FIGHTING FIRES AND FAT: AN EDUCATIONAL AND ENVIRONMENTAL NUTRITION INTERVENTION TO ADDRESS OBESITY AND CARDIOVASCULAR RISK FACTORS IN THE FIRE SERVICE

by

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ABSTRACT

An estimated 80% of paid and volunteer firefighters are overweight or obese, compromising firefighting performance and increasing risk of injury. Over 77% of firefighters have elevated blood pressure, and between one-quarter and one-half meet criteria for Metabolic Syndrome. These risk factors combined with the cardiovascular stress that is intrinsic in fire extinguishing activities have resulted in heart attacks being the leading cause of on-duty death among both paid and volunteer firefighters, contributing to over 40% of fatalities.

While data on dietary intake in firefighters is scarce, meals that are traditionally served at stations are typically high in saturated fat and refined carbohydrates. Furthermore, firefighters face unique challenges to eating healthfully due to their shift work schedules, the uncertainty of call times and duration, and time spent away from home. Firefighters have expressed interest in nutrition education and guidance; however, existing firefighter wellness programs focus primarily on physical activity and fitness.

The Firefighter Food Intervention, Research, and Evaluation (FFIRE) study aimed to address these concerns through the development of a quasi-experimental pilot nutrition intervention to reduce obesity and risk of heart attack. Since volunteers account for nearly 70% of firefighters in the U.S., participants were recruited from eight volunteer and combination volunteer/paid fire stations from across Maryland. The 112 study participants had a median age of 41 years and 85% were male. Over 90% had a BMI in the overweight or obese range at baseline, with 62.5% obese. Participation at each station ranged from eight to twenty individuals, representing 16% to 30% of all station personnel.
The six-month intervention included environmental, behavioral, and educational components, e.g., monthly sessions with cooking demonstrations, provision of kitchen equipment, interdepartmental competitions, and tailored medical feedback, incorporating suggestions from area firefighters. Feasibility and process data were collected through attendance, interventionist logs, participant session evaluations, and a post-intervention evaluation and exposure survey. Study impact was assessed using the web-based Diet History Questionnaire II at baseline, six months (post-intervention), and twelve months (six months post-intervention). Additional eating habits, stages of change, and nutrition knowledge questions were administered through a written survey.

Baseline results suggest macronutrient composition followed dietary recommendations; however, diet quality was poor. Fruit (1.2 cups), vegetable (1.8 cups), and whole grain (0.7 ounces) intake fell far below recommended amounts, while added sugars (20 teaspoons), saturated fats (28 g), and sodium (3501 mg) far exceeded recommendations. Nearly 60% of participants reported currently trying to lose weight and consumed on average 300 fewer calories (p=0.11), with lower intake of added sugars (p<0.05) and a higher percent of calories from protein (p<0.001). Nutrition facts label literacy was higher than knowledge of other nutrition topics. Responses to stages of change questions indicated a disconnect between perceived and actual intake.

The intervention was implemented at all stations with high fidelity. Participants rated the intervention favorably, reported trying new foods and cooking methods, and indicated changes to food environments at their stations and homes. On average, participants attended 70% of the education sessions and read 79% of handouts. Total caloric, saturated and trans fat, refined grain, added sugar, and sodium intakes decreased
significantly in both the intervention and control groups, while Healthy Eating Index 2010 total scores increased in both groups (p<0.05). The intervention group additionally reported significant improvement in eating habits, e.g., proportion of plate containing vegetables or grains, and progression through the stages of change for fruit and vegetable, fiber, sugar-sweetened beverage, solid fat, and sodium intake (p<0.05). The FFIRE study pilot nutrition intervention successfully improved diet and promoted progression through dietary stages of change. Further exploration is needed to assess the impact of biannual medical evaluations on motivating dietary change. Results show promise for use in larger firefighter populations to improve cardiovascular risk factors and reduce fatalities.

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To Baji, who, in typical big sister fashion, worried that I would not see this through with the many distractions I introduced into my life. I finally did it, and not without your lasting example, love, and guidance.
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INTRODUCTION

**Problem Statement**

Rates of overweight and obesity in firefighters are alarmingly high. Studies suggest over 80% of firefighters are carrying excess weight, surpassing the U.S. adult average\(^1\)\(^{-}\)\(^{5}\). This increases risk of many health problems, including cardiovascular disease, diabetes, hypertension, osteoarthritis, and certain cancers, and increases all-cause mortality\(^6\). Indeed, over 77% of firefighters have elevated blood pressure and between one-quarter and one-half meet the criteria for Metabolic Syndrome\(^2\)\(^{,} \)\(^{7}\)\(^{,} \)\(^{8}\). Compounding the problem is the cardiovascular stress intrinsic in fire extinguishing activities, when heart rates often near or even exceed age-predicted maximums\(^5\)\(^{,} \)\(^{9}\)\(^{-} \)\(^{12}\).

