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THESIS

INFLUENCING HEALTHY FOOD CHOICES IN THE MARINE CORPS

by

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December 2021

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INFLUENCING HEALTHY FOOD CHOICES IN THE MARINE CORPS

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Submitted in partial fulfillment of the
requirements for the degree of

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ABSTRACT

The purpose of this thesis is to create an influence campaign focused on improving nutritional choices of Marines across the Marine Corps. It explores the most current publications from the U.S. Departments of Agriculture and Health and Human Services, and the U.S. military to establish a healthy nutrition baseline and identify how the Marine Corps attempts to provide adequate nutrition to its Marines. It demonstrates how optimizing food nutrition equates to combat readiness of the force. It investigates how food affects the body and how nutrients and timing affect a tactical athlete's performance. Since Marines have to choose from the food selections provided, the thesis outlines principles of influence that are and/or could be used to change food behavior. Influencing Marines' behavior in favor of healthier food types that optimize physical performance and longevity is a pursuit worthy of an organization that must be fit and ready for combat. The thesis culminates with an influence campaign outlining suggestions that would achieve this nutritional increase, and thus combat readiness, in the Marine Corps.

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LIST OF ACRONYMS AND ABBREVIATIONS

AFI	Air Force Instruction
AR	Army Regulation
CHAMP	Consortium for Health and Military Performance
CFT	Combat Fitness Test
HEI	Healthy Eating Index
HHS	U.S. Department of Health and Human Services
HPO	Human Performance Optimization
HPRC	Human Performance Resources CHAMP
IIC	Information and Influence Campaign
LDL	Low-density lipoprotein
MCCS	Marine Corps Community Services
MCO	Marine Corps Order
MRE	Meal-Ready-To-Eat
MOS	Military Occupational Specialty
NHANES	National Health and Nutrition Examination Survey
OPNAVINST	Office of the Chief of Naval Operations Instruction
PEAKS-NQ	Platform to Evaluate Athlete Knowledge of Sports Nutrition Questionnaire
PFT	Physical Fitness Test
T&R	Training and Readiness
USDA	U.S. Department of Agriculture
USMC	United States Marine Corps
USU	Uniformed Services University

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I am truly passionate about making the Marine Corps a better place in so many ways, better nutrition is just one. We all love food; however, not all food is good for us. The Marine Corps places an abundant emphasis on physical fitness; nutrition should be an equally important point of interest and conversation among Marines. This is my attempt to stir the pot of discussion with a spoon of information and influence.

I address this thesis mainly towards Marine Corps leadership, but I hope it brings inspiration to anyone who might read it. I think big changes are needed—both by individuals and by the institution. May we all live and eat with a greater resolve to nourish our bodies healthfully and happily.

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I. INTRODUCTION

A. TOPIC MOTIVATION

Food is critical to the survival of any species. For humans of past generations, food sources were limited to what their region and season produced for sustenance. In modern days, there are methods of storing, shipping, and preserving food for longer periods of time, which allow for a robust selection of food choices for an average American. Though the selection has widened, effective marketing and business agreements seem to cloud what the “healthy foods” truly are and are capable of, even for individuals whose livelihood is based on optimizing their physical capacity. Professional athletes and service members are just a few such individuals.

More and more modern research reveals that food selection can have both immediate and long-lasting effects on the body’s health. These effects on the body are either positive or negative, and could very well be a matter of life or death. The Marine Corps prides itself in being a ready force, with the toughest military branch in terms of overall physical standards, and yet individual Marines end up with loads of fried food on their lunch plates and candy bars in their pockets for an afternoon snack. What many Marines are observed feeding themselves seems to be misaligned with the idea that their body is a weapon in need of elevated food fuel.

B. PROBLEM STATEMENT

United States Marines are perpetually told that they are “professional athletes” and as such, should maintain their physical well-being and fitness. The expectation often is that they should not only meet minimum physical training standards, but exceed them. Nutrition is a crucial component of physical performance and overall health. The Marine Corps produces significant material related to the nutritional effects of various foods, though how well Marines retain and implement such education is unknown. Although the current nutritional choices/trends among Marines is unclear, there is always room for food choice improvement.

C. RESEARCH QUESTIONS

What does the Marine Corps say are healthy food choices? How does food affect physical performance? How can the U.S. Marine Corps better influence its Marines to make healthier food choices?

D. RESEARCH OBJECTIVES AND LIMITATIONS

The objective of this thesis is to create an influence campaign focused on improving the nutritional choices of Marines across the Marine Corps. This thesis attempts to show that it is not only the Marine Corps' duty to adequately educate and influence healthier eating, but it is also in its best interest as a fighting force to do so. This thesis reviews the nutritional content made available to Marines currently and demonstrate how to improve its delivery as to improve Marines' mental reception so that they their actions becomes observable behavior.

There are limitations to this research regarding the scope. The thesis mainly focuses on nutritional effects of food; it does not elaborate on liquids, nor does it consider effects of medical conditions and genetics. Another scope limitation exists in the Literature Review: many nutritional sources are discussed and analyzed, but it does not represent a comprehensive review of all available doctrine, rather, select sources. Due to a lack of formal studies on actual consumption of food types by United States Marines, there are assumptions are made in this thesis based on the author's personal observations and experiences as a Marine officer with seven years of fleet experience.

E. SIGNIFICANCE

The Marine Corps espouses the idea that it will mold a man or woman not only into a Marine, but will return him/her to society as an upstanding citizen—this includes leadership principles and lifestyle habits. It is in the Marine Corps' interest to have a ready and fit force mentally, physically, and spiritually. Optimizing health and performance should be in the forefront of every Marine's mind when he is deciding what to ingest nutritionally.

Providing the means and influencing Marines' behavior in favor of healthier food types, that optimize physical performance and longevity, is a worthy pursuit for the Marine Corps. This thesis has the potential to increase awareness and education in the Marine Corps related to nutritional shortcomings. It could inspire widely distributed surveys and measurements on Marine Corps nutritional trends, that could ultimately improve overall health and readiness.

F. THESIS ORGANIZATION

This thesis is organized into five chapters:

Chapter I—"Introduction." This chapter introduces the thesis research of changing nutritional choices in the Marine Corps. It details the motivation behind choosing this topic, includes the problem statement related to Marines and lists questions the thesis seeks to answer. This chapter also details the thesis objectives and methodology, significance, and its organization.

Chapter II—"Background." This chapter establishes a baseline perspective of Marine Corps core values, the concept of readiness, physical fitness, and operating environments. These principles are important because they affect nutritional choices and food habits.

Chapter III—"Literature Review." This chapter introduces content about the food standards from selected sources. It reviews doctrine related to physical performance, nutrient timing, and nutritional resources useful to tactical athletes. It also presents literature related to influencing changes in mindset and culture.

Chapter IV—"Information Campaign." This chapter is organized into a six-part influence campaign consisting of Predevelopment Actions, Objectives, Audience, Theme and Message Development, Methods of Dissemination, and Methods of Effectiveness. The campaign is inspired by the content introduced in Chapter III.

Chapter V—"Conclusion." This chapter is composed of chapter summaries for the thesis, final recommendations derived from the information campaign, and issues related to improving Marine Corps nutrition that could be furthered researched.

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II. BACKGROUND

A. MARINE CORPS CULTURE

There are many things that make The United States Marine Corps distinct from other organizations. A major component of Marine Corps culture that makes it unique is the physical rigor and mental determination each individual must rise to during the process of becoming a Marine. Usually this also bears the unmistakable pride which is hallmark to being a Marine. Indoctrination of this pride, the Corps' mission, and the value what each Marine brings to the fight is what perpetuates confidence and allegiance to high standards and practices. Understanding some of these values will lend perspective into the nutritional mission.

1. Ethos and Core Values

Honor, courage, and commitment are the three defining values the Corps infuses into its Marines from the start of initial training. Though these words can mean different things to different people, the Marine Corps defines these values as follows:

- Honor – foundation of character that drives one to be honest, respectful, “act responsibly, to be accountable for actions, to fulfill obligations, and to hold others accountable for their actions.”¹
- Courage – strength from mental, moral, and physical discipline, “mastery of fear, to do what is right in every situation, to adhere to a higher standard of personal conduct, lead by example, and to make tough decisions under pressure.”²

¹ U.S. Marine Corps, *Leading Marines*, MCWP 6-11 (Washington, D.C.: Department of the Navy, 2014), https://www.marines.mil/Portals/1/MCWP%206-11_Part1.pdf.

² U.S. Marine Corps.

- Commitment – spirit of determination and dedication to Corps, pride, and “unrelenting determination to achieve a standard of excellence in every endeavor.”³

Leaders of all ranks echo these terms in various settings so that all Marines are reminded to what moral standard of thinking and acting they are expected to achieve and maintain.

These values are not always inherent to the individual who joins the Marine Corps; but they are introduced early and recited often as means to instill them as part of a Marine’s identity. The Marine Corps expects of its members to constantly calibrate their standard of thinking and action to a place of moral substance. If an individual’s moral standing is less than what the values of honor, courage, and commitment represent, they are expected to raise their personal standard—both mentally and in practice. The principle of implementing lifestyle changes and/or adopting new practices is something that every Marine, at one point or another, will do if he is to “survive” either the Corps’ culture or standards.

2. The Deal on Readiness

“The Marine Corps is ready when the nation is least ready” is a phrase commonly recited in the Marine Corps. It emphasizes the dire importance of always being prepared to fight, and applies to individual Marines, units, and equipment. Readiness is the unrelenting focus of everyday work in the Marine Corps—almost all training and administrative activities center on making or maintaining a person, a unit, and/or a piece of equipment ready to fight. The nation expects a ready force to answer the call to arms when conflicts and emergency situations arise; the Marine Corps prides itself in retaining the reputation of that ready force.

Readiness is measured in a variety of ways according to the subject. For equipment, the three main statuses (operational, degraded, and deadline) are used to denote how well a piece of equipment can fulfill its primary functions. Operators will

³ U.S. Marine Corps.

engage in an activity known as preventative maintenance, or regularly scheduled checks and actions intended to preserve the well-functioning and life of a piece of equipment. If preventative maintenance is regularly performed, the equipment should operate well for a long time. If an equipment part fails, the whole thing may require corrective maintenance to fix the broken part. Depending on the required correction, the equipment may be deadlined or degraded for a time. Corrective maintenance occurrences are less likely when preventative maintenance is performed as directed.

For units, readiness is measured according to specific standards known as Training and Readiness (T&R) events, which can be assessed both informally and formally. For individual Marines, their readiness is quantified by several factors including their medical and dental statuses, mastery of certain T&R events for their specific military occupational specialty (MOS), and how physically fit they are as measured through formal physical tests.

Nutrition correlates to medical health and physical fitness, and it therefore a contributing ingredient to the readiness equation. The Marine Corps even acknowledges that principle when it states every Marine must be physically fit and “adopt a healthy lifestyle and a lifelong commitment to fitness. This combination has a direct and positive impact on job performance and combat readiness.”⁴ Good nutrition is a form of preventative maintenance for the body – caring for it with the right content and quantities will maximize its function and prevent health-related risks that require “correcting.”

3. What Is Fitness Worth?

Another mark of pride and Marine Corps culture is physical fitness and strength. It is not only a requirement for entry into the service, but a standard to maintain throughout. People train well in advance of joining the Marine Corps, so they are physically conditioned to handle the rigors of basic training. Once a Marine, there are two formal physical fitness tests taken annually: The Physical Fitness Test (PFT), between the

⁴ U.S. Marine Corps, *Marine Corps Order 6100.13A Change 3: Marine Corps Physical Fitness and Combat Fitness Tests* (Washington, DC: U.S. Marine Corps, 2021), <https://www.marines.mil/Portals/1/Publications/MCO%206100.13A%20with%20CH-3.pdf?ver=w0AHhSYBRrVBdzoRUGlyQ%3d%3d>.

months of January to June, and the Combat Fitness Test (CFT), between the months of July through December. Not only do these tests measure various components of physical strength and ability, but the associated scores received will either positively or negatively affect an individual's promotion potential.

Physical fitness is socially worth a lot in the Marine Corps, and is often a metric of popularity. Because it takes so much discipline to be strong and perform physically, generally people respect those that push harder than them. Likewise, because staying physically fit is a job requirement, Marines often regard those individuals who perform better than them, across various settings, in high esteem.

The Department of Defense instructs that "Service members shall maintain physical readiness through appropriate nutrition, health, and fitness habits. Aerobic capacity, muscular strength, muscular endurance, and desirable body fat composition, form the basis for the DOD Physical Fitness and Body Fat Programs."⁵

B. TWO MAJOR ENVIRONMENTS FOR MARINES

1. Garrison

Garrison indicates the everyday, administrative environment that Marines enjoy during a peacetime or non-training status; it entails sleeping in their own quarters, exercising daily, executing a normal eight-to-five workday, eating the food they choose, and spending their post-work free time at their leisure. In garrison, Marines have the most structured routine: physical exercise five days a week, at a minimum—often with their peers, and then eating, working, sleeping, relaxing at predictable intervals. This research will focus more on influencing Marines in garrison settings than in operational ones.

"The primary purpose of...garrison mess halls is to feed the enlisted member. Each enlisted member of the Marine Corps is entitled to three meals for each day on

⁵ Department of Defense, *DODI 1308.3: DOD Physical Fitness and Body Fat Programs Procedures* (Washington, DC: Department of Defense, 2002), <https://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/130803p.pdf>.

active duty.”⁶ The chow meals during the work week: breakfast, lunch, and dinner. While chow halls menus vary across areas and installations, the preponderance of menu selections remain consistent, according to orders that will be introduced later in the Chapter III.

A lack of formal studies specific to Marines’ eating habits on a large scale necessitate anecdotal assumptions to be made about the average diet in the Marine Corps. These assumptions will focus on mainly what food content is available to the average Marine on bases. For a Marine who lives on base in the barracks, the bulk of his food options will be from the chow hall, commercial vendors (from the Marine Mini-Mart or Commissary), and other options. For Marines not living in the barracks, either on or off base, their food options will likely include a combination of homemade meals, the chow hall, Marine Mini-Mart, and/or other options. “Other options” here could consist of anything else available to subsist from options like burrito trucks, McDonald’s, ready meals from grocery stores, vending machine snacks, restaurants, etc.

2. Operational

Operational is any setting not considered a typical “garrison” environment including field training, deployments, combat environments, etc. There may or may not be a predictable schedule of physical training, eating, and/or sleeping. Operational statuses can vary widely in terms of regularity.

In this setting, often Marines will be consuming food in the form of “field rations.” Field rations include things like meals-ready-to-eat (MREs), which is the most basic but formal form of pre-packaged food a Marine will get in an operational environment.

The individual 24-hour combat ration is intended to provide appropriate nutrition to maintain good health, physical performance, mental status and cognitive function of the military user in the field

⁶ U.S. Marine Corps, *Marine Corps Order 10110.14N: Marine Corps Food Service and Subsistence Program* (Washington, DC: U.S. Marine Corps, 2018), <https://www.marines.mil/portals/1/Publications/MCO%2010110.14N.pdf?ver=2018-03-12-084920-963>.

environment. The food components that make up a ration are dehydrated and/or thermally processed products and snack items.⁷

Even though the field or combat rations “provide appropriate nutrition,” it is not ideal for optimum nutrition over long periods. The focus of this research will be more so on the garrison environment than the operational one.

⁷ Research and Technology Organization Task Group RTG-154 and North Atlantic Treaty Organization, “Nutrition Science and Food Standards for Military Operations” (France: NATO Research & Technology Organisation, 2010), <https://apps.dtic.mil/dtic/tr/fulltext/u2/a526318.pdf>.

III. LITERATURE REVIEW

A. SELECTED SOURCES OF NUTRITION STANDARDS

As noted, food is critical to the survival of any species. For humans of past generations, food sources were limited to what their region and season produced for sustenance. In modern day, there is ample selections and variety of food options ranging from fresh to processed; humans are not constrained to eating food strictly available by season anymore. Food trends can vary based on many factors including, but not limited to, availability of certain food types, a person's culture, income, and/or geography. Nutritional habits and patterns are born out of such factors and perpetuate until there is an opportunity to change.

Over the past century, much research has been conducted of the effect of food and nutrients on the body. Nutritional guidelines have existed for decades in the United States, both for the public and the military, as means to communicate authoritatively what the best food and consumption practices are, based on research of the day. Over the years, such guidelines have been revised and updated according to new studies and evidence. There are three sources of nutrition instructions that this research will examine in the subsequent sections:

- Dietary Guidelines for Americans 2020–2025
- Nutrition and Menu Standards for Human Performance Optimization
- The Marine Corps Food Service and Subsistence Program

The Marine Corps Food Service and Subsistence Program, outlined in MCO 10110.14N, serves “to issue policies for the management, operation, budgeting, and administration of garrison mess halls, field messes, and subsistence management.”⁸ Of particular note, the Appendix A of this order includes menu standards for meals served at garrison chow halls, and Chapter 19 is “Nutritional Standards,” which lists key persons,

⁸ U.S. Marine Corps, *MCO 10110.14N*.

parties, and committees involved with the development of the associated nutritional guidance and directives.

1. Dietary Guidelines for Americans 2020–2025

The U.S. Departments of Agriculture (USDA) and Health and Human Services (HHS) are responsible for providing such nutrition guidance for Americans; the most current is Dietary Guidelines for Americans 2020–2025,⁹ which was released in December 2020. Its first edition was published in 1980; the document is intended to provide “science-based advice on what to eat and drink to promote health, reduce risk of chronic disease, and meet nutrient needs.”¹⁰ Additionally, since National Nutrition Monitoring and Related Research Act of 1990, the USDA and HHS are required to jointly publish a report for the general public at least every five years.¹¹

a. What Constitutes a Healthy Diet?

The first thing to consider is the content of food itself, along with nutrient density. According to the most recent Dietary Guidelines for Americans, a healthy diet consists of six core elements:

- Vegetables of all types—dark green, red, orange, beans, peas, lentils starchy, etc.
- Fruits, especially whole fruit
- Grains, at least half of which are whole grain
- Dairy, including fat-free or low-fat milk, yogurt, and cheese, and/or lactose-free versions and fortified soy beverages and yogurt as alternatives
- Protein foods, including lean meats, poultry, and eggs; seafood; beans, peas, and lentils; and nuts, seeds, and soy products

⁹ U.S. Department of Agriculture, U.S. Department of Health and Human Services, *Dietary Guidelines for Americans, 2020–2025*, 9th ed. (Washington, D.C.: U.S. Department of Agriculture, U.S. Department of Health and Human Services, 2020), https://www.dietaryguidelines.gov/sites/default/files/2020-12/Dietary_Guidelines_for_Americans_2020-2025.pdf.

¹⁰ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

¹¹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

- Oils, including vegetable oils and oils in food, such as seafood and nuts¹²

The next consideration for a healthy diet is relative quantities for the six core food groups listed above, according to an individual's daily calorie pattern. Figure 1 shows recommended food element consumption by specific quantity for adults (ages 19–59) that would constitute a “healthy dietary pattern.” There are military-specific guidelines that will be presented later in this text however, it is also important to include the respective age group's data of the general population for comparison.

