 677). Omega-3 fatty acids are often highly regarded for their anti-inflammatory effects that oppose the pro-inflammatory aspects of linoleic acid, a fatty acid that is more prevalent in the typical Western diet (Calder S18). According to the U.S Department of Health, Americans are currently consuming linoleic acid and linolenic acid at a ten to one ratio as opposed to the one to one ratio of primitive man (Eaton 83).

Obesity is characterized by a chronic inflammation that can be caused by the imbalance of linoleic acid and linolenic acid; however, that is not the sole cause of inflammation throughout the body. Although this research is still in early stages, recent evidence suggests that the microbiota within the digestive tract may affect inflammation and promote obesity (Caesar 320).

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Some of the theories for the mechanism through which pathogenic microbiota may promote obesity include the following: increased glucose absorption, increased short-chain fatty acid generation for the gut lumen, increased hepatic lipogenesis, decreased fatty acid oxidation and increased deposition of triglycerides, although none are completely proven so far (Caesar et al. 320). Lipopolysaccharides are the main component of the outer membrane of gram-negative bacteria; lipopolysaccharides are also associated with increased adipose macrophage infiltration and insulin resistance (Caesar et al. 321). Additionally, increased lipopolysaccharides are associated with up–regulation of pro-inflammatory cytokines such as tumor necrosis factor alpha and interleukin-6 in the adipose tissue of obese and overweight individuals (Caesar et al. 323). This inflammation and increased macrophage accumulation can lead to the development of foam cells, one of the precursors to cardiovascular disease (Caesar et al 323). Once scientists recognized that microbiota modulate obesity, they also asked whether microbiota could be manipulated for beneficial effects (Caesar et al. 324). Lactobacilli have been shown to reduce serum cholesterol in some people (Caesar et al. 324). Lactobacillus Rhamonosus GG had a significant effect on increased body weight in early infancy when administered perinatally (Caesar et al. 324). Lactobacillus Gasseri was found to reduce adiposity and body weight in obese adults; it is thought that it may also reduce lipid absorption and inflammatory status (Caesar et al. 325). Improvement in the balance between pathogenic and commensal (good) bacteria in the gastrointestinal tract can occur through the consumption of more dietary fiber and fermented foods. These are more common in traditional diets, not the Western Diet, which includes many processed foods. The Western diet is less deleterious when exercise is engaged in with sufficient intensity and duration, but that is not always the case.

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Sedentarism and Sedentary Lifestyle

Obesity is related to the nutrients and microbes that are consumed, but also how the body moves. It is not enough to simply evaluate all that is ingested; physical activity is also an important factor. Sedentarism is defined as the excess of sitting time (Hart et al 1). Many children sit for long periods watching TV and playing computer games, while adults sit for prolonged periods at their jobs or in front of the TV. Sedentarism is one of the major problems negatively affecting Americans through its effect on mortality, cardiovascular disease, type 2 diabetes, metabolic syndrome risk factors, and obesity (Hart et al 1). Sedentarism alters metabolism leading to increases of triglycerides, and decreases in insulin sensitivity and HDL in the blood (Tremblay 730). This seems to be due in part to decreased lipoprotein lipase activity, the enzyme that collects free fatty acids from the blood and transports them to adipose tissue (Tremblay 730). Sedentary lifestyle is a related but distinctly different issue than sedentarism, it simply means a lack of sufficient exercise (Rimmer). Both sedentarism and sedentary lifestyle are compounded by poor diet, promoting the "development and progression of cardiometabolic diseases by promoting dyslipidemia, elevated blood glucose and overweight" (Pasiakos et al 1). Work schedules, limited access to healthy food, food advertising, larger food portions, lack of exercise space and technological advancements are detrimental to healthy weight maintenance (NHLBI). Technology continually improves, leaving people with less need for physical activity, and more distractions that entice them towards a more sedentary lifestyle (NHLBI). It is commonplace for someone to spend excessive amounts of time daily watching television and/or using the computer; over two hours daily has been linked to overweight and obesity (NHLBI).

More than thirty-three percent of people in the United States exhibit multiple risk factors for obesity and its co-morbidities even before beginning college (Pasiakos 1). Negative feeding

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behaviors and limited activity can stem back as early as infancy (Pasiakos 6). This progression of risk for cardiometabolic disease is then compounded throughout childhood, teenage years, and well into adulthood (Pasiakos 6). Therefore, American people need to be more diligent at ensuring that their children develop healthy eating habits in order to address this problem and establish healthy lipid profiles. It is necessary to encourage consumption of healthier foods as opposed to energy-dense, low nutrient foods because these habits can be difficult to break away from as children grow into adulthood (Hill 1373). A very effective way of encouraging these healthy habits is for parents to model them by eating healthfully themselves (Hill 1373). The amount of food consumed must also be considered. It is not uncommon for parents to pressure children to eat everything given to them; this trains children to ignore the feeling of satiety and continue eating, a behavior that can also cause dietary and health issues later on in life (Hill 1373).The Institute of Medicine recommends that children should be limited to under 2 hours of television time per day and should be encouraged to exercise (Institute of Medicine). The importance of exercise cannot be overstated, but there are multiple other contributions to obesity.