It therefore comes as no surprise that heart attacks are the leading cause of on-duty death in both paid and volunteer firefighters, contributing to over 40% of fatalities\(^13\). An additional 620 firefighters suffered a non-fatal heart attack or stroke in the line of duty in 2013, consistent with the annual average of seventeen non-fatal cardiovascular events for each on-duty death\(^14\)\(^{,} \)\(^{15}\). Furthermore, while firefighting activities are most likely to trigger a cardiac event, they are not associated with increasing risk; rather, it is modifiable risk factors such as high blood pressure, total and LDL cholesterol, and triglycerides that predict cardiac episodes\(^16\). Thus, poor cardiovascular health endangers individual firefighters and the communities they serve.

Recognizing the need to control these risk factors, the CDC has recommended that all firefighters be required to participate in a wellness program\(^13\). Numerous firefighter organizations including the National Fire Protection Association (NFPA), International Association of Firefighters (IAFF), and the International Association of Fire
Chiefs (IAFC) have developed guidelines for fitness and wellness programs, but current participation remains low\textsuperscript{17–19,5}. Furthermore, while dietary intake and physical activity are both critical to maintaining a healthy weight and achieving good cardiovascular health, firefighter culture has long emphasized physical activity over dietary intake. Little is known about firefighter diet, barriers to eating healthfully, or preferred nutrition interventions, leaving questions about the most impactful changes to promote weight loss and improve cardiovascular health in this at-risk population.

The Firefighter Food Intervention, Research and Evaluation (FFIRE) study aimed to address these concerns through the development of a pilot firefighter nutrition program to reduce obesity and risk of heart attack. The goal of the study was to use the results of formative research to design, implement, and evaluate a pilot firefighter nutrition intervention. The trial was conducted in volunteer and combination volunteer/paid fire departments since they comprise over 90% of fire departments in the country\textsuperscript{20}.

This dissertation details the nutrition intervention that was developed and implemented as part of the study, as well as all nutrition-related data, including dietary intake, eating habits, nutrition knowledge, and stages of change for dietary recommendations. The intervention aimed to provide participants with the knowledge, skills, and resources needed to improve dietary intake while improving the station food environment. Additional environmental and behavioral interventions led by other team members are described in the methods section, and all anthropometric data are published separately. The specific aims of this dissertation were:
**Aim 1**: To develop an educational and environmental nutrition intervention tailored to volunteer firefighters using results of formative research and input from firefighters as part of a broader nutrition intervention trial.

**Aim 2**: To pilot the intervention in suburban and rural volunteer and combination volunteer / paid fire departments across Maryland.

**Aim 3**: To analyze baseline data to gain an understanding of dietary intake, eating habits, readiness to change dietary behavior, and nutritional knowledge in a representative sample of firefighters.

**Aim 4**: To assess impact of the FFIRE study pilot nutrition intervention on dietary intake, eating habits, readiness to change dietary behavior, and nutritional knowledge.

**Dissertation Overview**

Following this introductory chapter, Chapter 2 presents a literature review of health considerations in the fire service and worksite interventions to address obesity. Chapter 3 details the study methods, including the population and sampling, data collection instruments and schedules, descriptions of the intervention components including comprehensive accounts of each of the six educational sessions, descriptions of the participating stations, and data analysis methodology.

Chapter 4 (paper 1) presents an overview of the FFIRE study intervention trial aimed at public health nutrition practitioners. It describes the intervention components and presents results from the post-intervention exposure and evaluation survey, which
demonstrate that exposure to and satisfaction with the FFIRE study was high. This paper was published in the *Journal of Nutrition Education and Behavior* (2014).