¹² U.S. Department of Agriculture, U.S. Department of Health and Human Services.

CALORIE LEVEL OF PATTERN ^a	1,600	1,800	2,000	2,200	2,400	2,600	2,800	3,000
FOOD GROUP OR SUBGROUP ^b	Daily Amount of Food From Each Group (Vegetable and protein foods subgroup amounts are per week.)							
Vegetables (cup eq/day)	2	2 ½	2 ½	3	3	3 ½	3 ½	4
	Vegetable Subgroups in Weekly Amounts							
Dark-Green Vegetables (cup eq/wk)	1 ½	1 ½	1 ½	2	2	2 ½	2 ½	2 ½
Red & Orange Vegetables (cup eq/wk)	4	5 ½	5 ½	6	6	7	7	7 ½
Beans, Peas, Lentils (cup eq/wk)	1	1 ½	1 ½	2	2	2 ½	2 ½	3
Starchy Vegetables (cup eq/wk)	4	5	5	6	6	7	7	8
Other Vegetables (cup eq/wk)	3 ½	4	4	5	5	5 ½	5 ½	7
Fruits (cup eq/day)	1 ½	1 ½	2	2	2	2	2 ½	2 ½
Grains (ounce eq/day)	5	6	6	7	8	9	10	10
Whole Grains (ounce eq/day)	3	3	3	3 ½	4	4 ½	5	5
Refined Grains (ounce eq/day)	2	3	3	3 ½	4	4 ½	5	5
Dairy (cup eq/day)	3	3	3	3	3	3	3	3
Protein Foods (ounce eq/day)	5	5	5 ½	6	6 ½	6 ½	7	7
	Protein Foods Subgroups in Weekly Amounts							
Meats, Poultry, Eggs (ounce eq/wk)	23	23	26	28	31	31	33	33
Seafood (ounce eq/wk)	8	8	8	9	10	10	10	10
Nuts, Seeds, Soy Products (ounce eq/wk)	4	4	5	5	5	5	6	6
Oils (grams/day)	22	24	27	29	31	34	36	44
Limit on Calories for Other Uses (kcal/day)^c	100	140	240	250	320	350	370	440
Limit on Calories for Other Uses (%/day)	6%	8%	12%	11%	13%	13%	13%	15%

^a Calorie level ranges: Ages 19 through 30, Females: 1,800-2,400 calories; Males: 2,400-3,000 calories. Ages 31 through 59, Females: 1,600-2,200 calories; Males 2,200-3,000 calories. Energy levels are calculated based on median height and body weight for healthy body mass index (BMI) reference individuals. For adults, the reference man is 5 feet 10 inches tall and weighs 154 pounds. The reference woman is 5 feet 4 inches tall and weighs 126 pounds. Calorie needs vary based on many factors. The DRI Calculator for Healthcare Professionals, available at na1.usda.gov/fnic/dri-calculator, can be used to estimate calorie needs based on age, sex, height, weight, and activity level.

^b Definitions for each food group and subgroup and quantity (i.e., cup or ounce equivalents) are provided in [Chapter 1](#) and are compiled in [Appendix 3](#).

^c All foods are assumed to be in nutrient-dense forms; lean or low-fat; and prepared with minimal added sugars, refined starches, saturated fat, or sodium. If all food choices to meet food group recommendations are in nutrient-dense forms, a small number of calories remain within the overall limit of the pattern (i.e., limit on calories for other uses). The number of calories depends on the total calorie level of the pattern and the amounts of food from each food group required to meet nutritional goals. Calories up to the specified limit can be used for added sugars, saturated fat, or alcohol, or to eat more than the recommended amount of food in a food group.

NOTE: The total dietary pattern should not exceed *Dietary Guidelines* limits for added sugars, saturated fat, and alcohol; be within the Acceptable Macronutrient Distribution Ranges for protein, carbohydrate, and total fats; and stay within calorie limits. Values are rounded. See [Appendix 3](#) for all calorie levels of the pattern.

Figure 1. Healthy Dietary Pattern for Adults Ages 19–59.¹³

¹³ Source: U.S. Department of Agriculture, U.S. Department of Health and Human Services.

A different frame of reference for relative food amounts is that the USDA and HHS recommend that 85% of total daily calories should be filled by the five nutrient-dense core elements (vegetables, fruits, grains, dairy, protein foods), while the remaining 15% of calories should account for “other uses” (oils, added sugar, saturated fat).¹⁴ Figure 2 represents this described 85–15 Guide.

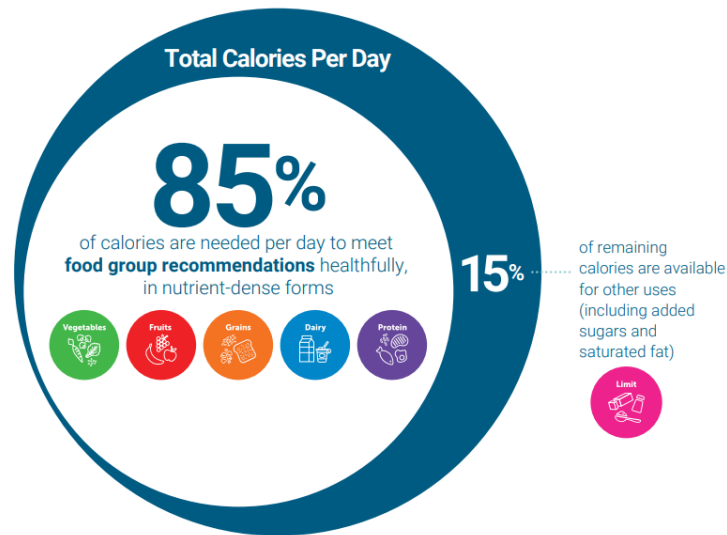


Figure 2. The 85–15 Guide: Percentage of Calories Needed to Meet Food Group Needs with Nutrient-Dense Choices and Percentage Left for Other Uses.¹⁵

b. Dietary Patterns

A term often used by the USDA and HHS in their publication is “dietary pattern.” A dietary pattern is defined as the consumption of foods and beverages in combination over the course of a given amount of time (day, week, or year).¹⁶ “A dietary pattern represents the totality of what individuals habitually eat and drink, and the parts of the pattern act synergistically to affect health. As a result, the dietary pattern may better

¹⁴ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

¹⁵ Source: U.S. Department of Agriculture, U.S. Department of Health and Human Services.

¹⁶ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

predict overall health status and disease risk than individual foods or nutrients.”¹⁷ When a dietary pattern is created is an important component. If healthy dietary patterns can be established early in life and sustained thereafter, the impact on health could be significant.¹⁸ Dietary patterns and their implementation timing can impact more than just the individual adopting them.

Many individuals enter the adult life stage with an unhealthy dietary pattern already established from the childhood and adolescent years. A concerted effort to change this trajectory and support adults in adopting a healthy dietary pattern is needed for better health and to promote the well-being of family and friends across life stages. Learned food and beverage preferences, and norms and values placed on diet, physical activity, and health, can positively or negatively influence health because they can determine an individual’s willingness to change and maintain behaviors. These norms and values, including preferences toward certain types of food, attitudes about healthy eating, and beliefs about the importance of physical activity, can extend beyond the individual to larger social networks, influencing the behaviors of friends and older or younger family members.¹⁹

The guidelines encourage its audience that “at every life stage—infancy, toddlerhood, childhood, adolescence, adulthood, pregnancy, lactation, and older adulthood—it is never too early or too late to eat healthfully.”²⁰ A dietary pattern is only as permanent as it is consistently perpetuated, and that perpetuation will contribute to long-term effects.

c. Consequences of Certain Dietary Patterns

It is widely recognized that food affects the function of the human body both short-term and long-term. Negative, short-term effects include things like bloating, indigestion, headaches, and fatigue. Positive, short-term effects from good nutrition are sustained energy levels, mental focus and alertness, and physical strength and

¹⁷ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

¹⁸ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

¹⁹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

²⁰ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

performance—to name a few. “Chronic” is the word used when describing long-term consequences or diseases. There are many chronic conditions that can be either exacerbated by poor nutrition or improved by good nutrition. According to the most recent guidelines from the USDA,

Establishing and maintaining a healthy dietary pattern can help minimize diet-related chronic disease risk. Conversely, consuming foods and beverages that are not nutrient dense may lead to disease expression in later years. High intakes of such foods (i.e., an unhealthy dietary pattern) throughout the lifespan can increase the risk of developing chronic disease

Evidence on the association between dietary patterns and reduced risk of diet-related chronic diseases has expanded in recent years and supports the use of dietary patterns as a foundation for the recommendations in the Dietary Guidelines for Americans, 2020–2025.

Consistent evidence demonstrates that a healthy dietary pattern is associated with beneficial outcomes for all-cause mortality, cardiovascular disease, overweight and obesity, type 2 diabetes, bone health, and certain types of cancer (breast and colorectal).

Common characteristics of dietary patterns associated with positive health outcomes include relatively higher intake of vegetables, fruits, legumes, whole grains, low- or non-fat dairy, lean meats and poultry, seafood, nuts, and unsaturated vegetable oils, and relatively lower consumption of red and processed meats, sugar-sweetened foods and beverages, and refined grains. The evidence examined showed broad representation across a number of populations and demographic groups. This suggests a consistent association no matter the region or cultural context in which a healthy dietary pattern is consumed. In addition, dietary patterns characterized by higher intake of red and processed meats, sugar-sweetened foods and beverages, and refined grains are, in and of themselves, associated with detrimental health outcomes.²¹

d. How Do Americans Measure Up?

Given the guidelines’ thorough recommendations, it is essential to highlight where the general American population is on the spectrum of healthy eating. According to Chris Woolston of Consumer Health News,

²¹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

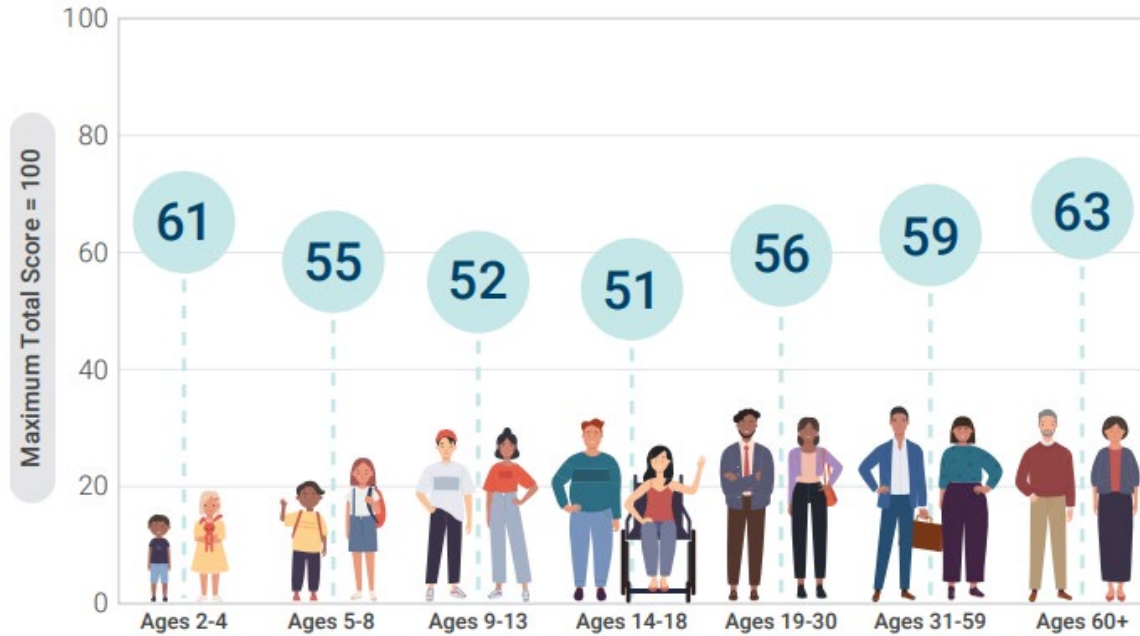
Most American diets fall into one of two broad categories: ‘Western’ or “prudent.” The prudent diet is a nutritionist’s dream. People in this category tend to eat relatively large amounts of fish, poultry, cruciferous vegetables (i.e., cabbage and broccoli), greens, tomatoes, legumes, fresh fruits, and whole grains. They also skimp on fatty or calorie-rich foods such as red meats, eggs, high-fat dairy products, French fries, pizza, mayonnaise, candy, and desserts. The Western diet is the prudent diet reflected in a carnival mirror. Everything is backwards: red meat and other fatty foods take the forefront, while fruits, vegetables, and whole grains are pushed aside. In addition to fat and calories, the Western diet is loaded with cholesterol, salt, and sugar. If that weren’t bad enough, it’s critically short on dietary fiber and many nutrients – as well as plant-based substances (phytochemicals) that help protect the heart and ward off cancer.²²

Results from the National Health and Nutrition Examination Survey (NHANES) in 2015–2016 found that many Americans’ dietary patterns did not align with their Dietary Guidelines.²³ The diet quality translates to the degree of compliance to the Dietary Guidelines, which is represented by a number score (on a scale from 0 to 100) known as the Healthy Eating Index (HEI).²⁴ Figure 3 shows the results of the survey by age group and HEI.

²² Chris Woolston, “What’s Wrong with the American Diet?” Consumer HealthDay, December 31, 2020. <https://consumer.healthday.com/encyclopedia/weight-control-39/obesity-health-news-505/whats-s-wrong-with-the-american-diet-644659.html>

²³ U.S. Department of Agriculture, U.S. Department of Health and Human Services, *Dietary Guidelines for Americans, 2020–2025*.

²⁴ U.S. Department of Agriculture, U.S. Department of Health and Human Services.



NOTE: HEI-2015 total scores are out of 100 possible points. A score of 100 indicates that recommendations on average were met or exceeded. A higher total score indicates a higher quality diet.

Data Source: Analysis of What We Eat in America, NHANES 2015-2016, ages 2 and older, day 1 dietary intake data, weighted.

Figure 3. Adherence of U.S. Population to the Dietary Guidelines Across Life Stages, as Measured by Average Total HEI-2015 Scores.²⁵

“For Americans ages 2 and older, HEI-2015 scores indicate that intakes are not consistent with recommendations for a healthy dietary pattern. Average diet quality has slightly improved in the past 10 years, but the average score of 59...indicates that people have much room for improvement.”²⁶ The two highest scoring groups were ages 2–4 and over 60 years old, with scores of 61 and 63 respectively. The lowest scoring age group was teenagers aged 14–18 with a score of 51. USDA asserts that aligning one’s diet more closely to the core elements of a healthy dietary pattern, for one’s age group, the risk for chronic disease will decrease.²⁷

²⁵ Source: U.S. Department of Agriculture, U.S. Department of Health and Human Services.

²⁶ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

²⁷ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

(1) Nutrition Profile Adults ages 19–59

Because the active-duty Marine population falls within the approximate ages of 18–60, it is prudent to examine the counterpart population (ages 19–59) of America for comparison. Figure 4 displays the “current” (2015-2016 collected data) food group intakes of adults aged 19 to 30 years old. It shows the HEI of 56 out of 100, and the average daily intakes compared to the recommended amounts.²⁸ For this age group, both males and females consume only 50% the daily recommended amount of vegetables, approximately 50% of the daily recommended amount of fruits, about 50–70% of the daily recommended amount of dairy, and less than the daily recommended amount of grains.²⁹ The protein category was the only one where average intakes for higher (for males) or at recommended levels (for females).³⁰ Figure 4 highlights important statistics regarding the percentage of individuals aged 19–30 who exceed daily recommended amounts of added sugars, saturated fat, and sodium. It states that 66% of females and 62% of males exceed the recommended limit of added sugars; 71% of females and 76% of males exceed intake of recommended saturated fat amounts; 84% of females and 97% of males exceed daily recommended limits of sodium.³¹

²⁸ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

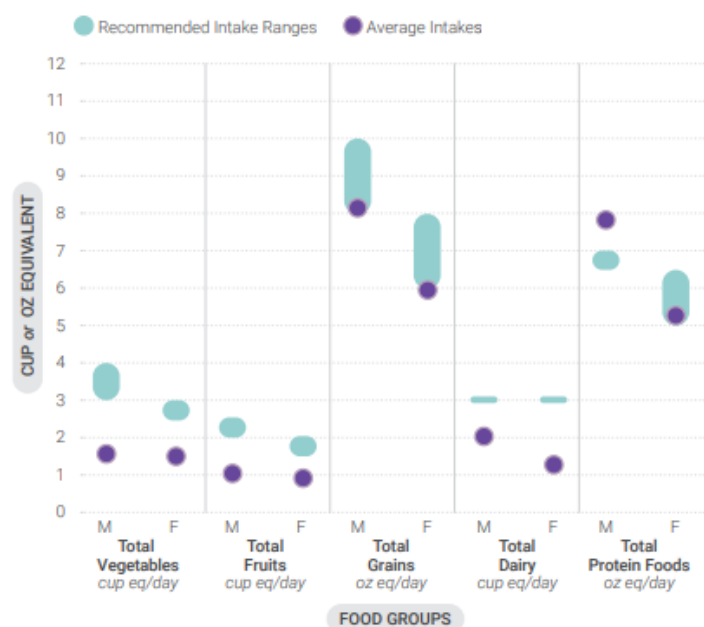
²⁹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

³⁰ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

³¹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

Current Intakes: Ages 19 Through 30

Average Daily Food Group Intakes Compared to Recommended Intake Ranges

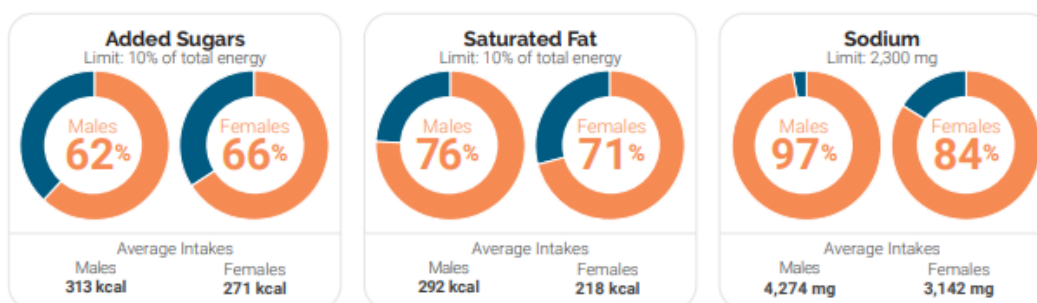


Healthy Eating Index Score
(on a scale of 0-100)



Percent Exceeding Limits of Added Sugars, Saturated Fat, and Sodium

● Exceeding Limit ● Within Recommended Limit



Data Sources: Average Intakes and HEI-2015 Scores: Analysis of What We Eat in America, NHANES 2015-2016, day 1 dietary intake data, weighted. Recommended Intake Ranges: Healthy U.S.-Style Dietary Patterns (see [Appendix 3](#)). Percent Exceeding Limits: What We Eat in America, NHANES 2013-2016, 2 days dietary intake data, weighted.