Other Obesity-related Factors

Lack of sleep can also have a significant effect on one's health and weight. "Sleep helps to protect health and quality of life" (NHLBI). Ongoing sleep deprivation has been linked with obesity as well as heart disease, hypertension, diabetes, and stroke (NHLBI). Sleep has been found to help with the repairing/healing of blood vessels—the way sleep combats the cardiometabolic diseases mentioned (NHLBI). Sleep also contributes in regulating the balance between grehlin, which is known as the "hunger hormone" and leptin, which helps one to feel

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satiated (which is how it helps to prevent obesity) (NHLBI). Sleep also affects how the body processes insulin, which will affect the amount of energy one's cells are able to use from the blood sugar of the individual (NHLBI). There are many mechanisms by which sleep can affect one's health and yet between seven and nineteen percent of adults in the United States do not get enough sleep on a daily basis (NHLBI).

Another factor that cannot be ignored is the emotional state of a person, many people may eat due to stress, sadness or even boredom. The habit of emotional eating can lead to weight gain and cause health problems, particularly in cases of chronic emotional distress. In fact it has been discovered that those who have experienced emotional or sexual trauma during childhood are more likely to develop disordered eating habits and to become obese (Fuemeller et al). Support groups such as Overeaters Anonymous have come about in order to help provide the necessary emotional support (OA Program).

Obesity is labeled as multi-factorial because it is related to diet, activity, living environment, emotional status, financial constraints, sleep habits as well as genetic components. This latter influence, genetics, is by no means simple; it is actually so complex that the exact mechanism is not completely understood. Some experts believe that there is a strong genetic component to obesity. Comuzzie states: "Between forty percent and seventy percent of variation in obesity – related phenotypes including body mass index, skinfold thickness, fat mass and leptin are all inheritable" (Comuzzie 1374). It seems that certain ethnic groups may be more susceptible to obesity (Comuzzie 1374). Other experts would argue that although there seems to be a genetic component, genetics do not fully explain the dramatic rise in obesity seen over the last several decades. This problem has grown increasingly complex and severe, spilling over into the military community.

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Overweight and the Military

As earlier demonstrated, overweight and obesity are widespread in the U.S. population. Groups that value a higher level of physical fitness are particularly concerned about the obesity epidemic. One such group is the U.S. Military. Military personnel are a very distinct group, and there are multiple differences between that population and the average civilian population. However, the population of America as a whole affects the American military population. In addition there are also many similarities between the two populations. For instance, the same modifiable risk factors that plague the American population as a whole also affect the US military population: smoking, sedentary lifestyle, and poor dietary habits (Pasiakos et al. 1). It has been shown that progressive conditions influenced by modifiable risk factors, such as dyslipidemia, elevated blood glucose, and overweight/obesity often begin as early as adolescence (Pasiakos et al. 1). There may be as many as thirty-three percent of students entering college who already exhibit at least one risk factor for cardiometabolic disease; these groups are compared because college students are the same age group as the majority of military recruits (Pasiakos et al 1). These findings of these cardiometabolic risk factors in this age group have added to the recent concern of health and diet in children and young adults (Pasiakos et al 1).

Military service members are often assumed to be healthy because of the unique requirements of this career: the military has a specific level of body composition, physical fitness, and medical standards that must be maintained (Pasiakos et al 1). Although this is true upon entrance to the service, this is not always the case afterwards, as the Body Composition Assessments (BCAs) are only held two times annually and soldiers are informed ahead of time (Gleason 2014). This enables military service members to be overweight for the majority of the year and to lose weight for their weigh-ins twice every year. Studies show that the amount of

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military personnel with a Body Mass Index above twenty-five kilograms per meter squared (overweight) is sixty-two percent (approximately two thirds), although because BMI is simply a weight to height ratio this number will include those that are very muscular in the overweight or obese category (Pasiakos et al. 1). The prevalence of dyslipidemia and smoking were both found to be thirty percent (Pasiakos et al. 1). This "evidence suggests that biomarkers and health risk behaviors associated with cardiometabolic disease is similar" between the American civilian and military populations (Pasiakos et al. 1). This similarity is especially evident in the similar size of the smoking population: twenty- seven percent in the American military population and twenty-nine percent in the American civilian population (Pasiakos et al. 5). However, the distinct difference can be seen by comparing the obesity incidence between these two populations: where the civilian American population has an estimated thirty-four percent obesity rate, the American military has an obesity rate of approximately fourteen percent (Pasiakos et al. 5).

Upon entry to the military, one is required to go through army basic combat training or a similar training program. Basic combat training is an "integrated ten week physical and didactic military training program" (Pasiakos et al 2). It provides an opportunity for soldiers to develop a healthier lifestyle, mitigating some of these controllable risk factors (Pasiakos et al 1). Soldiers are forced to abstain from the consumption of alcohol and the smoking of cigarettes (Pasiakos et al 2). Soldiers are provided with healthier food options at military dining facilities that consists of a choice of one entrée, one starch, and a vegetable from a daily cycle, designed based on the Military Dietary Reference Intake ("Military Dietary Reference Intake"), which will be discussed later (Pasiakos et al 2). There is also a mandatory standardized physical training program that soldiers participate in that includes distance running, sprinting, marching with weighted loads, obstacle courses and muscular strength and endurance exercises (Pasiakos et al. 2).