Chapter 5 (paper 2) presents baseline nutrition and knowledge data, including intake data from the Diet History Questionnaire (e.g., total calories, saturated fat, sodium, whole and non-whole grains, fruits and vegetables, and added sugars), eating habits data (e.g., frequency of food preparation, proportion of plate filled with vegetables, grains, and meat), and stages of change data for dietary behaviors (e.g., consistency of eating a high fiber diet, consistency of limiting salt intake). In addition to nutrition knowledge data, the development of the nutrition knowledge scale and its psychometric characteristics are also briefly discussed. Baseline data suggest dietary intake and habits constitute significant risk for cardiovascular disease in participating firefighters. The manuscript will be submitted to *Public Health Nutrition*.

Chapter 6 (paper 3) is an impact analysis on dietary intake, eating habits, and stages of change. Participants across both the intervention and control groups saw significant reduction in total caloric intake and improvement in intake of specific nutrients and food groups. Intervention participants also saw improvement in numerous eating habits and progressed through the stages of change for all targeted dietary behaviors. The paper will be submitted to *Preventing Chronic Disease*.

Chapter 7 summarizes the main study findings and discusses the implications of these results. It includes a discussion of study strengths and limitations, and concludes with suggestions of areas for future research.

Funding for the FFIRE study was through the Department of Homeland Security, Federal Emergency Management Agency’s Assistance to Firefighters Grant Program, #
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   20, 2015.

   Fighter Fatality Investigation and Prevention Program: Leading Recommendations

LITERATURE REVIEW

The rationale for developing an educational and environmental firefighter nutrition intervention is presented in this chapter. After providing background on obesity in the U.S., workforce statistics, and the interrelation of the two, the chapter details obesity and related health and performance concerns in the fire service. Occupational factors that contribute to poor cardiovascular health and nutritional intake in firefighters are also explored. Next, approaches to reducing obesity are outlined, emphasizing characteristics of effective behavioral and environmental interventions, followed by an examination of worksite-based nutrition interventions. The need for such programs at fire stations is then addressed, with a summary of the scarce documentation of such work in the published literature. The behavioral change theories and conceptual framework that were chosen to guide intervention development are presented next. The chapter ends with a summary of the focus groups that were conducted to understand the health concerns of firefighters from their perspective, including their suggestions and considerations for a successful nutrition program.

Background

The United States (U.S.) is in the midst of an obesity epidemic with over one-third of adult men and women meeting obesity criteria\(^1\). An additional one-third of U.S. adults are categorized as overweight but not obese, totaling over two-thirds of the population with significant excess weight\(^2\). This is of grave concern since these conditions increase the risk of many health problems, including cardiovascular disease,
diabetes, hypertension, osteoarthritis, and certain cancers, and increase all-cause mortality\textsuperscript{3}.

Workforce trends over the past few decades have contributed to the rise in obesity. Sixty-three percent of the American population aged 16 years and older is in the civilian labor force\textsuperscript{4}. Over 58 million are employed in low-activity occupations, nearly twice the number employed in high-activity ones\textsuperscript{5}. This is in stark contrast to 1950, when 30\% more Americans were employed in high-activity versus low-activity occupations\textsuperscript{5}. As a result of the decrease in occupation-related physical activity, mean daily caloric expenditure at work decreased by 140 calories for men and 124 calories for women from 1960 to 2008\textsuperscript{6}. This corresponds to the steady weight gain experienced by American adults over the same time period\textsuperscript{6}. Additionally, sedentary work has been shown to increase risk for total and central adiposity, and adults tend to spend a higher proportion of time engaged in sedentary activities at work than away from work\textsuperscript{7,8}.

In part due to the far-reaching effects of obesity on health, data suggest that healthcare costs for obese individuals are 36\% higher than those for normal-weight individuals\textsuperscript{9}. Furthermore, obese employees, on average, experience higher rates of injury, longer recovery times, and increased absenteeism and presenteeism\textsuperscript{10–12}. These statistics give employers reason to be concerned about the weight status of their employees. Fortunately, achieving weight loss of 5-10\% over a six month period can be sufficient to decrease risk for heart disease and other conditions\textsuperscript{13}. A reduction in obesity prevalence could benefit both employees and employers, suggesting that it would be in the best interests of employers to put health and wellness on their agenda.
Obesity in the Fire Service

Rates of overweight and obesity in firefighters are alarmingly high. Several studies have found that the prevalence of overweight and obesity in this population nears or exceeds 80%, well above the national average\textsuperscript{14–18}. Even firefighter recruits, typically aged in their 20’s, have an average BMI of 28.5\textsuperscript{15}. Weight status has been confirmed using numerous measures of obesity, including body fat percent and waist circumference, thus accounting for the potential effects of muscle mass on BMI\textsuperscript{14}. In fact, concerns about BMI overestimating obesity prevalence in this population have been shown to be unfounded, and if anything, the opposite has been demonstrated. Studies have shown that BMI actually underestimates overweight and obesity prevalence compared to body fat percent, suggesting that even firefighters suffer from the “skinny fat” or normal-weight obesity (NWO) phenomenon\textsuperscript{14,19–23}.