Figure 4. Current Nutrient Intakes for U.S. Population Ages 19–30.³²

Figure 5 displays the “current” (2015-2016 collected data) food group intakes of adults aged 31–59 years old. It shows the same statistics as Figure 4, but specific to the 31–59-year age group. This group’s HEI is 59 out of 100, which is somewhat higher, but

³² U.S. Department of Agriculture, U.S. Department of Health and Human Services.

still comparable, to the HEI of the 19–31-year-old age group.³³ Males and females of this age category eat slightly more vegetables, but still only about 60% the daily recommended amount. The daily consumption of recommended fruit amounts is still around 50%. Dairy amounts remain about 50–70% of the daily recommended amount. This age group averages grain consumption at the lower end of recommended amounts.³⁴ The protein category was the only one where average intakes for higher (for males) or at recommended levels (for females).³⁵ Figure 4 also highlights important statistics regarding the percentage of individuals aged 19–30 who exceed daily recommended amounts of added sugars, saturated fat, and sodium. It states that 66% of females and 62% of males exceed the recommended limit of added sugars; 71% of females and 76% of males exceed intake of recommended saturated fat amounts; 84% of females and 97% of males exceed daily recommended limits of sodium.³⁶ Identical categories are presented in Figure 5 with comparable percentages.

³³ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

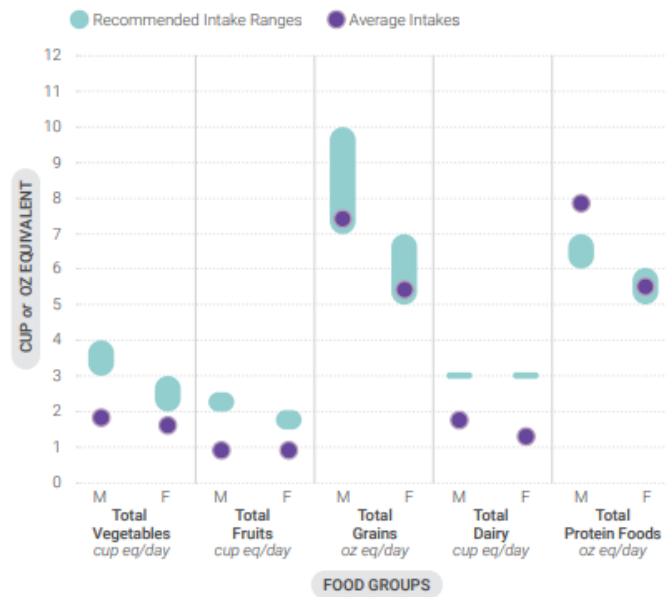
³⁴ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

³⁵ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

³⁶ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

Current Intakes: Ages 31 Through 59

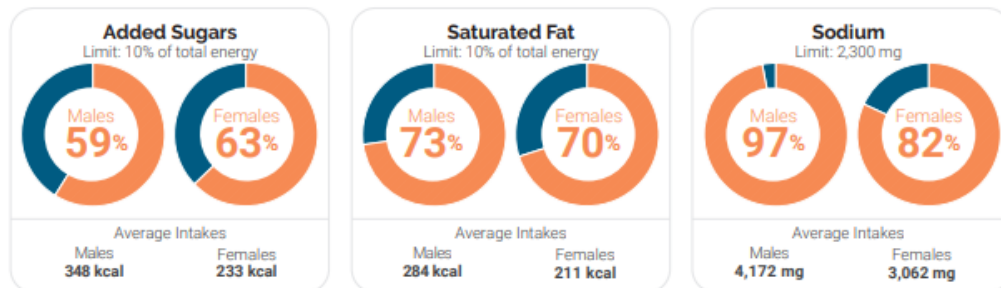
Average Daily Food Group Intakes Compared to Recommended Intake Ranges



Healthy Eating Index Score (on a scale of 0-100)



Percent Exceeding Limits of Added Sugars, Saturated Fat, and Sodium



Data Sources: Average Intakes and HEI-2015 Scores: Analysis of What We Eat in America, NHANES 2015-2016, day 1 dietary intake data, weighted. Recommended Intake Ranges: Healthy U.S.-Style Dietary Patterns (see [Appendix 3](#)). Percent Exceeding Limits: What We Eat in America, NHANES 2013-2016, 2 days dietary intake data, weighted.

Figure 5. Current Nutrient Intakes for U.S. Population Ages 31–59.³⁷

- (2) Overconsumption risks and food sources of saturated fat, added sugars, and sodium

Saturated fat, added sugars, and sodium are of particular interest to the dietary community because of their significant impact on body function over short and long terms. Their excessive intake can directly contribute to high low-density lipoprotein

³⁷ Source: U.S. Department of Agriculture, U.S. Department of Health and Human Services.

(LDL) cholesterol, hypertension, high blood pressure, obesity, cardiovascular disease, stroke, and coronary heart disease.³⁸ The USDA and HHC states that reducing intake of foods that contain high amounts of these substances, will reduce the risk of developing the above-mentioned health issues.³⁹ It is crucial to increase Americans' and servicemembers' awareness of what "healthy" and "unhealthy" look like according to recommended limits on sugar, saturated fat, and sodium.

The daily limit for saturated fat is 10%; 70–75% of adults exceed that limit.⁴⁰ The guidelines note that the following items contain the higher amounts of saturated fat:

- Sandwiches (e.g., deli sandwiches, burgers, tacos, burritos, grilled cheese, hot dogs)
- Grain-based mixed dishes (e.g., spaghetti and meatballs, casseroles, quesadillas).
- High-fat meat
- Full-fat dairy products (e.g., whole milk, ice cream, cheese)
- Butter, coconut oil, and palm kernel and palm oil⁴¹

Further, Figure 6 depicts the foods Americans consistently choose to consume (by percentages) that are high in saturated fat.

USDA and HHC recommends reducing saturated fat consumption by:

- Reading/identifying the amount of added sugars on Nutrition Facts label and adjusting/replacing for healthier alternatives
- Using lean meats and low-fat cheese
- Substituting beans in place of meats as the protein source
- Substituting certain ingredients with sources of unsaturated fat (e.g., using avocado, nuts, or seeds in a dish instead of cheese)
- Eating desserts and sweets less often
- Consuming smaller portions sizes of foods high in saturated fat⁴²

³⁸ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

³⁹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁴⁰ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁴¹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁴² U.S. Department of Agriculture, U.S. Department of Health and Human Services.

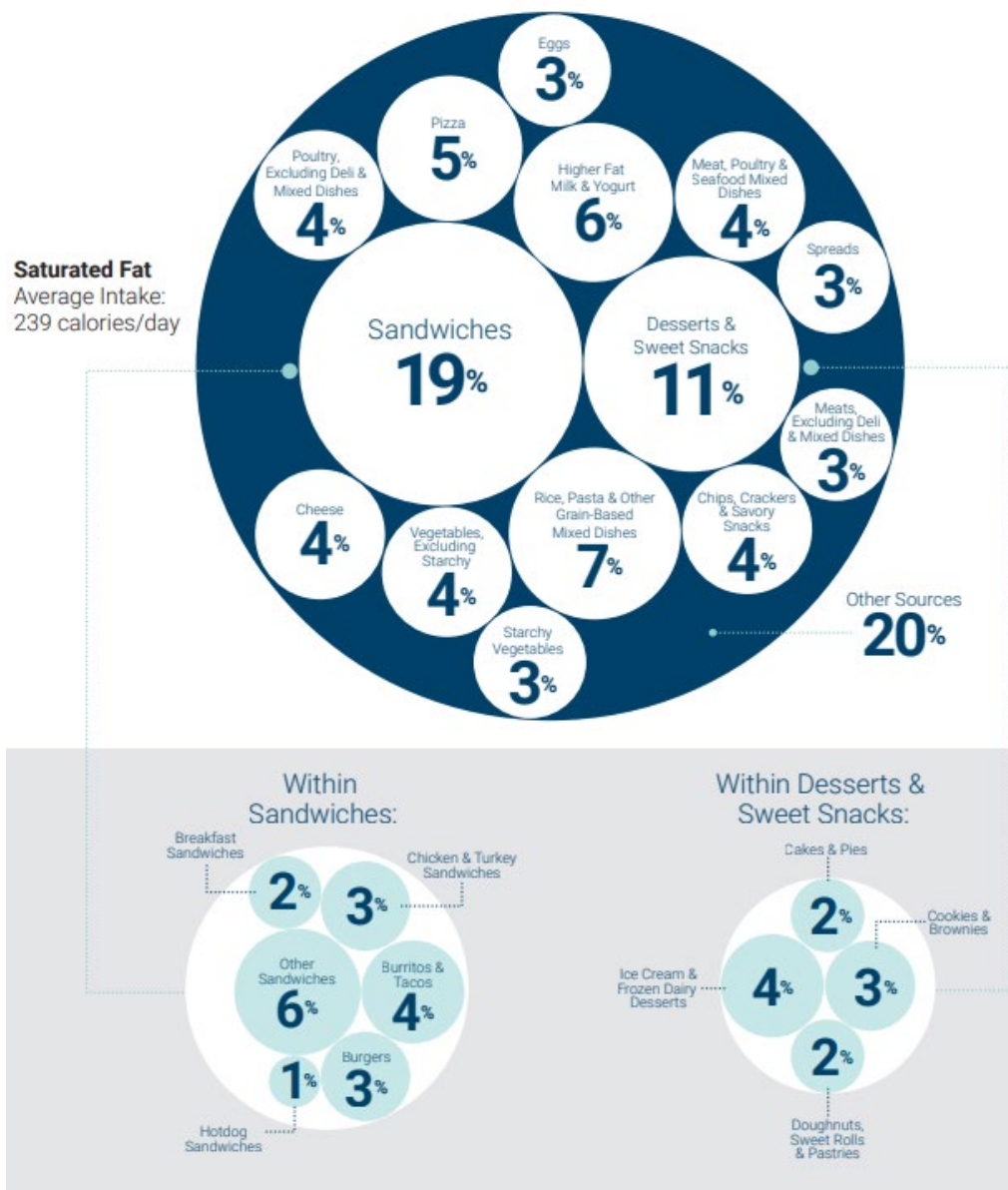


Figure 6. Top Sources and Average Intakes of Saturated Fat in the U.S.⁴³

In addition to excessive saturated fats, the second culprit that can contribute to poor nutritional health is excessive sugar consumption. To be considered a healthy dietary pattern, the limit of added sugars should be less than 10% of daily calories – over

⁴³ Source: U.S. Department of Agriculture, U.S. Department of Health and Human Services.

60% of adults exceed that limit.⁴⁴ Figure 7 provides details several added sugar sources by percentage of consumption; the top three sources for daily intake of added sugar are:

- Sugar-sweetened beverages (e.g., soda, sports drinks, energy drinks, fruit drinks)
- Sweetened coffees and teas (including ready-to-drink varieties)
- Desserts and sweet snacks, candies, and sweetened breakfast cereals⁴⁵

USDA and HHC recommends reducing saturated fat consumption by:

- Reading/identifying the amount of added sugars in a product on the Nutrition Facts label and removing/replacing for healthier alternatives
- Replacing sugar-sweetened beverages to options containing no added sugar (e.g., water)
- Replacing fruit drinks with 100% juice options
- Making coffee and tea with milk instead of added sugars
- Limiting sugar-sweetened beverages to small amounts⁴⁶

⁴⁴ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁴⁵ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁴⁶ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

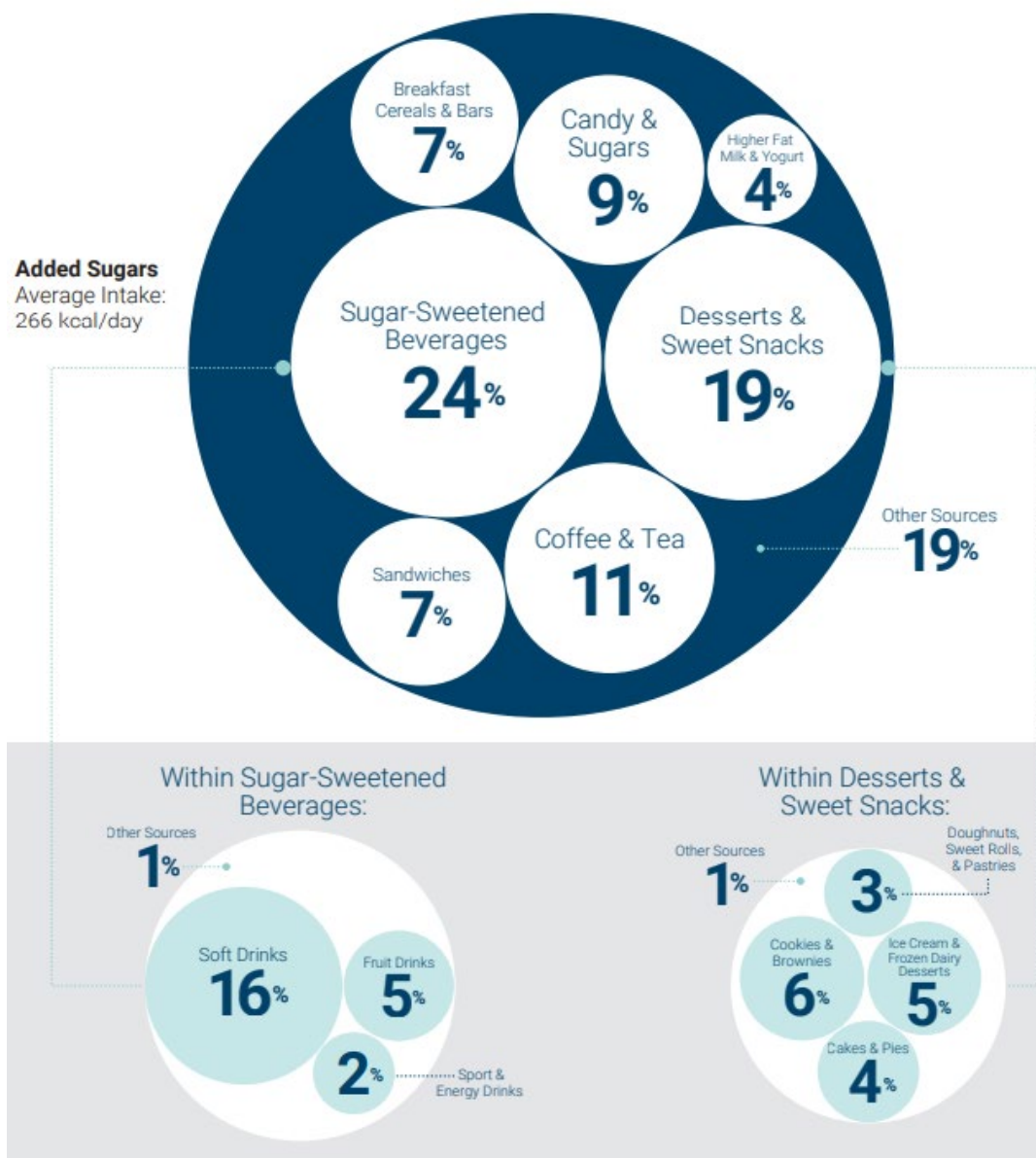


Figure 7. Top Sources and Average Intakes of Added Sugars in the U.S.⁴⁷

The third item to monitor for excessive intake is sodium. Sodium is considered an essential nutrient for the human body when consumed as sodium chloride (salt) up to a limit; a healthy dietary pattern establishes an upper limit at 2,300 mg/day for adults.⁴⁸ From the 2015 data, Americans actually consume 3,393 mg/day on average, with a range

⁴⁷ Source: U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁴⁸ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

of 2,000 to 5,000 mg.⁴⁹ That means that the average American is ingesting nearly 50% more sodium than recommended. The majority of people are over consuming sodium by a large factor. Additionally, because of how much sodium exists in foods and beverages already, calorie intake positively correlates to sodium intake.⁵⁰ Due to sodium's presence in "almost all food categories across the food supply," it is less apparent which foods to tag as "high sodium".⁵¹ The most evident food culprits for higher sodium content, taken from Figure 8, are "mixed dishes" (which are a combination of food components):

- Sandwiches, burgers, and tacos
- Rice, pasta, and grain dishes
- Pizza
- Meat, poultry, and seafood dishes
- Soups⁵²

USDA and HHC has recommendations for reducing sodium consumption:

- Cooking at home more often
- Using the Nutrition Facts label to choose products with less sodium, reduced sodium, or no-salt-added, etc.
- Flavoring foods with herbs and spices instead of salt⁵³

⁴⁹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁵⁰ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁵¹ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁵² U.S. Department of Agriculture, U.S. Department of Health and Human Services.

⁵³ U.S. Department of Agriculture, U.S. Department of Health and Human Services.