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In 2012, Pasiakos et al. conducted a study in which the recruits' risk factors for cardiometabolic disease were evaluated prior to and after basic combat training and subsequently compared with their civilian counterparts of college-aged students. Initially, this study investigated the diets, revealing that male and female recruits had a similar macronutrient distribution prior to basic combat training: forty–eight percent of their Calories were consumed from carbohydrates, approximately sixteen percent of Calories were from protein, and approximately thirty-five percent of Calories were from fat (Pasiakos et al 3). The only significant difference in macronutrient distribution after basic combat training was that females decreased their intake of fat from approximately thirty-five percent to approximately thirty-two percent. Nearly thirty-three percent of recruits reported smoking and/or engaging in less than twenty minutes of physical exercise daily (Pasiakos et al. 3). Another thirty-three percent reported having a family history of cardiometabolic disease; less than half of the recruits were not meeting the recommendations for total fat, fiber, saturated fat, fruit and vegetable intakes (Pasiakos et al 3). In the penultimate week of basic training, recruits were reevaluated and "energy obtained from saturated fat decreased, while fiber, fruit and vegetable intake increased during basic combat training" (Pasiakos et al 3). The prevalence of obesity also decreased, along with the prevalence of high triglycerides, high blood glucose levels, and high Low Density Lipoprotein levels as well (Pasiakos et al 3). This shows that basic combat training yielded improved lipid profiles, enhanced glycemic regulation, and produced improvements in body composition (Pasiakos et al 5).

Healthy people 2010 is an American national health promotion initiative released in 2000. One of the goals of this program was to get sixty percent of the population within a healthy weight range (between a BMI of eighteen and a half and twenty-five kilograms per meter

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squared by 2010 (Smith et al. 1534). Based on national surveys, four years later, the American population is far from achieving it. However, these studies that have been done for the civilian population do not represent the military population, and there are some distinct differences (Smith et al. 1534).

Based on the Department of Defense's Health-Related Behaviors among the Military Personnel (HRBS), the military population's prevalence of overweight and obesity has been growing along with the American civilian population: in 1995 there was a fifty-four percent combined prevalence of military overweight and obesity, a number that rose to fifty-nine percent after three years (Smith et al 1534). Between 1998 and 2002, it dropped back to fifty-seven percent, but the most recent data from this study suggests that the combined prevalence of overweight and obesity in the military is now approximately sixty percent (Smith et al. 1535). This means that only approximately forty percent of the American military population reached the Healthy People 2010 goal of a healthy weight, but this is still significantly higher than the approximately thirty-three percent of the American civilian population. However, these differences among both the American military and civilian population are not evenly distributed in relation to certain socio-demographic factors (Smith et al. 1534).

Certain ethnic and racial populations are disproportionately affected by overweight and obesity. Age and marital status have also been shown to have a significant effect on the prevalence rate of obesity and overweight (Smith et al 1534). It has been shown that those soldiers of African American and Latino descent are more at risk than white soldiers for obesity (Smith et al. 1435). Older age is also considered to increase the risk of obesity in soldiers; this increased risk is assumed to be a result of gradual weight gain over many years (Smith et al. 1535). Sex has been shown to affect the prevalence of obesity: women have a higher obesity

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prevalence in the American civilian population, but amongst the American military population, men have a higher obesity prevalence (Smith et al. 1535). The final risk factor investigated is marital status; being married is considered a risk factor for both overweight and obesity in both American military and civilian populations (Smith et al. 1535). These multiple risk factors and differences among sub- populations are helpful in the investigation of the source of chronic problems such as overweight and obesity, and the increased understanding of these factors can help in the development of programs designed to solve the issue of overweight.

Maintaining nutritional health should be thought of as an essential part of a soldier's job, as poor nutritional status has negative effects on the health and performance of military personnel (Ramsey et al. 1285). These effects can manifest themselves in multiple ways: unintentional weight loss or weight gain, decreased muscle mass, decreased strength, and decreased immune function (Ramsey et al. 1285). There is an athletic component to military service and, in many cases, poor nutrition can hinder performance. Diet has become an area of great interest for its potential to reverse these negative effects, reducing the amount of overweight and obesity and improving performance and health across the board (Ramsey et al. 1285). Although it is now a pertinent concern of the military to address nutrition, the dietary habits of military service personnel are "largely unknown" (Ramsey et al. 1286).

Dietary Variation within the Military

Studies have begun to be conducted on certain groups--such as Navy SEALS, Army Special Forces and Army Rangers--in order to get a better idea of what theses military members are consuming and in what amounts (Ramsey et al. 1286). However, these are the more physically demanding jobs--these military service members have increased Calorie needs due to

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sleep patterns, high stress level, and required protective body armor; their needs differ greatly from a military member with a desk job (Ramsey et al 1286). There are many variables within the military that must be considered: the intake and needs of males versus females, officers versus enlisted personnel, and combat versus noncombat members (Ramsey et al. 1286).

Female American military service members have been identified as having higher intakes of fruit, vegetables, dairy and condiment consumption compared to their male counterparts (Ramsey et al. 1286). Females were below the Military Dietary Intake standards for total Calories, calcium and protein when in the field, whereas male American military service members seem to consume larger amounts of more calorically dense foods including potatoes, legumes, bread, meat and alcohol, and cereal products and were not identified as having inadequate intakes in these areas (Ramsey et al 1286).

Sex was not the only factor that was shown to modulate the diet of the individuals in the American military. Socioeconomic status and weight status both had a significant effect on consumption levels. Those of higher socioeconomic status tended to be older with a higher income and ranking; these factors are associated with larger food budgets and higher education levels, and many of these "higher class" military service members were also married. Weight status is also closely associated with diet because those who are labeled as overweight or who risk failing the Body Composition Assessment will be more cognizant of their eating habits because they are aware of the risks and consequences (Ramsey et al. 1286). Those with a history of enrollment in the military weight loss programs seem to have increased motivation to eat healthy foods. While it is difficult to identify and isolate exactly what variables influence eating behaviors, this goal is essential in designing an improved system to educate and motivate military service members concerning healthier diets (Ramsey et al. 1286). The military is now

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working on offering healthy food options in the military dining facilities based on the Military Dietary Reference Intakes in order to ensure adequate nutrition in field training and in garrison (Ramsey et al. 1289).

Current Standards Used for Military Nutrition

The Institute of Medicine (IOM) develops standards for nutrition, specific to age and gender, in order to ensure that nutrient needs are met. These standards are known as the Dietary Reference Intakes (DRIs) and they are comprised of four aspects: the Estimated Average Requirement (EAR), the Recommended Dietary Allowance (RDA), the Adequate Intake Level (AI) and the Tolerable Upper Intake Level (UL) (Military Dietary Reference Intakes 36). The Estimated Average Requirement is developed to meet dietary needs of fifty percent of the population (Military Dietary Reference Intakes 36). The Recommended Dietary Allowance is more comprehensive, and must meet the dietary needs of at least ninety-seven percent of the healthy population (Military Dietary Reference Intakes 36). It is not always possible to obtain the data necessary to determine the Recommended Dietary Allowance; in this case the Adequate Intake level is approximated, so this value does not have as much strength because research supporting the level is either inadequate or conflicting. Lastly, the Tolerable Upper Intake Level is the highest amount that can be consumed before negative health effects can occur (Military Dietary Reference Intakes 36).

Over ten years ago, it was realized that the military is a quite distinct population and could benefit from separate and specific nutrient standards, as they are typically heavier and more active than the civilian population (Military Dietary Reference Intakes 37). The average military person has different anthropometric standards (height, weight, body fat and lean mass)

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compared to his or her civilian counterparts (Military Dietary Reference Intakes 38). The military went to work on the Military Dietary Reference Intakes (MDRIs) based on the original Dietary Reference Intakes established by the Institute of Medicine (Military Dietary Reference Intakes 37).

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Table 2-1. Military Dietary Reference Intakes (MDRIs) 1 per day			
Nutrient	**Unit**	**Men**	**Women**
Energy [2] General/Routine:	kcal/d	3250	2300
Light activity	kcal/d	3000	2200
Moderate activity	kcal/d	3250	2300
Heavy activity	kcal/d	3950	2700
Exceptionally-heavy activity	kcal/d	4600	3150
Protein [3]	g/d	91 (63-119)	72 (50-93)
Vitamin A [4]	µg RE/d	1000	800
Vitamin D [5]	µg/d	5	5
Vitamin E [6]	mg/d	15	15
Vitamin K	µg/d	80	65
Vitamin C	mg/d	90	75
Thiamin (B_1)	mg/d	1.2	1.1
Riboflavin (B_2)	mg/d	1.3	1.1
Niacin [7]	mg NE/d	16	14
Vitamin B_6	mg/d	1.3	1.3
Folate [8]	µg DFE/d	400	400
Vitamin B_{12}	µg/d	2.4	2.4
Calcium [9]	mg/d	1000	1000
Phosphorus [10]	mg/d	700	700
Magnesium [11]	mg/d	420	320
Iron [12]	mg/d	10	15
Zinc	mg/d	15	12
Sodium [13]	mg/d	5000 (4550-5525)	3600 (3220-3910)
Iodine	µg/d	150	150
Selenium	µg/d	55	55
Fluoride [14]	mg/d	4.0	3.1
Potassium [15]	mg/d	3200	2500

Figure 1 from “Military Dietary Reference Intakes”

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The nutrient levels in the Military Dietary Reference Intakes are similar to the Dietary Reference Intakes, except for some minerals that are significantly different, especially sodium (Military Dietary Reference Intakes). The development of these new standards was a complex process that required nutrition experts as well as "detailed knowledge of military scenarios and factors" (Military Dietary Reference Intakes 37). The factors that must be considered for constructing these guidelines include stressful environment (extreme hot or cold weather), extensive activity levels, and mineral losses from sweat (Military Dietary Reference Intakes 38). The Nutritional Standards for Operational Rations (NSOR) were developed from Military Dietary Reference Intakes and are used to standardize the nutrition of military service members in the field, providing the basis for the "minimal amount of nutrients that can provide adequate nutrition for those doing moderate to intense physical activity" (Military Dietary Reference Intakes 37). The Military Dietary Reference Intakes are prescribed for military service members seventeen to fifty years of age (Military Dietary Reference Intakes 38). The Military Dietary Reference Intakes are used to design menus for garrison feeding situations which include administrative duties to support tasks and training situations, while the Nutritional Standards for Operational Rations are used for service members engaged in military operations (both full Calorie and restricted energy rations) (Military Dietary Reference Intakes 38). There are many areas in which military members overconsume, but there are also multiple deficiencies: reduced intake, impaired intake due to disease or trauma, increased requirements and impaired utilization (Military Dietary Reference Intakes 41). Adequate consumption can ensure that both physical and cognitive abilities remain unimpaired (Military Dietary Reference 41).