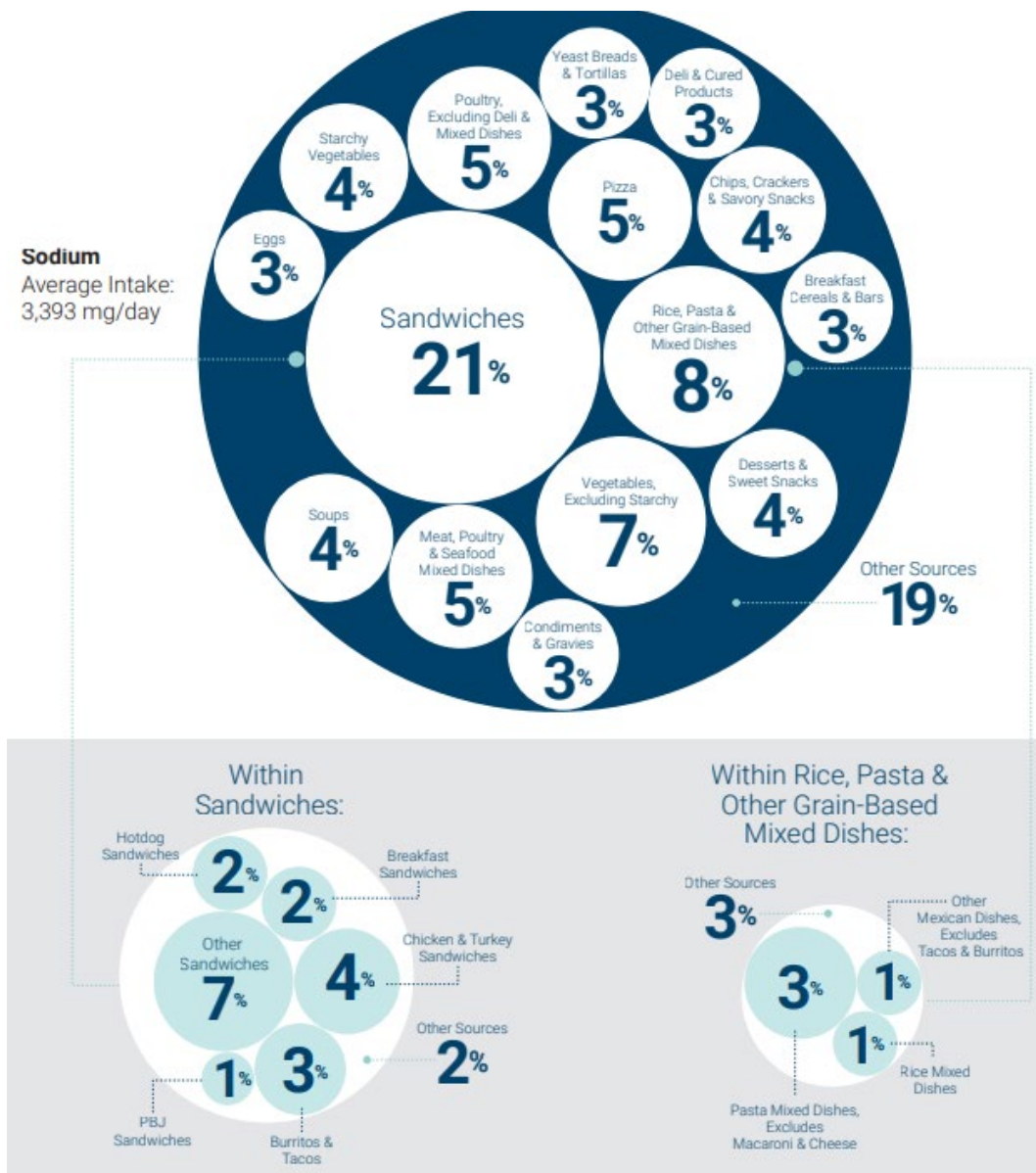


Figure 8. Top Sources and Average Intakes of Sodium in the U.S.⁵⁴

2. Nutrition and Menu Standards for Human Performance Optimization

For the United States military in terms of nutritional guidelines, there is the Nutrition and Menu Standards for Human Performance Optimization (HPO), updated in January 2017. “This regulation defines the nutritional responsibilities of the Surgeons General of the Army, the Navy, and the Air Force. It also updates nutrient standards,

⁵⁴ Source: U.S. Department of Agriculture, U.S. Department of Health and Human Services.

information, and education.”⁵⁵ The regulation is used by all the military branches but filed under different moniker, depending on the service. For the United States Army, it is known as Army Regulation (AR) 40–25; for the United States Navy, it is Office of the Chief of Naval Operations Instruction (OPNAVINST) 10110.1; for the United States Marine Corps, it is Marine Corps Order (MCO) 10110.49; and for the United States Air Force, it is Air Force Instruction (AFI) 44–141. All content within the document is identical, despite the file code variants. Among other things, it defines HPO as the “process of applying knowledge, skills, and emerging technologies to improve and preserve the capabilities of military (team) members (individuals), families, and organizations to execute essential tasks.”⁵⁶ The following subsections are extracted portions of the document highlighted for further discussion:

a. Military Dietary Reference Intakes

Among other sources, the MCO 10110.49 bases its nutrition standards on a now outdated (2010) version of The Dietary Guidelines for Americans – though it is assumed that the intent is to base newer versions off of the most current Dietary Guidelines for Americans. The 2017 order concisely discusses requirements of energy, nutrients, and water for the average military member. It defines healthy foods as those that “promote health by their nutrient density” with examples listed as “fresh and frozen fruits and vegetables, legumes, whole-grains, low-fat meats, and low-fat dairy products.”⁵⁷ It terms nutritional standards as “military dietary reference intakes” or MDRIs; Figure 9 lists daily MDRIs for the average military man and average military woman per the scale of activity (light, moderate, heavy, exceptionally-heavy).⁵⁸ Unlike Figure 1, which displayed food element quantities per day, Figure 9 shows a more traditional chart of nutrient categories

⁵⁵ Departments of the Army, Navy, and Air Force, *Nutrition and Menu Standards for Human Performance Optimization*, AR 40-25/OPNAVINST 10110.1/MCO 10110.49/AFI 44–141 (Washington, DC: Departments of the Army, Navy, and Air Force, 2017), https://armypubs.army.mil/epubs/DR_pubs/DR_a/pdf/web/AR40-25_WEB_Final.pdf.

⁵⁶ Departments of the Army, Navy, and Air Force.

⁵⁷ Departments of the Army, Navy, and Air Force.

⁵⁸ Departments of the Army, Navy, and Air Force.

and associated quantities. That is because “MDRIs are...used for planning and assessing diets for the healthy military population...intended for use by personnel involved in menu development, menu evaluation, nutrition education, nutrition research, and food research and development.”⁵⁹

⁵⁹ U.S. Marine Corps, *MCO 10110.14N*.

Table B-1
Military dietary reference intakes¹ per day

Nutrient	Unit	Men	Women
Energy ²	kcal/d	3400	2300
General/routine ³			
Light activity	kcal/d	3000	2100
Moderate activity	kcal/d	3400	2300
Heavy activity	kcal/d	3700	2700
Exceptionally-heavy activity	kcal/d	4700	3000
Protein ⁴	g/d	102 (68–136)	83 (55–110)
Carbohydrate ⁵	g/d	510 (340–680)	414 (276–552)
Fiber	g/d	34	28
Fat ⁶	g/d	<113 (100–157)	<77 (70–100)
Linoleic acid	g/d	17	12
α-linolenic acid	g/d	1.6	1.1
Vitamin A ⁷	μg RAE/d (IU/d)	900 (3000)	700 (2333)
Vitamin D ⁸	μg/d	15	15
Vitamin E ⁹	mg/d	15	15
Vitamin K	μg/d	120	90
Vitamin C	mg/d	90	75
Thiamin (B1)	mg/d	1.2	1.1
Riboflavin (B2)	mg/d	1.3	1.1
Niacin ¹⁰	mg NE/d	16	14
Vitamin B6	mg/d	1.3	1.3
Folate ¹¹	μg DFE/d	400	400
Vitamin B ¹²	μg/d	2.4	2.4
Calcium ¹²	mg/d	1000	1000
Phosphorus ¹³	mg/d	700	700
Magnesium ¹⁴	mg/d	420	320
Iron ¹⁵	mg/d	8	18
Zinc	mg/d	11	8
Sodium ¹⁶	mg/d	<2300	<2300
Iodine	μg/d	150	150
Selenium	μg/d	55	55
Fluoride ¹⁷	mg/d	4	3
Potassium ¹⁸	mg/d	4700	4700

Figure 9. Military Diet and Nutritional Standards.⁶⁰

Consider the notes included under the table of Figure 9, namely that the energy values are based off an “average” military man weighing 187 pounds, and the average military woman weighing 152 pounds. While Figure 9 is taken from MCO 10110.49, more insights about MDRIs are included in MCO 10110.14N. Of particular note, MDRIs are “established for personnel working in temperate climates,” and energy adjustments

⁶⁰ Source: Departments of the Army, Navy, and Air Force, *Nutrition and Menu Standards for Human Performance Optimization*.

would be required for those “training or fighting in more austere environments” such as “high altitude, extreme hot or cold weather.”⁶¹

b. Select Nutrient Terms Defined

There are seven nutrient terms that are useful to define for this research: carbohydrate, protein, fiber, electrolytes, fat, saturated fat, and cholesterol. They are important to define here because their definitions are a baseline knowledge from which all branches of the military reference from. The following selected definitions are taken directly from MCO 10110.49:

Carbohydrates are one of the main categories of nutrients. They are the most important source of energy for your body. The digestive system changes carbohydrates into glucose (blood sugar). The body uses this sugar as energy to fuel cells, tissues, and organs. Carbohydrates are called simple or complex, depending on their chemical structure. Simple carbohydrates include sugars found naturally in foods such as fruits, vegetables, milk, and milk products. They also include sugars added during food processing and refining. Complex carbohydrates include whole grain breads and cereals, starchy vegetables, and legumes. Many of the complex carbohydrates are good sources of fiber.

Protein is a category of nutrients. Protein is required to build and maintain bones, muscles, and skin. Proteins sources in the diet are meat, dairy products, nuts and certain grains, and beans. Proteins from meat and other animal products are considered complete proteins. This means they supply all of the essential amino acids the body requires and cannot make. Plant proteins are called incomplete proteins. Plant proteins require a combination of different sources to provide the body with all the essential amino acids the body needs.

Fiber is a substance in plants. Dietary fiber is the kind you eat. It is a type of carbohydrate. It may also see it listed on a food label as soluble fiber or insoluble fiber. Both types have important health benefits.

Electrolytes are naturally occurring minerals in the body that carry an electric charge. Electrolytes aid in the movement of water throughout the compartments of the body. Electrolytes affect the amount of water in the body, the acidity of blood (pH), muscle function, and other important processes. Electrolytes are lost in sweat and therefore must be readily

⁶¹ U.S. Marine Corps, *MCO 10110.14N*.

replaced by consuming foods or drinks containing electrolyte minerals. Examples: sodium, potassium, chloride, calcium, magnesium, phosphorus.

Fat is a category of nutrients. Fat is needed in the diet in small amounts. Fats provide energy and help the body absorb vitamins. Dietary fat also contributes to cholesterol levels. Fats are a general term; there are many types of fats, to include: saturated fats such as butter, solid shortening, and lard; trans fats such as vegetable shortenings, some margarines, crackers, cookies, snack foods, and other foods made with, or fried in, partially hydrogenated oils. Both saturated and trans-fat intakes should be limited. Replacing with unsaturated fats such as canola, olive, safflower, sesame, or sunflower oils are considered healthier alternatives.

Saturated fats are fats found in large amounts in meat and dairy products, and in some vegetables such as coconut, palm, and palm kernel oils. Eating large amounts of saturated fats raises blood cholesterol levels in many individuals, increasing their risk for heart disease.

Cholesterol is a fat-like substance present in all animal foods. Dietary cholesterol, to a lesser extent than saturated fats, raises blood cholesterol levels in many individuals, increasing their risk for heart disease.⁶²

c. Nutrition Education Policy for Marines

MCO 10110.49 establishes policies relating to educating Marines about nutrition. As an administrative note, where the order has stated “Services” and “servicemember/member,” the author has replaced with “Marine Corps” and “Marine” to lend more specificity. The order states that the Marine Corps will incorporate nutrition education throughout every Marine’s career life, starting with fundamental knowledge at boot camp, and including topics like nutrient timing and field ration use/composition.⁶³ It also says that the nutrition messages should be consistent, incorporating information from MyPlate.gov and the most up-to-date Dietary Guidelines from the USDA and HHS.⁶⁴ It directs Marine Corps chow halls to “provide a variety of healthy food and beverage choices for all [Marines] and use color-coded nutritional labeling...to reinforce the

⁶² U.S. Marine Corps.

⁶³ Departments of the Army, Navy, and Air Force, *Nutrition and Menu Standards for Human Performance Optimization*.

⁶⁴ Departments of the Army, Navy, and Air Force.

nutrition message and to encourage healthy eating habits.”⁶⁵ The Marine Corps’ program for managing policies related to chow halls is detailed in MCO 10110.14N, and will be discussed in the next section. The color-coded nutritional labeling that the Marine Corps uses is part of a program called the USMC Fueled to Fight Mess Hall Nutrition Education Program, which will be elaborated upon in a later section.

The order also requires the Marine Corps to develop and/or “refine programs that promote and support healthy and adequate dietary intake” such as:

- Weight management program – assessing readiness for change, individualized lifestyle changes, nutrition counseling, self-monitoring, behavioral training, physical training, and relapse prevention
- Initial military training performance fueling programs
- Diner nutrition educational programs
- Vending machine educational programs⁶⁶

The four programs in the above list are for reference purposes only and will not be further discussed for this research.

3. The Marine Corps Food Service and Subsistence Program

As noted in the previous section, The Marine Corps Food Service and Subsistence Program, delineated in MCO 10110.14N (last updated in March 2018), serves “to issue policies for the management, operation, budgeting, and administration of garrison mess halls, field messes, and subsistence management.”⁶⁷ It lists roles and responsibilities of the Commandant of the Marine Corps to installation and unit commanders, and everyone in between. This section will focus on information extracted from Chapter 19 “Nutritional Standards” and Appendix A “Menu Standards” of MCO 10110.14N.

d. Highlights from the Nutritional Standards Chapter

This program aligns itself with the nutrient recommendations and principles provided by MCO 10110.49 Nutrition and Menu Standards for HPO, Dietary Guidelines

⁶⁵ Departments of the Army, Navy, and Air Force.

⁶⁶ Departments of the Army, Navy, and Air Force.

⁶⁷ U.S. Marine Corps, *MCO 10110.14N*.

for Americans, MyPlate.gov, and USMC Fueled to Fight Mess Hall Nutrition Education Program. The first two of these were elaborated upon in previous sections. The latter two will be discussed in Section C of this chapter.

The order reinforces the information provided in Section 1A, 1B, and 1C of this chapter. Additionally, it affirms six essential nutrients for Marines as carbohydrate, protein, and fat (which provide calories/energy) and vitamins, minerals, and water (no calories but necessary energy nutrients to function properly).⁶⁸ It quotes the Dietary Guidelines for Americans 2020–2025, “Nutritional needs should be met primarily from foods. Individuals should aim to meet their nutrient needs through healthy eating patterns that include nutrient-dense foods.”⁶⁹ This statement highlights the significance of prioritizing healthy food choices and consistency as the basis of proper nutrition, over things like supplements. On the subject of healthy eating patterns, the order declares they “can be tailored to [an] individual’s socio-cultural and personal preferences” because such patterns are adaptable and flexible.⁷⁰ Eating healthfully need not be associated with rigidity for anyone; instead, it can allow an individual to explore and incorporate variety.

e. Chow Hall Management and Menus

The majority of food for the Marine Corps, 47 mess halls statewide, is currently contracted to the company Sodexo.⁷¹ Sodexo’s mission for food servicing the DOD is to guide “towards physical, mental and motivational readiness, preparing and maintaining them for sustainable peak performance”⁷² Marines in food service-related MOSs work with Sodexo employees at the various chow halls Corps-wide. Together they develop menus based on the menu guidance provided in MCO 10110.14N. In the notes of these

⁶⁸ U.S. Marine Corps.

⁶⁹ U.S. Marine Corps.

⁷⁰ U.S. Marine Corps.

⁷¹ U.S. Department of Defense, “Contracts for July 9, 2018,” U.S. Department of Defense, accessed June 23, 2021, <https://www.defense.gov/Newsroom/Contracts/Contract/Article/1570101/>.

⁷² “Sodexo Catering and Facilities Management Services for Defense,” Sodexo Group, 2020, <https://www.sodexo.com/home/your-industry/defense.html>.

figures, the “Contractor” would be Sodexo at this time. Figures 10, 11, and 12 represent the standard breakfast, lunch/dinner, and fast-food menus for Marine Corps chow halls. The cold bar menu is not included as a figure in this research due to formatting errors in the original publication; its menu items will be discussed in the next paragraph. Please note that not all chow hall standard menus are mentioned or listed as figures in this research. There are others, like the beverage and condiment menus, that are not highlighted here.

The cold bar, or salad bar, is available with varying items at breakfast, lunch, and dinner times at the chow hall. The standard cold bar menu for all meals includes: spinach, tomatoes, carrots, celery, bell and jalapeno peppers, onions, olives, peas or beans, assorted seeds/nuts, a variety of fresh/canned/frozen fruit, yogurt, and chopped hard-boiled eggs.⁷³ In addition to these items, the following additional ones are added during lunch and dinner times: cucumbers, broccoli or cauliflower, salad dressings, fruit flavored gelatin, salad croutons, crackers, bacon bits, and three specialty salads (like tuna and chicken salads).⁷⁴ There is quite a variety for individuals who choose to assemble a cold salad for themselves. The cold bar is a great source of nutrients for Marines to choose from in order to meet recommended daily amounts of fruits and vegetables.

Next will be a simple analysis of main line menu items. For the standard breakfast menu (Figure 10), by category of vegetables, fruits, grains, protein, dairy, and desserts, the following are available to choose from:

- Four fruits (fresh and assorted)
- One vegetable (potatoes)
- Three grains (mostly cereals)
- Five proteins (eggs and breakfast meats)
- Two dairies (both yogurt)

⁷³ U.S. Marine Corps, *MCO 10110.14N*.

⁷⁴ U.S. Marine Corps.

- Two desserts (breakfast pastries)

To give perspective to the proportions being served separate from the cold bar, there is a 1:1 vegetable/fruit to protein ratio being served for main line items. Additionally, the three grains are cereals (four types), one rotating hot cereal, and either pancakes, waffles, or French toast.

For the standard lunch/dinner menu (Figure 11), the following food categories/types are available to choose from:

- Three vegetables (one always potatoes)
- One grain (pasta or rice)
- Two entrees (likely proteins)
- One soup
- Three desserts

Excluding the cold bar menu options, there is a 1:1 vegetable to dessert ratio during lunch/dinner times. A Marine would need to be discerning of items like the soup (to make sure it was not high sodium as is suggested by USDA for some soups) and the desserts (to not overconsume added sugars and saturated fats by USDA dietary standards). Another interesting observation is that for the breakfast and lunch/dinner menus, there is a note that reads “whole grain starches such as brown rice, white whole wheat pasta will be incorporated as appropriate”⁷⁵ – which means there is not a hard requirement to incorporate whole grains for say half of the time, as suggested by the USDA and HHC guidelines.

Finally, there is the standard fast-food menu (Figure 12) which items are intended to “increase meal participation by...[reducing] the time lost waiting in line and increase customer satisfaction.”⁷⁶ Although designed for Marines’ eating flexibility, the issue

⁷⁵ U.S. Marine Corps.

⁷⁶ U.S. Marine Corps.

with this menu is the majority of its items are categorized by the USDA as some of the top high sodium and high fat offenders (sandwiches, mixed dishes, desserts/sweet snacks, etc.).

Overall, the chow hall does well to ensure lean meats and low-fat dairy products are used in their menus. However, given this rudimentary menu examination, the preponderance of food items seems to be more skewed toward on proteins and grains than vegetables and fruits. That is to say, unless a Marine were aware of and committed to adequate dietary proportions and recommendations, it would be easy for him to form an unhealthy dietary pattern with the options offered at the chow hall. On the other hand, if a Marine were informed and enthusiastic about well-balanced nutrition, he would do well to focus most of his plate on selections from the cold bar menu, be attentive to nutrient dense main line menu options, and be wary of the fast-food menu and dessert selections. One explanation for such less healthful items on chow hall menus is the demand for them by Marines, who want and request them. One responsibility for The Surgeon General of the Navy is to “influence food choices to ensure mission is met without sacrificing morale”⁷⁷ Simply stated, such items may be present as a means to create morale for the Marines.

⁷⁷ Departments of the Army, Navy, and Air Force, *Nutrition and Menu Standards for Human Performance Optimization*.