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Nutrition-related Initiatives in the Military

The military has begun to make efforts to improve the nutrition of its service members through soldier education programs, improved menus, more healthful preparation, and strategic food line presentation (Steele 46). The primary area of action aimed at improving nutrition is the military dining facility, which is where the menus based on the Military Dietary Reference Intakes, the healthful preparation, and strategic food line presentation take place (Steele 46). While the healthful preparations and improved menus are straightforward, the food line presentation is a "stealth health" strategy (Steele 46). Stealth health is the concept of making foods healthier without diners realizing the slight difference (Steele 46). This concept takes advantage of manipulating hunger, visuals and satisfaction perception by placing the healthier dishes in the front and the unhealthier dishes in the back (Steele 50). The idea is that if the plate is full of healthy food, there is little room left for unhealthy foods (Steele 50). Why not just eliminate the unhealthy foods altogether? People like unhealthier foods and if menus are too restrictive, then the military service members may not return (Steele 50). Military dining facilities must compete with civilian fast food places and restaurants, so customer satisfaction is key while considering nutrition (Steele 50). Despite this competition, approximately 162 million meals were served by dining facilities during the 2013 fiscal year (Steele 50). Military stealth health strategies may include reducing the fat content in hamburger and hot dogs or reducing sodium without informing diners; the introduction of healthier foods can be a challenge, especially when competing with foods from other sources (Steele 47).

Of the numerous challenges, the major ones are money and regulations. Priscilla Dollof-Crane, leader of the menu and nutrition efforts at the Joint Culinary Center of Excellence (JCCoE) in Fort Lee, Virginia states that "money really limits" some of their efforts (Steele 46).

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An expansion in the budget would allow for a healthier selection of food at the military dining facilities and positively contribute to health in the military. Regulation impedes nutrition: "Berry's Amendment" is a legal document stating that Department of Defense must only purchase certain goods including food that have been produced in the United States (Department of Commerce). It forces the military to buy products produced in the United States (Steele 52). Dollof-Crane provides an example of the consequences of this restriction; the military may not serve quinoa, a newly popular healthy grain with the potential to increase the healthy options available to military members because it is not grown domestically in large enough quantities (Steele 52). If this amendment could be amended or overwritten then this would allow for a greater variety for the American military service members. Their health and nutrition should be our first priority because of all they have given in service to our nation and because their health directly affects how well our nation is prepared to defend itself (Cawley 22).

The United States military has been making significant steps forward in providing improved nutrition and health to its service members. A healthy lifestyle is encouraged and recruits are screened upon joining (Cawley 4). There are other resources and programs provided, including access to a dietitian for free, but these provisions should be improved. An interview with a dietitian who works directly with United States Navy Sailors, Marsa Gleason, reveals that more than eighty percent of her patient visits are related to concerns with being overweight (Gleason). Her views are based on approximately two years of experience working in a military health care environment. Despite the healthier food available in the dining facility, the money given to the enlisted sailor is not adequate for him/her to eat at the dining facility three times daily (Gleason 2014). Many of these enlisted sailors are only eighteen years old, just coming out of high school with no cooking or nutrition experience and the military provides them none.

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These young people are forced to maintain a healthy weight but not provided with enough money to afford to eat solely at the military dining facility; additionally, many of them live in quarters with no oven or stove (Gleason 2014). This situation results in poor food choices (fast food), the development of bad dietary habits, and--in some cases--weight gain (Gleason).

The main nutrition program in the military dining facilities is the new Go-for-Green labeling system along with the Soldier Athlete Program. The latter "incorporates physical exercise aspects with diet" to change soldiers attitudes towards health (Steele 52). The Go-for-Green program, implemented in 2009 by the United States Army, is the military version of the new "Front of Package" labeling push from the Food and Drug Administration; it employs a traffic light color coding system using green, amber, and red to communicate the nutritive value of a particular food (Arsenault et al. 1067). Green labels are used for foods that are nutrient-dense or high-performance foods that should be frequently consumed; amber labels mean that the foods are moderate-performance foods; and red labels are the low-performance foods highest in Calories and fat (Arsenault et al. 1068). In a study of approximately 300 soldiers, approximately fifty percent of respondents reported considering the Go-for-Green labeling when making food decisions at the dining facility (Arsenault et al. 1069). These initiatives are beginning to show results, changing the nutrition behaviors of some military members, although there is still much room for improvement.

Current State of Nutrition Behaviors in the Military

There was no difference between the sex, age, race, and ethnicity of Go-for-Green label users and non-users (Arsenault et al. 1069). Label use for desserts seems to be significantly less than label use for entrees (Arsenault et al. 1069). NHANES 2005-2006 revealed that front of

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package label users consumed five grams less of fat daily compared to those who do not use labels, but the Arsenault et al. study revealed a difference of fifteen grams instead of five (Arsenault et al. 1069). NHANES 2009-2010 revealed a mean fat intake of ninety-three grams of fat in men from ages to twenty to twenty-nine years old (Arsenault et al. 1069). Label use is associated with healthier dietary habits and is associated with a higher likelihood of adhering to special diets (Arsenault et al. 1069). The most popular type of special diet among label users was a "low carbohydrate/high protein" diet followed by "low cholesterol/ low fat" diet (Arsenault et al 1069).