MENU ITEM	MINIMUM STANDARD
Fresh Fruit	Four types of assorted fruit daily; one type will be seasonal fruit; rotate choices
Hot Breakfast Cereal	One type of hot cereal; rotate choices
Ready-to-Eat Cereal	Three types of cereal; rotate choices
Ready-to-Eat Cereal	One type of cereal that is non-presweetened and fortified with folic acid, calcium, and iron; Rotate choices
Eggs to Order	Patron choice
Assorted Omelets	Patron choice
Hard Cooked Eggs	Serve daily
Creamed Beef	Serve daily
Breakfast Meats	Two types of breakfast meats; rotate choices
Potato Product	Serve daily
Pancakes, French Toast, or Waffles	Rotate choices
Breakfast Pastry	Two breakfast pastries daily; rotate choices
Assorted Flavored Yogurt, Low Fat	Two types of yogurt; rotate choices
Additional Standards: 1. Breakfast and breakfast/brunch meals will be served daily. 2. One time every seven days a fresh potato recipe will be served. Prepared or purchased hash brown potatoes and/or tater tots will not be substituted for fresh potato recipes. 3. Pork or turkey sausage or bacon may be served for the breakfast meals. 4. Ground turkey fat content will not exceed 10%. a. Ground turkey may be substituted for ground beef, provided the use of ground turkey is supported with an AFRS recipe. b. Customer acceptability will be a primary factor in determining when it is appropriate to substitute ground turkey. 5. Ground beef fat content will not exceed 15%. Note: All of the above menu items where appropriate will follow the guideline of the DOD Menu Standards 1338.10.	

Figure 10. Standard Breakfast Menu for Chow Hall.⁷⁸

⁷⁸ Source: U.S. Marine Corps, *MCO 10110.14N*.

MENU ITEM	MINIMUM STANDARD
Soup	Served every meal
Entrée	Two entrees served every meal
Vegetables	Two vegetables will be served every meal
Potato or potato substitutes	Two potato, pasta, or rice choices will be offered for every meal. When Bread dressing is a menu item, it will be served in addition to the two choices. Dressing (i.e. bread dressing) will be served in addition to the two choices
Dessert	Three desserts will be served for every meal. One type of pie, cake, cookie or pudding bar will be provided. The same desserts will be served for lunch and dinner meals
1. An appropriate sauce or gravy will be offered separately as an accompaniment to an entrée. 2. At least one soup will be offered daily. A different type of soup will be served for the second meal when two soups are offered on the day's menu. Soup ingredients should differ from other menu selections of the meal. 3. Potatoes and/or potato substitutes will be offered at each meal to complement the entrée. The exceptions are meals that already contain pasta, rice, or potatoes, such as lasagna. One non-fried potato/potato substitutes shall be offered as a choice. 4. Two cooked vegetables will be served in addition to the potato choice. The exceptions are meals with entrees that already contain vegetables, such as beef stew. 5. Not more than one gas-forming cooked vegetable such as cabbage, cauliflower, broccoli, brussel sprouts, and dried beans and peas will be offered per meal. 6. Not more than one starchy vegetable (corn, lima beans, peas) will be served per meal. 7. If a fried vegetable is served, the second vegetable option will be prepared without extra sauces or fried. 8. Whole grain starches such as brown rice, white whole wheat pasta will be incorporated as appropriate. 9. One Green item will be served on the main line in the following categories, meat/entrée, starch, and vegetables. 10. The exception is if only two entrees are on the line then one item may be Green or Yellow. 11. One entrée selection will be a healthier option containing not more than 15g fat per serving.	

Figure 11. Standard Lunch/Dinner Menu for Chow Hall.⁷⁹

⁷⁹ Source: U.S. Marine Corps.

MENU ITEM	MINIMUM STANDARD
12. Ground turkey fat content will not exceed 10%. a. Ground turkey may be substituted for ground beef, provided the use of ground turkey is supported with an AFRS recipe. Additionally, the substitution of ground turkey will not be used if there is already a poultry entrée on the menu for that meal. b. Customer acceptability will be a primary factor in determining when it is appropriate to substitute ground turkey.	13. Ground beef fat content will not exceed 10%. 14. Beef patty fat content will not exceed 15%. 15. Meats that require carving will be performed at a carving station on the serving line. 16. Dinner meals when only two meals are served in the day and holiday meals will consist of higher priced meat entrees. 17. Holiday meals will include an appetizer and dinner rolls. 18. Excessive fat will be trimmed from meats prior to carving and serving.

Figure 12. Standard Lunch/Dinner Menu for Chow Hall (continued)⁸⁰

⁸⁰ U.S. Marine Corps.

STANDARD FAST FOOD AND FAST FOOD CONDIMENT LUNCH, DINNER, AND BREAKFAST/BRUNCH MENU	
MENU ITEM	MINIMUM STANDARD
Soup	Served every meal
Hamburgers	Serve for all breakfast/brunch, lunch and dinner meals
Cheeseburgers	Serve for all breakfast/brunch, lunch and dinner meals
Grilled Chicken	Serve for all breakfast/brunch, lunch and dinner meals
Hot Dogs	Serve for all breakfast/brunch, lunch and dinner meals
Specialty Sandwiches	Two types of specialty sandwiches will be provided for lunch and dinner meals and one type of specialty sandwich will be provided for breakfast/brunch.
French Fries	Serve for all breakfast/brunch, lunch and dinner meals
Onion Rings	Serve for all breakfast/brunch, lunch and dinner meals
Baked Beans	Serve for all breakfast/brunch, lunch and dinner meals
Potato Chips	Serve for all breakfast/brunch, lunch and dinner meals
Lettuce Leaves	Serve for all breakfast/brunch, lunch and dinner meals
To go container	Available to take items from the salad bar
Tomato Slices	Serve for all breakfast/brunch, lunch and dinner meals
Onions Sliced/Diced	Serve for all breakfast/brunch, lunch and dinner meals
Pickle Slices	Serve for all breakfast/brunch, lunch and dinner meals
- At least one soup will be offered daily. - A different type of soup will be served for the second meal when two soups are offered on the day's menu. - Soup ingredients should differ from other menu selections of the meal. Example: avoid serving entrées containing tomato sauce with tomato soup, baked beans with bean soup. The type of soup must be specified on the menu. Terms such as "soup of the day" will not be used. - One entrée selection will be a healthier option and coded green IAW the F2F® criteria. - Ground turkey fat content will not exceed 10%. - Ground turkey may be substituted for ground beef, provided the use of ground turkey is supported with an AFPS recipe. - Customer acceptability will be a primary factor in determining when it is appropriate to substitute ground turkey. - Ground beef fat content will not exceed 10%. - Beef patty fat content will not exceed 15%. - This menu is optional for the dinner meals on days when two meals are served. When fast food is not provided the serving line will provide the standard dinner menu for this meal. - Specialty sandwich must be a healthier option and coded green IAW the F2F® criteria. - One side dish/starch must be a healthier option and coded green IAW the F2F® criteria.	

Standard Fast Food/Condiment Menu (Continued)

Figure 13. Standard Fast-Food Menu for Chow Hall.⁸¹

⁸¹ Source: U.S. Marine Corps.

B. ATHLETE PERFORMANCE AND NUTRIENT TIMING

There are several considerations regarding food and timing when discussing athletes, as their needs will vary relative to the average American. After the content of the food or nutrient itself, the second most important consideration is timing of consumption—especially for persons regularly exerting themselves physically at high levels. Optimizing the timing of nutrients can positively affect how the body performs physically and mentally.

1. Athlete versus Tactical Athlete

“Athlete” and “tactical athlete” are two terms that share both similarities and differences. *Merriam-Webster* defines “athlete” to be “a person who is trained or skilled in exercises, sports, or games requiring physical strength, agility, or stamina.”⁸² By this definition, a Marine could indeed be defined as an athlete because he is physical trained to perform combat exercises requiring physical strength, agility, and stamina. Proof of this lies the rigor of various training throughout a Marine’s career. In terms of energy requirements for an athlete, they will “depend on the periodized training and competition cycle, and will vary from day to day throughout the yearly training plan relative to changes in training volume and intensity.”⁸³ Traditional athletes usually experience an off-season of training and a season of competing; this is not necessarily the case for Marines. A derivative of the term “athlete” may be more appropriate to embody what a Marine is. Scofield and Kardouni offer concise insight on this matter and define the tactical athlete as

Professionals that require expertise in their occupational skills concomitant with general physical preparedness, which enable them to perform physically demanding occupational tasks while mitigating injury. These tactical professionals are required to possess physical and mental preparedness necessary to effectively operate in their occupation emphasizing the importance of up-to-date hydration guidelines to optimize performance and highlight potential differences in traditional athletes and

⁸² *Merriam-Webster*, s.v. “athlete,” accessed July 6, 2020, <https://www.merriam-webster.com/dictionary/athlete>.

⁸³ Academy of Nutrition and Dietetics, Dietitians of Canada, American College of Sports Medicine, “Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance.”

their tactical counterparts. Uniformity of tactical athletes becomes the explicit requirement of baseline physical fitness, with the potential occupational requirement of confronting and overcoming physical, environmental, and human threats with little to no advanced notice setting them apart from civilian athletes. While traditional players train and compete in seasons, those considered tactical know their position requires them to operate “in season” constantly. Anything short of optimal performance for any tactical athlete can be the difference between life and death.⁸⁴

The highlights that stand out from this definition are performance “while mitigating injury” and that unlike traditional athletes, tactical athletes must always be physically ready to “compete” tactically because there is never an off-season.⁸⁵ Of course there are different MOSs, billets, and missions that will vary the playing field but overall, Marines are tactical athletes that must be ready at all times. For the purposes of this research and subsequent sections, tactical athletes are still considered athletes.

2. Purpose of a training diet

A training diet is when “athletes...consume energy that is adequate in amount and timing of intake during periods of high-intensity and/or long duration training to maintain health and maximize training outcomes.”⁸⁶ Ultimately, a training diet allows an athlete to:

- Stay healthy
- Prevent injuries
- Maximize the functional and metabolic adaptations to a periodized exercise program

⁸⁴ Taylor K. Zak, Christina M. Hylden, and Anthony E. Johnson, “Hydration Strategies for the Female Tactical Athlete,” *The United States Army Medical Department Journal* PB 8–18-1/2/3/4/5/6, January-June 2018 (2018): 116.

⁸⁵ Zak, Hylden, and Johnson.

⁸⁶ Chad M. Kersick et al., “International Society of Sports Nutrition Stand: Nutrient Timing,” *Journal of the International Society of Sports Nutrition*, 2017, 21, <https://doi.org/10.1186/s12970-017-0189-4>.

- Recover quickly⁸⁷

The downside of an athlete not adopting an adequate training diet is a lack of sufficient energy. “Low energy availability can result in unwanted loss of muscle mass; menstrual dysfunction and hormonal disturbances; suboptimal bone density; an increased risk of fatigue, injury, and illness; impaired adaptation; and a prolonged recovery process.”⁸⁸

3. When and which nutrients affect performance most?

Although “athletes should consume diets that provide at least the [Recommended Daily Allowances] ...for all micronutrients,”⁸⁹ the following have the most positive, short-term effect on physical performance:

- Water
- Sodium/Electrolytes
- Carbohydrates
- Protein

The time periods to consider these nutrients’ ingestion is before, during, and after a workout. “The hours leading up to competition are often a highly prioritized period of feeding and studies have indicated that strategic fuel consumption can help to maximize muscle and liver glycogen levels.”⁹⁰ The priority during a workout is to maintain healthy levels of nutrients to sustain energy. The priority after a workout is to replenish nutrients adequately to support recovery. Though there may be variance among the athletes, the

⁸⁷ Academy of Nutrition and Dietetics, Dietitians of Canada, American College of Sports Medicine, “Position of the Academy of Nutrition and Dietetics, Dietitians of Canada, and the American College of Sports Medicine: Nutrition and Athletic Performance.”

⁸⁸ Academy of Nutrition and Dietetics, Dietitians of Canada, American College of Sports Medicine.

⁸⁹ Kersick et al., “International Society of Sports Nutrition Stand: Nutrient Timing.”

⁹⁰ Kersick et al.

following subsections detail principles and practices when calculating replenishment frequency and nutrient amounts.

f. Water and Sodium / Electrolytes

Water is essential to the life of many species. For humans, and in this case athletes, hydrating properly is not only the key to survival, but optimizing functions of the body. Proper hydration is having the right balance of water in the body at a given time, so the body is neither dehydrated nor overhydrated. There are serious health risks associated with both dehydration and overhydration, with the worst being death. The amount of water will vary according to an athlete's weight and daily caloric intake. The following recommendations are taken from a 2018 article from The United States Army Medical Department Journal regarding water and sodium intake during the workout phases of preparation (before), maintenance (during), and recovery (after):

- Preparation: Hydration before exercise should be at a comfortable rate of ≈ 5 to 7 mL/kg at least 4 hours prior to the event to allow for sufficient absorption, distribution, and regulation of urine output. If time leading up to event is too short (overlaps significantly with recovery from last exercise), the addition of salted or sodium-containing foods are of benefit as they act to stimulate thirst and retain the consumed fluids.
- Maintenance: Replace fluid at a rate to offset sweat losses, keeping body weight loss less than 2%, while retaining electrolyte balance. A suggested starting rate ranges from 0.4 to 0.8L/hour drawn from marathon runners.
- Recovery: Replace any fluid and electrolyte deficits that have accumulated throughout exercise. If recovery time and opportunity permit, common sodium-containing meals and snacks consumed with a sufficient volume of plain water is enough to bring the athlete back to baseline.²⁰ While many focus on water, during any recovery period, failure to replace sodium will greatly hamper return to euhydration. In many, if not most situations, tactical athletes will be required to have shortened recovery periods. If time between the end of one exercise and the beginning of the next is less than 12 hours, one should consider this a rapid recovery, and steps should be taken to expedite the athlete's return to equilibrium. While sodium losses are even more difficult to assess than water losses, their intake becomes significantly

more important during this rapid recovery and extra salt in meals and recovery fluids may be appropriate.⁹¹

It should be noted that this article emphasizes the cruciality of customized hydration plans, meaning that the above information should not be considered an absolute standard for all tactical athletes everywhere.

Replenishing electrolytes (sodium, potassium, calcium, and magnesium) is crucial for rehydration and muscle function.⁹² “salty snacks or meals, adding salt to foods, and drinking beverages that contain sodium. Electrolytes can be found in everyday foods including bananas and oranges (high in potassium), chocolate milk (high in calcium), nuts/seeds and whole grains (high in magnesium) as well as sports drinks, sports foods, or a combination.”⁹³

g. Carbohydrates

Carbohydrates are important fuel as part as a pre-exercise, during exercise, and post-exercise. Their frequency of replenishment will depend on the workout’s intensity and duration.

In heavy and continuous physical exercise, carbohydrate and fluid requirements are elevated, as both carbohydrate depletion and dehydration have been shown to decrease physical performance. Carbohydrate is an essential fuel during exercise for the strenuous muscle contractions. Carbohydrate stores in the body are, however, limited. Therefore, a person who engages in regular or strenuous, [highly] intensive, prolonged physical exercise should consume substantially greater amounts of energy and carbohydrate to fuel the demands of training.⁹⁴

“The delivery of carbohydrate remains a priority once a workout or competition commences. Most research has employed study designs that integrate some form of

⁹¹ Zak, Hylden, and Johnson, “Hydration Strategies for the Female Tactical Athlete.”

⁹² Human Performance Resources by CHAMP, “Guide to Nutrient Timing: In-Depth,” Human Performance Resources by CHAMP, 2019, <https://www.hprc-online.org/nutrition/performance-nutrition/guide-nutrient-timing-depth>.

⁹³ Human Performance Resources by CHAMP.

⁹⁴ Research and Technology Organization Task Group RTG-154 and North Atlantic Treaty Organization, “Nutrition Science and Food Standards for Military Operations.”

continuous aerobic exercise, and within these studies it has been consistently demonstrated that providing carbohydrate (230–350 mL of a 6–8% carbohydrate solution) at regular intervals (every 10–12 min) can optimize performance and maintain blood glucose levels.”⁹⁵

Carbohydrates not only drive the energy required for strenuous exertions over a prolonged period of time, but they are also vital to recovery. A study “showed that restoration of muscle glycogen was 50% faster and more complete over a four-hour post-exercise period when a carbohydrate bolus (2 g/kg of a 25% carbohydrate solution) was delivered within 30 [minutes] versus waiting until two hours after completion of a cycling exercise bout.”⁹⁶

h. Protein

For tactical athletes who are consistently working their bodies out, “protein needs are increased due to muscle recovery and synthesis.”⁹⁷ It is widely accepted that protein is essential for muscle recovery and growth. The timing of the protein ingestions matters too. One source suggests that for exercising individuals, it is optimal to space out the total intake of daily protein throughout the day at an interval of approximately every three hours.⁹⁸ Additionally, how much an athlete weighs correlates how much protein he or she should consume for optimal results. “Ingesting a 20–40 g protein dose (0.25–0.40 g/kg body mass/dose) of a high-quality source every [3–4 hours] appears to most favorably affect [muscle protein synthesis] rates when compared to other dietary patterns and is associated with improved body composition and performance outcomes”⁹⁹

⁹⁵ Kersick et al., “International Society of Sports Nutrition Stand: Nutrient Timing.”

⁹⁶ Kersick et al.

⁹⁷ Research and Technology Organization Task Group RTG-154 and North Atlantic Treaty Organization, “Nutrition Science and Food Standards for Military Operations.”

⁹⁸ Kersick et al., “International Society of Sports Nutrition Stand: Nutrient Timing.”

⁹⁹ Kersick et al.

i. Hydration and Nutrient Guides from Human Performance Resources

Two selected guides below help to summarize the aforementioned topics of essential nutrients. Both are designed for quick reference to a viewer. Figure 13 shows a urine color test used as a visual guide to determine hydration level and potential effect on physical performance. Figure 14 outlines basic timing of nutrient consumption as it pertains to time periods surrounding a physical workout, the duration of exertion, and associated food examples.

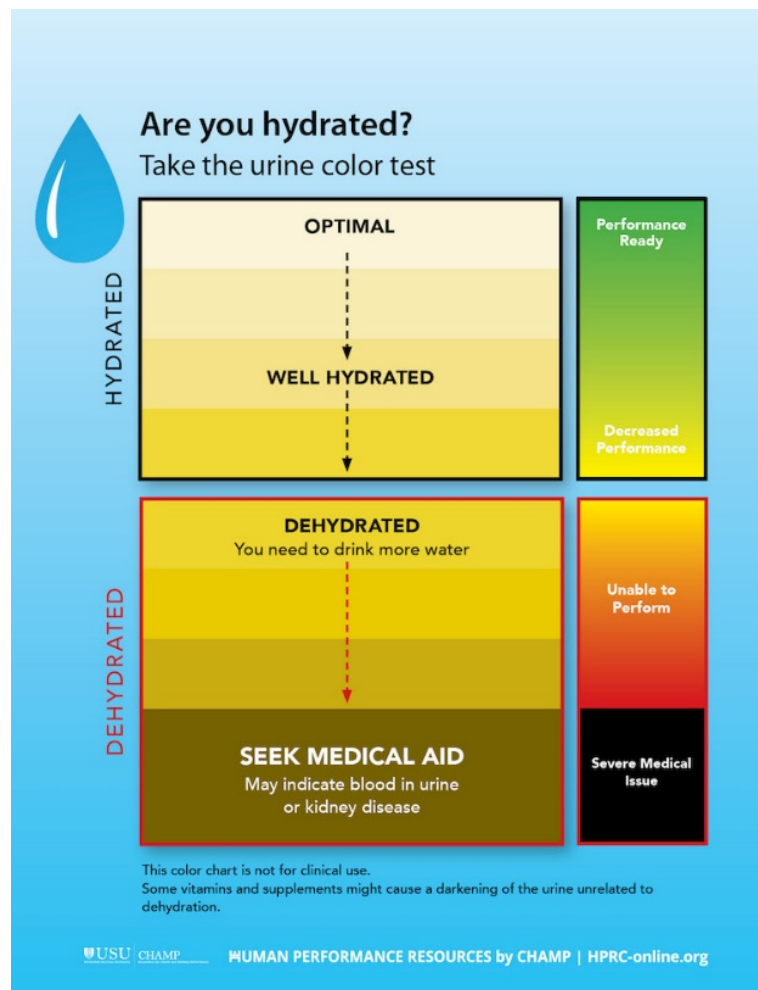


Figure 14. Urine Color Test for Hydration.¹⁰⁰

¹⁰⁰ Source: Human Performance Resources by CHAMP, “Guide to Nutrient Timing.”

Guide to nutrient timing: The basics

When you eat is just as important as **what** you eat for optimal performance. Fueling with the right types of food and fluids before, during, and after activity can mean the difference between mission success and failure.

	WHAT	WHEN	EXAMPLES
BEFORE YOU WORK OUT	For activity < 1 hour	A carb-rich meal or snack of 200–300 calories Avoid high-fat or high-fiber foods for easier digestion	30–60 minutes - Bread with jam - Cereal and milk - Banana or apple with nut butter
	For activity > 1 hour	1–4 g carb/kg (0.5–1.8 g carb/lb) Adjust timing and amount of carbs to match your schedule and activity	1–4 hours Examples for 185-lb person fueling 1g/kg: - Medium banana and 2 packets instant apple-cinnamon oatmeal - Orange juice and whole-wheat bagel with jelly - Waffles with syrup and berries
	Fluid	16 fl oz	2–4 hours Water
	Caffeine (Optional)	200 mg	30–60 minutes 16 oz coffee, 2 pieces caffeinated gum or mints
WHILE YOU WORK OUT	For activity > 1 hour	30–60 g carbs	Every hour At least 1–2 options (~25 g carb each) 1 sports gel 18 gummy bears 3 sport chews 25 jelly beans 20 mini-pretzels 2 squeezable fruit pouches ¼ cup raisins 16 oz sports drink
	For activity > 3 hours	Up to 90 g carbs	Every hour Up to 3.5 options from examples above (~25 g carb each)
	Fluid and Electrolytes	16–32 fl oz; adjust to environment and sweat rate Limit to 48 fl oz per hour Replenish electrolytes with food, sports drinks, or both	Every hour Water and/or sports drink 16 fl oz water bottle ½ 1-qt canteen 100 oz hydration pack (finish in 4–5 hours)
	Caffeine (Optional)	200 mg	Every 3–4 hours as needed 16 oz coffee, or 2 pieces caffeinated gum or mints ⚠️ Don't exceed 600 mg in 24 hours or 800 mg for sustained operations
AFTER YOU WORK OUT	Meal or snack	High in carbs (at least 50 g) with 15–30 g protein Include salty foods	Within 2 hours - Turkey and cheddar cheese on whole-wheat bread with an apple - Peanut butter and jelly on whole-wheat bread with chocolate milk - Low-fat Greek yogurt with trail mix and fruit
	Fluid	16 oz for every lb lost during exercise or until urine is pale yellow	Begin immediately after workout Water and/or sports drink

Figure 15. Guide to Nutrient Timing: The Basics.¹⁰¹

C. SELECT NUTRITION RESOURCES FOR ATHLETES

This section will highlight three education resources focused on nutrition for athletes. The first two have been mentioned in earlier sections: the Fueled to Fight (F2F) education program of the Marine Corps and the MyPlate.gov website. These two are

¹⁰¹ Source: Human Performance Resources by CHAMP.

focused on tactical athletes and servicemembers. The third resource is different because it is not affiliated with the DOD at all, but instead is a nutrition survey developed jointly by health experts from three Australian universities and one New Zealand university.

1. Fueled to Fight

The USMC F2F Mess Hall Nutrition Education Program, directed by MCO 10110.49, is a stoplight color-coded labeling system for foods (listed on the main line menu) at all Marine Corps chow halls, to support the Corps' weight control program and help Marines select foods "that will best fuel their body and mind for optimal performance."¹⁰² Figure 15 shows the F2F coding system and details the three categories (red, yellow, green) by nutrition quality and also provides nutrition specifics to four food classes (carbohydrates, proteins, fats, additives). The recommendation is for the proportions is that Marines follow the 80/20 Rule – eat foods that are best (green-labeled) 80% of the time, and the remaining types of the foods (yellow and red-labeled) 20% of the time.¹⁰³ This 80% is slightly less than what the Dietary Guidelines for Americans suggests, which is 85%.

MCO 10110.14N provides explanation of the three colors as follows:

1. Green "Engage at Will": defined as $\leq 30\%$ of calories from total fats, and $\leq 10\%$ of calories from saturated fat.
2. Yellow "Well Aimed Shots": defined as 31–49% of calories from total fats, and 11–15% of calories from saturated fat.
3. Red "Check Fire": defined as $\geq 50\%$ of calories from total fats, and $\geq 16\%$ of calories from saturated fat.¹⁰⁴

¹⁰² U.S. Marine Corps, *MCO 10110.14N*.

¹⁰³ Sharlene Holladay et al., "The Warfighter's Guide to Performance Nutrition" (Falls Church, VA: USU Consortium for Health and Military Performance, 2017), https://www.fitness.marines.mil/Portals/211/Docs/Nutrition%20Docs/Fueled%20for%20Fitness%20brochure%20web.Final_.pdf?ver=2018-01-03-112532-303.

¹⁰⁴ U.S. Marine Corps, *MCO 10110.14N*.

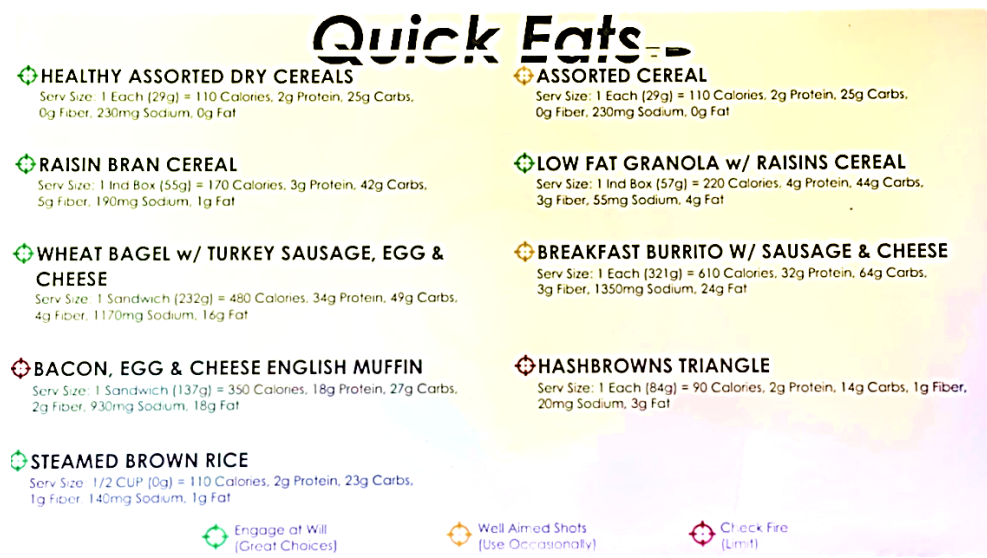
	Green	Yellow	Red
	Engage at Will	Well Aimed Shots	Check Fire
Overall Nutrition Quality	Least-processed Wholesome, nutrient dense High fiber Low in added sugar Healthy fats	Moderate-processed Lower in fiber Added sugars or artificial sweeteners Lower quality fats	Most-processed Lowest-quality nutrients Added sugar Excess fats and/or trans fats Fried foods
Nutrient Specifics: FATS	≤30% of calories from total fats and ≤10% of calories from saturated fat Foods with ≥30% calories from fats are considered healthier if mainly from unsaturated fats, including omega-3 fatty acids	31–49% of calories from total fats and 11–15% of calories from saturated fat Some fats can be consumed daily with close attention to portion size	≥50% of calories from total fats and ≥16% of calories from saturated fat Trans fats are not authorized in dining facilities and must be avoided Saturated fats
Nutrient Specifics: CARBOHYDRATES	Higher in fiber containing >3 grams of fiber Most foods that have <10 grams of added sugar	Most products made with white or refined flour or other refined grains Non-naturally occurring fibers: inulin, chicory root, polydextrose, maltodextrin	Low in fiber containing < 2 grams Most foods that contain >18 grams of added sugar
Nutrient Specifics: PROTEIN	Plant-based protein is almost always considered healthier Leaner cuts of animal-based protein is considered healthier based on the amount and type of fat it contains	Highly processed plant proteins such as soy protein isolate Lean cuts based on percentage of fat	Highly processed meats and meat products Fried animal proteins or cuts with visible fat
Other Specifics: ADDITIVES	No artificial sweeteners Naturally occurring foods generally do not have additives	Artificial sweeteners, including acesulfame potassium, aspartame (Equal®), saccharin (Sweet'N Low®), sucralose (Splenda®)	Trans fats Artificial colors are usually a marker of a highly processed food

Figure 16. Fueled to Fight Stoplight Color Coding System. The Warfighter's Guide to Performance Nutrition.¹⁰⁵

Overall, the coding system is well-organized and concise to read. It uses the simple concept of stoplight colors to help Marines internalize the takeaway of the system, which is to eat green-labeled foods with most abundance, monitor ingestion number of yellow-labeled foods, and be most restrictive with red-labeled food consumption. All

¹⁰⁵ Source: "Fueled to Fight, An Overview: Stoplight Color Coding System Criteria Green, Yellow, and Red Designations," U.S. Marines Corp, 2015, <https://www.fitness.marines.mil/Portals/211/Docs/Nutrition%20Docs/F2F%20Program%20Coding%20Criteria%20-%20AUG%202015.pdf?ver=2016-08-04-145125-337>.

chow halls have their main line and cold bar menus visible to their customers; the F2F color labels are placed next to each food item on that itemized menu. Figures 16 and 17 display samples of chow hall main line and cold bar menus with F2F coding. “The reference system is designed so that Marines can quickly ‘identify foods that are: less-processed, most wholesome, nutrient-dense, and those which are high in fiber, low in added sugar, and contain healthy fats.’”¹⁰⁶ According to MCO 10110.14N, the main line menu must be 30% “Green” (at a minimum) in hot vegetable, starch, and entrée categories.¹⁰⁷ Additionally, the F2F program “must incorporate updates from “DOD Menu Standards, USDA Dietary Guidelines, and Joint Military Medical Services Nutrition and Menu Standards for HPO publications.”¹⁰⁸



Photograph taken inside 21 Area Chow Hall on Camp Pendleton in 2021.

Figure 17. Chow Hall Main Line Menu with F2F Labeling.

¹⁰⁶ U.S. Marine Corps, *MCO 10110.14N*.

¹⁰⁷ U.S. Marine Corps.

¹⁰⁸ U.S. Marine Corps.



Photograph taken inside 21 Area Chow Hall on Camp Pendleton in 2021.

Figure 18. Chow Hall Cold Bar Menu with F2F Labeling

2. MyPlate.gov

ChooseMyPlate.gov, or MyPlate.gov, is a concept and website started in 2011 by the USDA. More specifically, the website is one resource among several (including the Dietary Guidelines for Americans), that is managed by the USDA Center for Nutrition Policy and Promotion.¹⁰⁹ The main product of this website is a simple image (Figure 18) that “illustrates the five food groups that are the building blocks for a healthy diet, using a familiar image—a place setting for a meal.”¹¹⁰

¹⁰⁹ U.S. Department of Agriculture, “MyPlate,” accessed June 19, 2021, <https://www.myplate.gov/>.

¹¹⁰ Departments of the Army, Navy, and Air Force, *Nutrition and Menu Standards for Human Performance Optimization*.



Figure 19. MyPlate Graphic.¹¹¹

Figure 18 represents specific recommendations from MyPlate.gov as:

- Make half your plate fruits and vegetables: focus on whole fruits.
- Make half your plate fruits and vegetables: vary your veggies.
- Make half your grains whole grains.
- Vary your protein routine.
- Move to low-fat or fat-free dairy milk or yogurt (or lactose-free dairy or fortified soy versions)¹¹²

Similarly, Figure 18 would be interpreted by the Nutrition and Menu Standards for HPO into the following action statements:

1. Strive to make half the plate fruits and vegetables. At a minimum consume two and a half (2.5) cups of vegetables per day and two (2) cups of fruit per day.
2. Consume whole grains at least half the time.
3. Consume a good source of calcium and vitamin D at least three times per day. Good sources include one (1) cup of milk, yogurt, or fortified soy/almond/rice milk.
4. Vary the protein food sources daily (lean meat, poultry, or fish; egg; tablespoon peanut butter; nuts or seeds; beans or peas).¹¹³

¹¹¹ Source: U.S. Department of Agriculture, “MyPlate.”

¹¹² U.S. Department of Agriculture.

Regarding the concept, MCO 10110.49 states that both “leaders and food service personnel will encourage and promote the consumption of foods in accordance with [MyPlate.gov]” so that through leaders’ examples, Marines will “think about what goes on the plate or in the cup or bowl.”¹¹⁴ The MyPlate proportions are: half of the plate be vegetables/fruits, a quarter are grains, a quarter is protein, and a serving of dairy. When comparing standard chow hall menu proportions to those recommended by MyPlate, they do not correspond well. The quantities of foods the chow hall serves are disproportionate with the serving types in MyPlate as they are skewed more toward main line entrees, proteins, and grains than cold bar vegetables and fruits.

In addition to the graphic, the MyPlate.gov website features an interactive setup where a user can access a breadth of nutrition information, including links to recipes, tips, and other tools like customizing a healthy diet.

3. Marines.mil and Human Performance Resources by CHAMP

The official website of the Marine Corps is www.marines.mil; within it are several resources including a section on Performance Nutrition which includes digital access to the Dietary Guidelines for Americans 2020–2025, the F2F program, the Charge by Sodexo application, and a combat feeding directorate known as Warfighter’s Guide to Performance Nutrition and Operational Rations (released in 2017). This directorate provides a summary of nutrition knowledge regarding energy, carbohydrates, protein, fats, hydration, vitamins, and nutrient timing and recovery, and includes vignettes to practice planning for real-life scenarios.¹¹⁵ The Performance Nutrition webpage on Marines.mil also has links to other websites managed by Uniformed Services University (USU) and the Consortium for Health and Military Performance (CHAMP).

CHAMP “carries out and translates research to improve service member performance ...[aiming] to be [the] DOD’s best resource for evidence-based information

¹¹³ Departments of the Army, Navy, and Air Force, *Nutrition and Menu Standards for Human Performance Optimization*.

¹¹⁴ Departments of the Army, Navy, and Air Force.

¹¹⁵ Holladay et al., “The Warfighter’s Guide.”

on HPO.”¹¹⁶ Additionally, CHAMP claims “to bridge the gap between science and best practices to the operational setting” for the warrior athlete.¹¹⁷ One website managed by CHAMP is entitled Human Performance Resources (HPRC) available at www.hprc-online.org. This website is teeming with information, articles, and material related to performance nutrition, mental health, injury prevention and recovery, total force fitness strategies, sleep and stress, COVID-19 resilience resources, and physical training and performance.¹¹⁸ Overall, the website is rich in applicable content to the tactical athlete. One small example is Figure 19, 3 Keys to Optimal Nutrition. The graphic is a simple summary of the principles introduced earlier in this research. It categorizes these healthy eating principles into three categories: balance, quality, and timing.

¹¹⁶ Melissa Givens, “CHAMP,” 2021, <https://champ.usuhs.edu/>.

¹¹⁷ Givens.

¹¹⁸ “Human Performance Resources,” HPRC-online.org, accessed June 25, 2021, <https://www.hprc-online.org>.

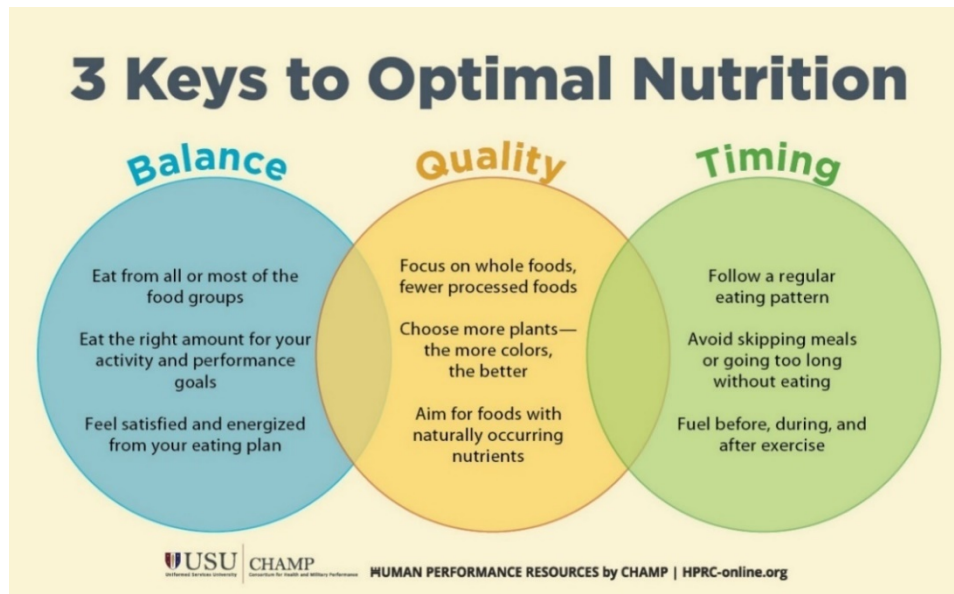


Figure 20. 3 Keys to Optimal Nutrition.¹¹⁹

4. PEAKS-NQ Survey

One resource not in practice in the Marine Corps is a formal nutrition survey distributed on a large scale. The Marine Corps is no stranger to surveys, in fact it is required to administer them regularly for purposes of unit safety, morale and welfare, etc. Such surveys are intended to assure that formal practices are being met at every applicable level.