The same concern that leads service members to follow a special diet may motivate them to use supplements. More than fifty percent of active duty U.S. Army soldiers regularly use dietary supplements (Pasiakos et al. 1815S). Protein supplements are the second most popular dietary supplements, second only to multivitamins (Pasiakos et al. 1815S). Many soldiers have the physical and/or time constraints that warrant under-eating and make protein supplementation beneficial. In fact, sixty- three percent of "warfighters" reported protein supplementation, although most military occupations are less physically intense (Pasiakos et al. 1815S). United States military members may differ in their reasoning for protein supplement usage.

Why do people use protein supplements? Approximately thirty-three percent of military users surveyed used protein supplements to enhance physical performance, a goal that may be considered the traditional use for protein supplementation (Pasiakos et al. 1816S). Other reasons reported include "promoting general health," or assistance with weight loss (Pasiakos et al. 1816S). Both of these last two reasons have been based on sources that are not credible, which exemplifies the lack of understanding of nutrition among the military service members (Pasiakos et al. 1817S).

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The Need for Nutrition Improvement

The job-related stress in the military may increase the risk of (pre) hypertension and cardiovascular disease (Ray et al 163). With an increase of 20 mm Hg in systolic pressure or 10 mm Hg over 115/75 mm Hg, the mortality rate doubles (Ray et al 163). This increased mortality is accompanied by other medical problems that are directly associated with poor diet and overweight, such as type 2 diabetes, coronary heart disease and gallbladder disease (Must et al 1524). Multiple studies have proven that dietary approaches alone are capable of reducing blood pressure (Ray et al 166). Mortality reduction through diet improvement is one reason that nutrition should be a greater priority to the military.

Between 1959 and 2008, adult male overweight prevalence rates in the United States have increased from approximately forty- seven percent to approximately sixty- eight percent (Cawley 2). As of 2011, there were nearly one and a half million active duty military service members and another million in the reserves. The military has to recruit almost 200,000 new service members annually. It has become increasingly difficult to maintain these numbers due to the overweight/obesity epidemic (Cawley 2). Excessive weight or body fat is currently the most common reason for medical disqualification, accounting for almost twenty- five percent of all rejected applicants (15,000 annually) (Cawley 4). The rampant overweight problem in the United States has been identified as a national security issue and should be treated as such (Cawley 4). Countries such as Singapore have implemented campaigns aimed at reducing obesity prevalence in youth with precisely this motive (Cawley 23). It is time that we do the same; some "retired generals are calling for the removal of high-Calorie, low-nutrient foods from schools" and a complete improvement in the quality of the school lunch program (Cawley 23). One may argue that these sorts of things would be too costly—after all, where would the money come from?

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Overweight and obesity are proposed to be the cause of an estimated 658,000 missed work days annually in addition to 17,000 missed work days' worth of work due to decreased productivity in the military (Cawley 3). The military health insurance, TRICARE, spends $1.1 billion annually on exclusively obesity-related illness (Cawley 3). Even when looking only at the financial aspect, it would be a good investment to increase the budget of dining facilities and expand nutrition programs; "cost-effective school-based intervention programs have been identified" and should be pursued and incorporated into both civilian and military settings in order to improve the health and nutrition status of the service members and the civilian pool that it recruits from (Cawley 22). New members to military service should be provided with some basic nutrition education, enough money to afford to eat healthfully and the opportunity and culinary skills to cook for themselves (more than a microwave oven). These initiatives will pay for themselves in the long run because the "healthier soldiers are, the less money they will cost the military" (Steele 45).

Conclusion

There is much to be done for the general population as well as the military. There are many different factors that contribute to being overweight, and many are out of the control of military influence. However the main factors that are in the control of the military: the amount of access military personnel have to accurate nutrition knowledge, the amount of funds that enlisted soldiers are compensated, and regulations regarding body composition assessment and dining services. These factors must be addressed.

In order to ensure that military members have an increased understanding of and adherence to a healthy diet, nutrition education and perhaps rudimentary, culinary skills training

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could be incorporated into basic training in some form, or an additional basic nutrition program could be incorporated into physical training. This additional program could cover topics such as portion control, recommended macronutrient distribution, and could include a Myplate tutorial (ChooseMyPlate). It is important that people understand how to eat healthily; however, if they lack the means to do so, the knowledge is not useful.

There are two issues of nutrition access: the extremely limited cooking facilities of some military members and the inability to buy healthy foods. Everyone should be allowed to cook and be provided with some way of doing so, such as a stove top, oven, or hot plate The other is the amount that these soldiers are paid, since they are not given enough to eat at the military dining facility three times a day. These two circumstances should not be happening simultaneously. Addressing the issue of nutrition access would increase the availability of healthy foods to service members; greater access could also result in healthier food choices and healthier service members.