After years of analyzing and perfecting survey's methods, content, and feedback, sports nutritionists in Australia and New Zealand developed a 94-item nutrition survey known as the Platform to Evaluate Athlete Knowledge of Sports Nutrition Questionnaire (PEAKS-NQ).¹²⁰ The survey is electronic and “aims to assist in rapid identification of knowledge gaps in athlete cohorts and facilitate the tailoring and evaluation of nutrition

¹¹⁹ Source: Human Performance Resources by CHAMP, “3 Keys to Optimal Nutrition,” Total Force Fitness, accessed June 25, 2021, <https://www.hprc-online.org/nutrition/performance-nutrition/3-keys-optimal-nutrition>.

¹²⁰ Ryan Tam et al., “Development of an Electronic Questionnaire to Assess Sports Nutrition Knowledge in Athletes,” *Journal of the American College of Nutrition*, 2020, <https://doi.org/10.1080/07315724.2020.1723451>.

education interventions.”¹²¹ It is important to know in what areas there are lapses in understanding before trying to customize recommendations for the athlete.

Another considerable focus of the survey’s creation regarded the timeliness of feedback given to the athlete. The survey’s study quotes that “rapid delivery of feedback [facilitates] improvement in outcomes” and that an electronic survey is a part of the solution for quickly providing that feedback.¹²² Two other notable parts of the PEAKS-NQ is that it uses “food images to assess different sources of nutrients, a novel approach emulating “real world” scenarios where athletes need to make independent food choices” and its framework allows “for adaptation to various cultures and food supplies.”¹²³ Figure 20 summarizes the six sections of the survey, the knowledge domain assessed in each, and a few descriptive details.

Table 5. Framework Summarizing Items in the PEAKS-NQ.

Section (total items; n = 94)	Knowledge domain assessed	Description
Section A Demographics (n = 11)	N/A	Age, weight, height, sport, caliber, education, previous nutrition education
Section B Food Groups (n = 13)	Food group classification	Classification of foods into groups
Section C Nutrients (n = 36)	Macronutrients and micronutrients	Identification of important macro- and micronutrients in foods and their functions Iron inhibitors and enhancers
Section D Applied Sports Nutrition (n = 14)	Fueling and recovery	Pre/post/during exercise food selection Fueling recommendations and consequences
Section E Competition Nutrition (n = 13)	Body composition Event nutrition Hydration	Strategies to alter body composition (gain and loss) Pre/post/during fueling and hydration Hydration guidelines Identifying dehydration Rehydration drinks
Section F Supplements and Special Concerns (n = 7)	Travel nutrition Vitamins, minerals and supplementation Low energy availability Extreme environments	Food and drink considerations for traveling athletes – including safety Vitamin and mineral use Supplement safety RED-S ^a Extreme environments (altitude, cold, hot)

^aRelative energy deficiency in sport (RED-S).

Figure 21. Framework Summarizing Items in the PEAKS-NQ.¹²⁴

¹²¹ Tam et al.

¹²² Tam et al.

¹²³ Tam et al.

¹²⁴ Source: Tam et al.

D. SOCIAL INFLUENCE TACTICS FOR NUTRITION CHANGE

The Marine Corps, like many other organizations, is a social one. Even more social because often Marines will spend more than just work time with one another: they will often socialize together, work out together, and eat together. The social nature of Marine Corps culture makes it a ripe ground from which social influence tactics can be used to encourage beneficial behaviors. According to Anthony R. Pratkanis, a “social influence tactic is any noncoercive technique, device, procedure, or manipulation capable of creating or changing the belief or behavior of a target of the influence attempt.”¹²⁵ He elaborates to say that social influence includes such actions as “conformity (creating/changing behavior/belief to match the response of others), persuasion/attitude change (change is response to a message/communication), and compliance (change in response to an explicit request).”¹²⁶

1. Valence Framing

Valence Framing is when “critical information concerning a decision can be cast in a positive (gain) or negative (loss) way.” When issues, like the types of foods ingested by a Marine, are framed in terms of losses (as opposed to gains), it will generate motivation to avoid the loss.¹²⁷

2. Be a Credible Source

Because people desire to have an accurate attitude regarding subjects like nutrition, expert and trustworthy sources were more effective in securing persuasion than those communicators lacking in trust and know-how.¹²⁸ For health and nutrition, this could be individuals like medical doctors, nurses, nutritionists, physical fitness instructors/trainers, etc.

¹²⁵ Anthony R. Pratkanis, *The Science of Social Influence: Advances and Future Progress*, ed. Anthony R. Pratkanis (New York: Psychology Press, 2007).

¹²⁶ Pratkanis.

¹²⁷ Pratkanis.

¹²⁸ Pratkanis.

3. Altercasting

Altercasting is the process of imposing identities and social roles on others by treating them in ways consistent with the imposed identity/role.¹²⁹ There are many specified actor/message recipient combinations, however a select three¹³⁰ will be highlighted for the purposes of this research, with an example of an actor provided, the message recipient always as a Marine type:

- Authority-Agent Altercast (senior ranking Marines to subordinate Marines)
- High Status-Admirer Altercast (a celebrity to Marines)
- Physically Attractive-Admirer Altercast (a body builder or model type to Marines)

4. Social Norms and Reinforcement

A norm is a “social consensus” or expectations for appropriate and correct behavior in a given situation.¹³¹ Social norms are a huge part of culture and will understandably vary according to that culture. Healthy eating is not necessarily a social norm in the Marine Corps yet, but has the potential to become so. Social reinforcement will be defined as the act of someone(s) negatively or positively reinforcing a certain behavior of another.¹³² Social reinforcement of healthy food choices would include positive affirmations (verbal, physical, visual, etc.) when a Marine chooses a healthy option over an unhealthy option, or negative affirmations if his choice were reversed.

¹²⁹ American Psychological Association, *American Psychological Association Dictionary of Psychology*, s.v. “altercasting,” accessed June 6, 2021, <https://dictionary.apa.org/altercasting>.

¹³⁰ Pratkanis, *The Science of Social Influence*.

¹³¹ Pratkanis.

¹³² Pratkanis.

5. Embarrass the Target of Influence

The target of influence is active-duty Marines. Embarrassment for eating unhealthily will only occur when a strong social norm to eat healthy forms. Embarrassment translates to a public self-consciousness produced from committing an act that others would judge unfavorably; it creates a need to restore self-image, which can lead to compliance.¹³³ Embarrassment occurs both intentionally and unintentionally at various times in the military often related to lack of conformity and/or ill ability to meet a standard.

6. Imagery Sells and Self-Efficacy

The mind is a powerful tool that can imagine improved living practices, and create the confidence to better one's situation. "Imaging the adoption of an advocated course of action" increases the likelihood of that action occurring.¹³⁴ In other words, visualizing oneself improving or increasing consistency regarding healthy eating will increase the probability of that behavior occurring. Complementary to imaging is self-efficacy. Self-efficacy is defined as "the beliefs about one's capability to organize and execute the courses of action required to reach given goals. Perceived self-efficacy can be increased by such procedures as teaching skills, guided mastery, vicarious learning, and verbal persuasion."¹³⁵ For nutrition behavior in the Marine Corps, these two tactics mean providing Marines the opportunities for visualization and cultivating a culture where Marines feel empowered to make and keep nutrition goals.

7. Repetition and Tone of the Message

If a person hears the same message from multiple sources, he is more likely to believe it to be substantial and factual. "Message repetition works by increasing liking for the object through the mere exposure effect and by increasing the perceived validity of

¹³³ Pratkanis.

¹³⁴ Pratkanis.

¹³⁵ Pratkanis.

‘facts’ stated in the message.”¹³⁶ Visually posting content and images in multiple settings or orally repeating nutritional recommendations at regular intervals are examples of repeating nutritional information and actions.

Another factor that affects receipt of message’s content is the tone in which it is delivered. For example, when a message is communicated with disgust and fear, acceptance by an individual can be enhanced significantly.¹³⁷ If the message is communicated authoritatively and concisely, one might associate validity to it (applies also to the aforementioned “credible source” principle). Tone can greatly sway an individual’s emotions and acquiescence to a message.

¹³⁶ Pratkanis.

¹³⁷ Andrea C. Morales, Eugenia C. Wu, and Gavan J. Fitzsimons, “How Disgust Enhances the Effectiveness of Fear Appeals,” *Journal of Marketing Research*, 2012, https://faculty.fuqua.duke.edu/~gavan/bio/GJF_Duke_site/Publications_files/disgust_appeals_jmr_2012.pdf.

IV. AN INFLUENTIAL INFORMATION CAMPAIGN

The first topic of this section is to define what an information and influence campaign (IIC) is. According to Manheim, an IIC is “an effort by one party, through some combination of communication and action, to change the behavior of another party to its advantage.”¹³⁸ In terms of Marine Corps nutrition, the definition could translate to an effort by Marine Corps leadership and policy to improve the eating behavior of its Marines for the short-term readiness and performance benefit of the institution and the long-term health advantages to the Marines. If individually defining what an information campaign and an influence campaign are, then there are subtle differences between the two, represented in the continuum that is Figure 21.

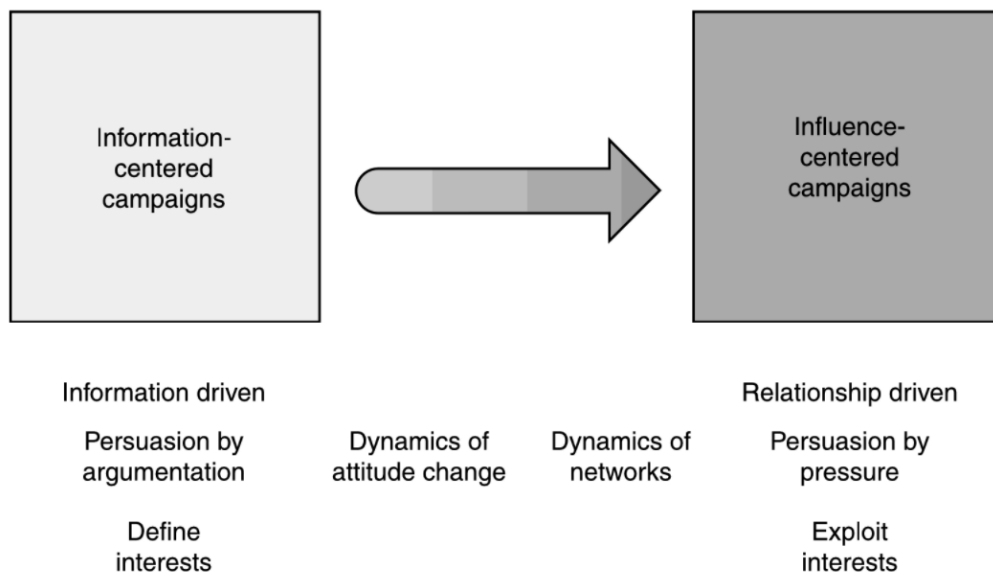


Figure 22. Information to Influence Campaigns Continuum.¹³⁹

¹³⁸ Jarol B. Manheim, *Strategy in Information and Influence Campaigns: How Policy Advocates, Social Movements, Insurgent Groups, Corporations, Governments and Others Get What They Want* (Taylor & Francis Group, 2010), <https://ebookcentral.proquest.com/lib/ebook-nps/reader.action?docID=667886&ppg=33>.

¹³⁹ Source: Manheim.

The figure suggests information-centered campaigns are driven by facts and persuasion by debate whereas influence centered campaigns are fueled more so by relationships and persuasion by pressure. Information-centered campaigns are communication-based and flowing with information free and unfettered.¹⁴⁰ Influence-centered campaigns focus more “on the strategic manipulation of interests, often through actions that generate pressure,” so they are action-based.¹⁴¹ To summarize these differences more concisely: an information campaign is more communication and fact-based while an influence campaign is more exploitative of relationships and pressure focused. Both campaign types share the intent of changing behavior, but vary slightly in their means to do so. It is important to note too that IICs vary in their complexity and parts. Manheim asserts:

There has never been a “perfect” information and influence campaign, one in which a strategist has sat down and literally worked through all of the elements...Doing so would require perfect knowledge, perfect information, perfect resources, perfect command of those resources, and perfect control of the campaign environment. Not a single one of those conditions is likely.¹⁴²

Although there are tremendous nutrition facts and trends presented in this research, indeed not all knowledge and insights are perfect. Conditions need not be flawless in order to for one to be decisive; if there is one thing Marine leaders learn how to do, it is to develop a bias for action in the presence of limited information. This research fuses elements from all the information to influence spectrum to fashion a campaign based on information, but designed to additionally become relationship-driven and to create communal pressure in the Marine Corps.

A. PRE-EXISTING CONDITIONS BY OBSERVATION

The Marine Corps already has tools in place to encourage its personnel to eat more healthfully. Most of these tactics are observable in initiatives like the F2F program,

¹⁴⁰ Manheim.

¹⁴¹ Manheim.

¹⁴² Manheim.

due to its being Marine Corps produced. For example, the F2F Color Code, as shown in Figure 22, uses a stoplight color system and correlates the actions taken while approaching a stoplight in a vehicle to the food choices taken in the chow hall. Green is labels foods that are a “go” for good nutrition, yellow is associated with foods one should considering “slowing down” or “going slow” on, and finally foods marked red should be associated with “ceasing” or “stopping” consumption on.

Green	Yellow	Red
Engage at Will	Well Aimed Shots	Check Fire

Figure 23. Fueled to Fight Color Code.¹⁴³

Additionally, the F2F Color Code uses familiar weapons terminology to create short phrases related to each color. Since every Marine is a rifleman, every Marine would recognize the terms and be able to subconsciously, if not, consciously, correlate the actions taken while shooting a rifle to the actions taken when choosing food options. “Engage at Will” means to shoot as many times as one desires, “Well-Aimed Shots” denotes being deliberate and conservative with the shots take, and “Check Fire” means to take a temporary halt in shooting.

At the very least, this example is tied to a few social influence techniques mentioned in the last chapter. In a sense, *valence framing* is used with the F2F coloring because green-labeled foods are equated to gains in health to the chooser, whereas consumption of majority red-labeled foods is cast as a loss to good health. The technique of *imagery and self-efficacy* is present as well because the colors visually funnel the choices into three categories of good, not good, and worst while allowing the chooser to be well-informed and empowered to decide for himself which foods are best for him. The

¹⁴³ Adapted from: U.S. Marine Corps, “F2F Program Coding Criteria.”

final technique is *repetition of the message*; F2F color labels are in every Marine Corps chow hall, which means Marines are constantly seeing the menu items labeled as green, yellow, or red. According to the technique, such repetition is likely to increase the Marines' affinity toward making empowered and informed food choices, or at the very least, increasing a liking for the coloring system itself.

Other observed tools, created by other close entities to the Marine Corps, are digital tools provided by USDA and Sodexo. USDA manages MyPlate – which program and resources are available online (MyPlate.gov) and on a correlated mobile device application called Start Simple with MyPlate (which icon is left-displayed in Figure 23). Whether on the computer or on a phone, MyPlate offers interactive tools like nutritional quizzes, food goal setting, reminders, etc., for a user to engage with. Mobile applications that offer “individualized dietetic advice” can be quite effective in improving knowledge and influencing choices; in one study of hockey players using such an application, “82.3%...reported attempts to improve dietary behaviors over [a 6-week timeframe].”¹⁴⁴ Both the MyPlate application and website have direct access to the most current Dietary Guidelines for Americans which a user can reference as well. The MyPlate website has further links to MyPlate Kitchen which provides an array of recipes.



Figure 24. Start Simple with MyPlate Mobile Application Icon.¹⁴⁵

¹⁴⁴ Tam et al., “Development of an Electronic Questionnaire to Assess Sports Nutrition Knowledge in Athletes.”

¹⁴⁵ Source: Apps on Google Play, *Start Simple with MyPlate*, 2021, 2021, <https://play.google.com/store/apps/details?id=gov.usda.startsimple&hl=en&gl=US>.



Figure 25. Charge by Sodexo Mobile Application Icon¹⁴⁶

Another resource is a mobile device application launched by Sodexo in 2020 called Charge by Sodexo (which icon is Figure 24). The application allows a user to view current chow hall menus from 15 stateside Marine installations; there are currently over 50 menus available to view. A user can search chow hall hours and specific meal menus by base name/area name. All the items listed on these menus have been labeled with the three colors of the F2F stoplight system. The user can filter food items by their F2F color label and/or the number of calories per item, so that only foods the user prefers to see will display. Both MyPlate and Sodexo digital resources afford interested users quick, accessible information and the opportunity to be accountable to themselves in convenient, interactive ways.

B. A MORE INFLUENTIAL WAY

The Marine Corps should not abandon its current practices, but should reinforce them with new approaches. There are strategies that could magnify and multiply the current influence even more. The IIC will use the structure represented in Figure 25 to organize the campaign into the following core elements: pre-development actions, objective(s), audience, message(s), method(s), evaluation/measurement, and overall goal/end state.

¹⁴⁶ Source: Apps on Google Play, *Charge by Sodexo*, 2021, 2021, https://play.google.com/store/apps/details?id=com.sodexo.bite.charge&hl=en_US&gl=US.

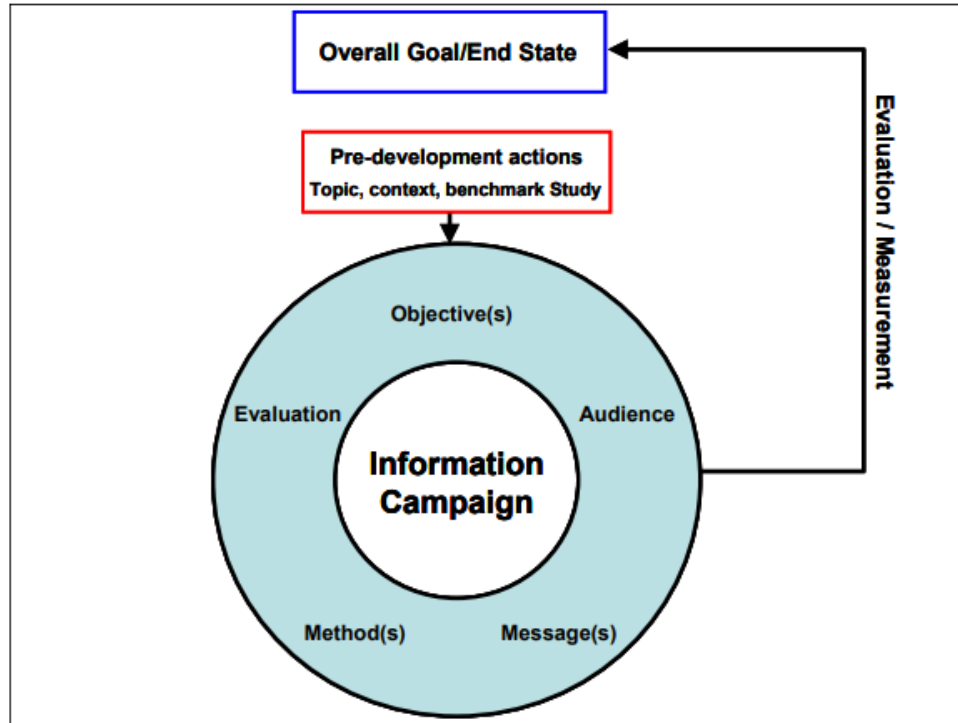


Figure 26. Information Campaign Core Elements.¹⁴⁷

1. Pre-Development Actions

There are no required preparatory activities that need to occur before implementing the subsequent recommendations because requisite pre-development actions have already been taken in the form of the F2F program, by the labels attached to chow hall food items for Marines to choose from.

2. Objectives

The objectives associated with this information campaign are:

- Influence individuals to make more conscious, informed, and healthful food choices
- Maximize Marine adherence to MyPlate proportions.

¹⁴⁷ Source: Paula S Bloom, "Citizen Preparedness Campaign : Information Campaigns Increasing Citizen Preparedness to Support Creating a 'Culture of Preparedness,'" 2007, 142.

- Increase consumption of F2F green-labeled food items in the chow hall
- Decrease consumption of F2F red-labeled food items in the chow hall
- Increase Marines' awareness, motivation, and participation in healthy eating goals through use of media, slogans, and incentives
- Increase exposure of nutrition content and training to all active-duty Marines

3. Audience

The audience for this IIC is active-duty Marines, roughly between the ages of 18–60 years old, and that are considered medically cleared (and physically fit) to serve in the Marine Corps. Differences in demographics, such as ethnicity, age, and rank will vary across the audience, but will contribute less as a basis of influence than the status of being a Marine. The assumption being made is that the Marine identity itself is the stronger basis of commonality for the target audience, which identity obliges mutual values and a culture of excellence. This Marine culture, if not ingrained on an internal level, is at least practiced in public settings. It is assumed that not all of the target audience frequents the chow hall for meals on a regular basis.

4. Theme and Message Development

The overarching theme is “Eat Healthier” – but is insufficient to properly inform and empower Marines to take action without proper content and tactics. The theme is better quantified through more specific statements, graphics, and taglines extracted from the material presented in the previous chapters of this research.

j. Messages

The following messaging statements are specific and actionable:

- (1) Good nutrition is preventative maintenance.
- (2) Marines represent a standard of excellence in all things, including healthy eating.
- (3) It is never too late to eat healthfully.
- (4) Healthful food choices are a personal responsibility.
- (5) Follow F2F's 80/20 rule to guide your chow hall food consumption.
- (6) Make your plate 50% fruits and vegetable, 25% protein, and 25% grains.
- (7) When you eat is just as important as what you eat.
- (8) Fuel to optimize performance and reduce risk of injury.
- (9) Look at labels; limit consumption of foods that have high amounts of sugar, sodium, and/or saturated fats.
- (10) It is a Marine's responsibility to seek out nutrition education and resources.

k. Graphics

All of the graphics represented as figures in this research would be excellent to use for training and educating Marines on the subject of healthful nutrition however, two graphics (Figures 26 and 27, presented earlier as Figures 18 and 19 respectively) are selected as the focus of this IIC.



Figure 27. MyPlate Graphic.¹⁴⁸

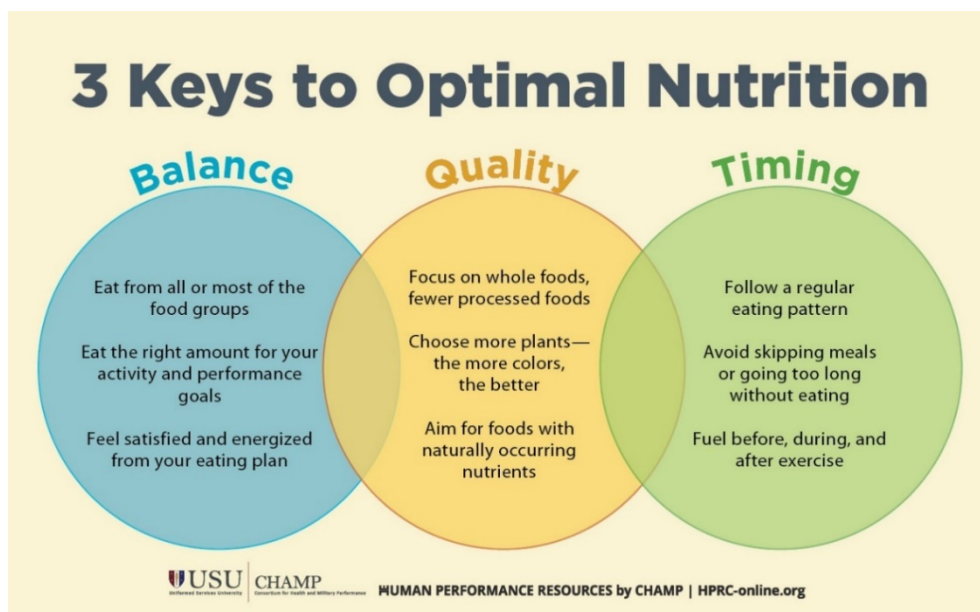


Figure 28. 3 Keys to Optimal Nutrition.¹⁴⁹

¹⁴⁸ Source: U.S. Department of Agriculture, “MyPlate.”

¹⁴⁹ Source: Human Performance Resources by CHAMP, “3 Keys to Optimal Nutrition.”

1. Taglines

Taglines or slogans are short, catchy, informative statements that grab attention and latch to memory. “Most successful slogans are only 3–6 words long and get the point across without much thought.”¹⁵⁰ The words contained within a tagline are usually commonly used, and could be arranged according to their alliterative, syllable, or rhyming effect – so their combination make more of an impression on the reader or speaker. “There’s a psychological phenomenon called the mere-exposure effect, in which we tend to develop a preference for things merely because we’re familiar with them...this is why taglines work so well; they are memorable.”¹⁵¹ One tagline already in use is the title of the F2F program itself “Fueled to Fight.” Other example taglines the Marine Corps might consider in its quest for influencing healthier food choices are:

- It takes guts to be a Marine.
- Preventative maintenance starts on your plate.
- The food. The fuel. The Marines.
- Feed your muscles, not your fat.
- Muscles are fed in the chow hall.
- Stomach your choices.
- 80% green, 100% mean.
- Half, quarter, quarter.
- Divide the plate, change your fate.
- Intestinal fortitude.

¹⁵⁰ Bill Widmer, “What Is a Tagline? A 3-Step Plan to Create an Amazing Business Tagline,” Sumo, 2019, <https://sumo.com/stories/what-is-a-tagline>.

¹⁵¹ Widmer.

- Don't be a boot, eat your fruit.
- Ingest the best.

5. Methods of Dissemination

There are three main methods of dissemination suggested for this IIC that will most effective: visual materials posted in frequented areas, incentivizing adherence to MyPlate in the chow hall, and increasing nutrition discussions by leaders. Such methods can be tied back to social influence tactics.

m. Visual Materials Posted in Frequented Areas

In addition to the F2F spotlight coloring labels for individual food items, the MyPlate graphic (Figure 26) should be repeatedly visible throughout the chow hall to make it easy for Marines with their plates in hand, to correlate their meal choices according to the proportions of the graphic. The following are strategic places to position the graphics to maximize exposure:

- Meal trays
- All food stations
- Tabletops
- Near the dish or utensil dispenser

In places that Marines do not have a meal plate in front of them, Figure 27 would be a better graphic to feast their eyes on as it allows the reader to ponder the both the suggestions (for either immediate or later implementation) as well as the credibility of the message itself. The frequency of seeing the 3 Keys of Optimal Nutrition will also help the seer internalize the principles, which is a steppingstone to later practice them. Suggested places to increase the content's credibility and visual frequency are:

- Medical lobbies/examination rooms
- Fitness centers

- Marine Exchanges and Mini-Marts
- Barracks laundry and game rooms

This method of deliberate placement of certain graphics in specific settings (that are most frequented by Marines) uses the tactics of repetition and imagery to increase the amount of familiarity Marines have to the graphic, and ultimately increase the chance of liking and following the visual challenge. Only two graphics were discussed, but more visuals from any part of this research would be beneficial to post in frequented areas.

n. Incentivize Adherence to MyPlate in the Chow Hall

Incentives can be very enticing to people, and Marines are no different. What if the Marine Corps partnered up with Sodexo or MyPlate, and Marine Corps Community Services (MCCS) to create an incentive program for Marine patrons of the chow hall? It could look something like this:

1. Who: Marine patrons of the chow hall
2. What: Marines submit pictures of their meal plates using a predetermined or unique tagline, and basic demographic data (age, rank, gender)
3. Where: at the chow hall
4. When: during breakfast/brunch/lunch/dinner
5. How: Marines take and submit pictures on a new camera function of the mobile application (either Charge by Sodexo or Start Simple with MyPlate) that would be circular (like a plate) and equipped with a simple sensor to distinguish food types (and/or a manual input capability)
6. Incentive: a winner could be random drawn based on the number of picture submissions or “nutritious” adherence of the plate they have submitted. A winner could be drawn either weekly or monthly, and be given a gift card (funded by MCCS) to the Marine Exchange or somewhere

This method of incentivizing is connected back to a few social influence tactics including valence framing (because if Marines do participate, they surrender a potential gain of a prize) and social norms/reinforcement (if enough Marines do start snapping and submitting pictures of their meals, it becomes not only a normalized behavior, but an encouraged one for the sake of collectively improved nutritional food choices).

o. Leadership Weaves in More Nutrition Rhetoric

If there is one thing a young person knows before joining the Marine Corps, it is that the physical fitness standards are high, and he or she must train in advance to meet or exceed those standards. What is not discussed in detail, is the type of nutrition he or she should adopt to sustain or maximize that physical performance. Leadership in this situation would be the Marine Corps recruiters; conversations about proper fueling content and timing should be had before joining the service and everywhere in between afterward.

Almost every Marine is called to lead others at one time or another in the Marine Corps. There are leadership traits and principles that are taught as core doctrine to all Marines so they can adopt and practice them. Though every Marine has either the knowledge or capacity to lead, there are high-ranking leaders that can and should be held accountable for discussing current and constantly updated nutrition principles. Those leaders are commissioned officers and staff non-commissioned officers. Positively mentioning nutrition principles and practices would be a form of social reinforcement and altercasting by Marine Corps leadership.

Additionally, medical staff and fitness workers should be well-versed in basic nutrition principles or at the very least, aware of latest Marine Corps-supported nutrition resources and content so they can properly refer individuals when asked. These leaders are even more so viewed as credible sources of information because of the roles they fill related to health and fitness.

Finally, the Marine Corps Public Affairs could reach out and arrange a short media clip from a prominent athlete, sport celebrity, or healthy veteran reinforcing a specific nutrition standard. The media clip could be something posted on the Marine

Corps' website, social media platforms, etc., as to maximize publicity of the message. The frequency of such stardom messages is flexible, but recommended at least twice a year. This approach is tied loosely tied to altercasting because inevitably there will be some Marines who look up to such individuals, therefore trust what they say, and are more likely to adopt the practices they see or hear them doing.

Any leadership discussing the health risks of poor nutritional practices to an audience of Marine(s) might also unconsciously cause embarrassment to the listener, which in turn could influence their food habits in a healthier direction.

6. Measures of Effectiveness

Evaluating the effectiveness of this IIC is not a perfectly objective task however, there are correlations to food expenditures that would prove enlightening. A chow hall should inventory the food supplies that it receives and expends; if one or both of those is untrue, then an assumption is being made that those two things occur. When a chow hall prepares an entrée – it should calculate the number of servings in that entrée. The chow hall should track the number of patrons that enter per meal, per day, and record the number of servings expended per food item, per meal, per day. Simple mathematics would yield generalized consumption patterns of certain food types and amounts, per the number of consumers. If all Marine Corps chow halls could inventory their food serving expenditures against the number of patrons, over time, then there would certainly be data over short and long time periods that could be further scrutinized regarding Marines' eating habits.

The same measure of effectiveness could also be applied to Mini Marts – where the store simply notes the number and type of food product expenditures over time and provides researchers the data to infer changes or improvements in a given period.

Another measure of effectiveness for this IIC is the tracking the amount of participation in the social media incentive program (mentioned in the last section of this chapter). If there are hundreds of the submissions and/or accurate plate photos entered into the challenge, that would be indicative of Marines paying attention to and acting upon the MyPlate message throughout the chow hall.

A final measure of effectiveness would be monitoring for trends of improvement of formal PFT and CFT scores over time. If such scores in the Marine Corps improved overall, it could be indicative that Marines are fueling their bodies in such ways that are increasing their physical performances.

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V. CONCLUSION

A. CHAPTER SUMMARY

Chapter I—“Introduction.” The chapter introduced the thesis topic of the importance of influencing food behavior in the Marine Corps. It provided details of what inspired the thesis, how it was derived from a problem statement, its objectives, methodology, and significance, and organization. It clearly stated the questions that would be explored as part as the basis of thesis research.

Chapter II—“Background.” This chapter established some key principles of Marine Corps culture including its core values, the various methods of quantifying readiness, the worth of physical fitness, and operating environments.

Chapter III—“Literature Review.” This chapter covered a wide range of topics including how food affects physical performance, defining military food standards, comparing how Marines are educated about nutrition compared to professional athletes, and various influence tactics used to change human behavior.

Chapter IV—“Information Campaign.” This chapter comprised an information campaign based mainly on content introduced in Chapter III, to demonstrate how to inform and influence Marines’ food choices towards healthier options. The campaign was organized into six parts: Predevelopment Actions, Objectives, Audience, Theme and Message Development, Methods of Dissemination, and Measures of Effectiveness.

Chapter V—“Conclusion.” This chapter summarized all chapters of the thesis. It also included a section of recommendations for Marine Corps implementation, and a section for suggested future research relating to influencing and improving Marine Corps nutrition.

B. RECOMMENDATIONS

1. Establish a Baseline of Data

The Marine Corps lacks formal research relating to food consumption trends among its members. This fact seems unacceptable due to emphasis it places on Marines to be as physically and mentally fit as professional athletes.

a. Administer a Nutrition Survey to all Marines

The Marine Corps could mandate a food survey, as part of initial and/or annual training, which could collect critical information about Marines' nutrition knowledge and patterns. A well-designed survey of questions would indicate how well-informed individuals and groups are within the organization. Once such baseline data is collected, the survey could continue to be administered on every year or every few years so it can be used additionally as a metric of change or improvement in food comprehension and behavior. That survey could be coupled with online training to amplify education.

b. Analyze Consumption Trends Based on Food Expenditures/Sales

There are two avenues from which the Marine Corps could extract data regarding food consumption trends: the chow hall and Marine Exchanges/Mini-Marts. Chow halls already quantify serving sizes and their associated nutrient data as part of the Fuel to Fight program; whether they also track overall expenditure of such food products is unclear. Reviewing how much of a food product is expended (daily, per meal) in the chow hall, and comparing it to how many people are eating there, could yield indications about what types and quantities of foods are being consumed more than others. For example, if the chow hall knows it had 50 patrons for breakfast, and it records distributing 50 servings of French Toast and zero servings of oatmeal, one could assume the Marine patrons prefer French Toast over oatmeal. The same could be done with Marine Exchanges and Mini-Marts – just look at product sales per food item; it could be indicative of Marines' relative preferences are to other food products. This is a simple analysis of easily collectable data that could contribute to the big nutrition picture of the Marine Corps.

c. Collect Data from Potential Media Submissions

In this research, Chapter 5, Section 5 “Incentivize Adherence to MyPlate in the Chow Hall” discussed an idea for submitting photographic adherence to the MyPlate standard. If that idea were to come to fruition, then the submission could serve as insightful data to discovering how Marines eat. The pictures and associated demographic information could be analyzed by CHAMP researchers/nutritionists to build a baseline of eating trends at the chow halls.

2. Mandate Nutrition Education

The Marine Corps obligates those in its organization to complete online courses as part of annual training to review certain key principles of operational readiness. For example, there is a Tobacco Cessation course, that Marines must complete on an annual basis, that outlines detailed facts about the negative health effects of tobacco use. This course is designed to educate the viewer on all the negatives of smoking, chewing tobacco, etc., so that the viewer is more inclined to decrease or eliminate tobacco use altogether. Likewise, the Marine Corps could mandate annual nutrition training in the form of nutritionist-led discussion groups, allowing one-on-one appointments with a nutritionist (even if the Marine is within height/weight standards), online courses as already offered on MarineNet (but added as an annual or biennial requirement), and books (which could even be added to the Commandant’s Reading List).

There are three online courses at MarineNet that any Marine can enroll in are CIEP Human Performance Introduction, Food Service Nutrition Fundamentals (FDSV01NTR1), and Semper Fit Advanced Fitness Course (MCIZ4134AZ). CIEP Human Performance Introduction has lessons relating to anatomy, nutrition, sleep, and stress and is designed to be taken over a three-week period. FDSV01NTR1 is designed like a typical MarineNet course in that it provides narration, videos, and easy-to-read information. It bases the course content on MCO 10110.14 and MCO 10110.49. MCIZ4134AZ consists of downloading Marine Corps Institute 4131A (a manual updated in 2013), reading it, then taking a two-part proctored exam. There is also a MarineNet video “Performance Nutrition,” about five minutes long, with commentary by Gunnery

Sergeant Maragni, who is Force Fitness Instructor at School of Infantry East. Finally, there is one course titled IMC Human Performance Introduction, which requires an enrollment key to access.

Nutrition education is also available in the form of nutritionists, but there is a limited number of nutritionists on Marine Corps installations. To have a one-on-one visit with one often requires an assignment to the Body Composition Program (to return to weight standards) or money (if the nutritionist is contracted by entities like Morale, Welfare, and Recreation). More nutritionists could be made available free of charge, but by appointment, to accommodate a potential demand for them. If that were not feasible, then nutritionists could make regular appearances at unit formations or other formal settings to communicate tips and tricks of healthy food choices.

3. Improve On-Base Food Options for Marines

There should be greater access to healthier options on-base at chow halls, Mini-Marts, food establishments, and vending machines. “Healthier” meaning products with less preservatives, artificial substances/sweeteners, sugar, etc., and more whole, less-processed ingredients. Improvement also means expanding options and products to accommodate those individuals with vegetarian, vegan, and gluten-free lifestyles.

4. Adopt and Expand a More Robust Nutrition IIC

The Marine Corps could adopt wholly, or elements of, the IIC presented in Chapter IV of this thesis so that broader behavioral changes can occur more quickly and become part of the Corps’ social culture.

C. ISSUES FOR FURTHER RESEARCH

There are several research avenues worthy of pursuit that branch from this thesis exploration. Those topics include, but are not limited to, the following questions:

- What are the business contracts the Marine Corps has with on-base fast-food companies and how are such agreements reconciled with a fit fighting force?

- What are the eating trends of food products by type in local Marine Corps Exchanges and Mini-Marts?
- A cost-benefit analysis of the Department of Defense or Veterans Affairs researching diet as a cause of current or future medical problems compared to current cost of veteran health care types
- A cost-benefit analysis of replacing on-base fast-food establishments with more healthful alternatives
- Research and cost-benefit analysis of replacing current vending machine snacks with healthier alternatives

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