The last manner in which the military may help soldiers to become and stay healthy is through regulations. If military service members did not know when Body Composition Assessment was scheduled to take place, they would be forced to be ready for it at all times, thus increasing their motivation to adopt healthy behaviors. While that may be too drastic, increasing the frequency of the body composition should produce similar results. The other regulation that hinders health promotion throughout the military is Berry's Amendment; elimination or revision of this regulation would allow dining facilities more freedom to obtain and provide healthy foods.

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Complex problems require complex solutions. While these ideas are examples of actions that may prove helpful, they will probably not solve the problem immediately. However, progress must start somewhere. These recommendations are an example of ways to move forward. Hopefully soon we will see some improvement in the diets of the military service members, whether they come from these actions or not. That is the ultimate goal: a healthier population, both military and civilian.

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Works Cited

Arsenault, Joanne., M. Singleton, and L. Funderburk."Use of the Go-for-Green Nutrition Labeling System in Military Dining Facilities Is Associated with Lower Fat Intake." *Journal of the Academy of Nutrition and Dietetics* 14.7 (2014): 2067-071. Print.

“Body mass index (BMI)”. (2012). In Mosby's dictionary of medicine, Nursing & Health Professions.

Caesar, R., F. Fåk, and F. Bäckhed. "Effects of Gut Microbiota on Obesity and Atherosclerosis via Modulation of Inflammation and Lipid Metabolism." *Journal of Internal Medicine* (2010): 320-28. Print.

Calder, P C, and R F Grimble. "Polyunsaturated Fatty Acids, Inflammation and Immunity." *European Journal of Clinical Nutrition* (2002): S14-19. Print.

"Calorie King” - Diet and Weight Loss. Calorie Counter and More." Calorie King - Diet and Weight Loss. Calorie Counter and More. Web. 22 Nov. 2014.

Casey, John. "Do You Know How Much Sugar You're Eating?" MedicineNet. WebMD, 3 Jan. 2005. Web. 5 Dec. 2014.

Cawley, John, and Johanna Catherine Maclean. "Unfit For Service: The Implications Of Rising Obesity For Us Military Recruitment." *Health Economics* (2011): 1-28. Print.

Centers for Disease Control and Prevention. Centers for Disease Control and Prevention, 20 Nov. 2014. Web. 5 Dec. 2014.

*NHANES is a government program of studies designed to assess the health and nutritional status of people in the United States (Centers for Disease Control and Prevention)

"ChooseMyPlate." ChooseMyPlate.gov. United States Department of Agriculture. Web. 19 Feb. 2015.

Comuzzie, A. G. "The Search for Human Obesity Genes." *Science* (1998): 1374-377. Print

"Cross-linking." Hawley's Condensed Chemical Dictionary. Hoboken: Wiley, 2007. Credo Reference. Web. 5 December 2014.

Denniston, K. J., and Joseph J. Topping. General, Organic, and Biochemistry. 8th ed. Boston: McGraw-Hill Higher Education, 2013. Print.

"Diet" Merriam-Webster. Merriam-Webster. Web. 19 Feb. 2015.

Dietary Guidelines for Americans, 2010. Washington, D.C.: U.S. Dept. of Health and Human Services, U.S. Dept. of Agriculture, 2010. Print.

Eaton, Mary Anne, and Janet Rouslin. "Carbohydrates." Nutrition: A Culinary Approach With Website. Fourth ed. Kendall Hunt Pub, 2010. 42-62. Print.

Fuemmeler, Bernard F., Eric Dedert, F. Joseph McClernon, and Jean C. Beckham. "Adverse Childhood Events Are Associated With Obesity And Disordered Eating: Results From A U.S. Population-based Survey Of Young Adults." *Journal of Traumatic Stress* 4 (2010): 329-33. Print.

Gersch, M. S., W. Mu, P. Cirillo, S. Reungjui, L. Zhang, C. Roncal, Y. Y. Sautin, R. J. Johnson, and T. Nakagawa. "Fructose, but Not Dextrose, Accelerates the Progression of Chronic Kidney Disease." *AJP: Renal Physiology* (2007): F1256-1261. Print.

Gleason, Marsa RD. Personal Interview. 7 November 2014.

*NHANES is a government program of studies designed to assess the health and nutritional status of people in the United States (Centers for Disease Control and Prevention)

Hart, Teresa L., et al. "Markers Of Sedentarism: The Joint Canada/U.S. Survey Of Health." *Journal Of Physical Activity & Health* 8.3 (2011): 361-371. SPORTDiscus with Full Text. Web. 22 Nov. 2014.

Hill, J. O. "Environmental Contributions to the Obesity Epidemic." *Science* 280 (1998): 1371-374. Print.

"Institute of Medicine - Recommendations." *Institute of Medicine*. National Academy of Sciences, 23 June 2011. Web. 27 Feb. 2015

Krilanovich, Nicholas. "Fructose Misuse, the Obesity Epidemic, the Special Problems of the Child, and a Call to Action." *American Journal of Clinical Nutrition* 80.5 (2004). Print.

Lustig, Robert. "Sugar: The Bitter Truth." University of California: San Francisco. San Francisco, California. 2009.

"Military Dietary Reference Intakes: Process to Establish, Uses, and Delivery Methods." Mineral Requirements for Military Personnel Levels Needed for Cognitive and Physical Performance during Garrison Training. Washington, D.C.: National Academies, 2006. Print.

Must, A et al. "The Disease Burden Associated With Overweight and Obesity." *JAMA: The Journal of the American Medical Association* 282.16 (1999): 1523-529. Print.

"OA Program of Recovery." *Overeaters Anonymous*. Overeaters Anonymous Inc. Web. 27 Feb. 2015.

"Office of Textiles and Apparel." Berry Amendment. Department of Commmerce. Web. 13 Feb. 2015.

*NHANES is a government program of studies designed to assess the health and nutritional status of people in the United States (Centers for Disease Control and Prevention)

Pasiakos, Stefan M. et al."Cardiometabolic Risk in US Army Recruits and the Effects of Basic Combat Training." *PLoS ONE* 7.2 (2012): E31222. Print.

Pasaikos, S et al.. "Doubling the daily allowance of protein intake with diet and exercise protects muscle loss." *Federation of American Societies for Experimental Biology*. (2013). Print.

Pasiakos, S. M., S. J. Montain, and A. J. Young. "Protein Supplementation in U.S. Military Personnel." *Journal of Nutrition* (2013): 1815S-819S. Print.

Picone, Thomas, Lindsay Allen, Pauline Olson, and Margaret Ferris. "Pregnancy Outcome in North American Women Effects of Diet, Cigarette Smoking, Stress, and Weight Gain on Placentas." American Journal of Clinical Nutrition 36 (1982). Print.

"Polyunsaturated Fatty Acids." The Crystal Reference Encyclopedia. West Chiltington: Crystal Semantics, 2005. Credo Reference. Web. 22 November 2014.

Ramsey, Casside B., Cheryl Hostetler, and Anne Andrews. "Evaluating the Nutrition Intake of U.S. Military Service Members in Garrison." *Military Medicine* 178 (2013): 1285-290. Print.

Ray, Sougat, and A. Sreenvias. "Prevalence of Prehypertension in Young Military Adults & Its Association with Overweight & Dylipidaemia." *Indian Journal of Medicine* 134 (2011): 162-67. Print.

Rimmer, James. "Sedentary Lifestyle Is Dangerous to Your Health : NCHPAD - Building Inclusive Communities." National Center on Health, Physical Activity and Disability (NCHPAD). National Center on Health, Physical Activity and Disability. Web. 19 Feb. 2015.

*NHANES is a government program of studies designed to assess the health and nutritional status of people in the United States (Centers for Disease Control and Prevention)

Sacks, Frank M., George A. Bray, Vincent J. Carey, Steven R. Smith, Donna H. Ryan, Stephen D. Anton, Katherine Mcmanus, Catherine M. Champagne, Louise M. Bishop, Nancy Laranjo, Meryl S. Leboff, Jennifer C. Rood, Lilian De Jonge, Frank L. Greenway, Catherine M. Loria, Eva Obarzanek, and Donald A. Williamson. "Comparison of Weight-Loss Diets With Different Compositions of Fat, Protein, and Carbohydrates." *New England Journal of Medicine* 360.9 (2009): 460-62. Print

Shapiro, A., W. Mu, C. Roncal, K.-Y. Cheng, R. J. Johnson, and P. J. Scarpace. "Fructose-induced Leptin Resistance Exacerbates Weight Gain In Response To Subsequent High-fat Feeding." *American Journal of Physiology* 295.5 (2008): R1370-1375. Print

Simopoulos, A. P. "The Importance Of The Omega-6/Omega-3 Fatty Acid Ratio In Cardiovascular Disease And Other Chronic Diseases." *Experimental Biology and Medicine* (2011): 674-88. Print.

Smith, Tracey J., Bernadette P. Marriott, Laura Dotson, Gaston P. Bathalon, Leslee Funderburk, Alan White, Louise Hadden, and Andrew J. Young. "Overweight and Obesity in Military Personnel: Socio-demographic Predictors." *Obesity Journal* 20.7 (2012): 1534-537. Print.

Steele, Dennis. "Better Nutrition Efforts Fill the Army's Plate." Army Magazine May 2014: 45-53. Print.

Thompson, Dennis. "U.S. Dietary Guidelines Take Aim at Sugar – WebMD." *U.S. Dietary Guidelines Take Aim at Sugar*. WebMD, 20 Feb. 2015. Web. 1 Mar. 2015.

*NHANES is a government program of studies designed to assess the health and nutritional status of people in the United States (Centers for Disease Control and Prevention)

Tremblay, Mark Stephen, Rachel Christine Colley, Travis John Saunders, Genevieve Nissa Healy, and Neville Owen. "Physiological and Health Implications of a Sedentary Lifestyle." *Applied Physiology, Nutrition, and Metabolism* 35 (2010): 725-40. Print.

Webb, Densie. "How Many Calories Equal One Pound?" How Many Calories Equal One Pound? Today's Dietitian. Web. 11 Mar. 2015.

"What Causes Overweight and Obesity?" - NHLBI, NIH. National Institute of Health, 13 July 2012. Web. 19 Feb. 2015.

"What Foods Are in the Grains Group?" What Are Grains? United States Department of Agriculture. Web. 27 Nov. 2014. <http://www.choosemyplate.gov/food-groups/grains.html>.

*NHANES is a government program of studies designed to assess the health and nutritional status of people in the United States (Centers for Disease Control and Prevention)