Increased BMI and adiposity have been associated with worsened health and performance parameters in firefighters\textsuperscript{17}. Over 77\% of paid and volunteer firefighters have elevated blood pressure, putting them in the pre-hypertensive or hypertensive category\textsuperscript{15}. Furthermore, 75\% of hypertensive firefighters are not adequately controlling their blood pressure\textsuperscript{15}. Additionally, on average, career and volunteer firefighters have low HDL, and 10\% to 24\% of firefighters have elevated total cholesterol levels\textsuperscript{14,18,24}. Even when diagnosed with high cholesterol, many firefighters are not aware of the best dietary methods for lowering it\textsuperscript{16}. Other studies have found that between one-quarter and one-half of participating firefighters (28.3\% and 46.7\%) meet criteria for Metabolic Syndrome\textsuperscript{25,26}. 
These factors are themselves enough to increase risk of cardiovascular events. But when combined with the cardiovascular stress that is intrinsic to fire extinguishing activities, firefighters face even worse odds\textsuperscript{18}. When responding to a fire call, firefighters must jump to action at a moment’s notice, rush to the scene of the fire, and haul heavy equipment, all while wearing 25-28 kilograms of protective gear\textsuperscript{27}. Studies have demonstrated that heart rates often near or even exceed age-predicted maximums during fire extinguishing activities, putting extreme strain on the heart\textsuperscript{28–31}. These activities, which are estimated to require 12 METS or a VO\textsubscript{2}max of 42 mL/kg/min to perform safely, are clearly enough to precipitate a cardiovascular event, particularly in individuals with several underlying risk factors\textsuperscript{32}.

It thus comes as no surprise that heart attacks are the leading cause of on-duty death among both paid and volunteer firefighters, contributing to over 40\% of fatalities\textsuperscript{33}. In 2014, cardiac events accounted for 56\% of firefighter deaths, including 43\% of deaths among paid firefighters and 65\% of volunteer deaths\textsuperscript{34}. Almost one-third of cardiac fatalities occur during fire suppression activities, despite the fact that only 1-5\% of firefighters’ professional time is spent on those tasks\textsuperscript{35}. However, while firefighting activities are most likely to trigger a cardiac event, they are not associated with increasing risk; rather, it is modifiable risk factors such as high blood pressure, total and LDL cholesterol, and triglycerides that predict cardiac events\textsuperscript{36}. Most fatalities occur in firefighters with multiple risk factors for coronary artery disease\textsuperscript{37}. An additional 620 firefighters suffered a non-fatal heart attack or stroke in the line of duty in 2013, consistent with the annual average of 17 non-fatal cardiovascular events for each on-duty death\textsuperscript{38,39}.
Further exacerbating the problem, risk of injury is higher among overweight and obese firefighters. One study found that obese firefighters (BMI $\geq 30$) were 5.2 times more likely to suffer a musculoskeletal injury over a nine-month period than firefighters at a healthy weight\textsuperscript{40}. Another found that each unit increase in BMI was associated with a 5% increase in risk of job disability and that firefighters whose BMI fell above the median (28.5) had a 70% increased risk compared to firefighters whose BMI fell below the median\textsuperscript{41}.

Firefighting performance is also compromised by excess weight and lack of fitness. Body fat percentage has been shown to be the strongest predictor of time needed to complete simulated firefighting activities\textsuperscript{42}. VO2 max is inversely related to time required for completion of firefighting tasks, demonstrating that more fit firefighters are able to better execute their duties\textsuperscript{27}. Anaerobic endurance and muscular strength and endurance are also significantly correlated with firefighting job performance\textsuperscript{43}.

Thus, the effects of obesity and poor cardiovascular health extend beyond the individual firefighters to the communities they serve. It is clearly dangerous for all parties to have a firefighter experience a heart attack or other injury while on a call, leaving that individual and perhaps other colleagues unable to continue with fire suppression tasks. Economic implications result from presumptive disability laws regarding heart disease in firefighters, currently existing in thirty-six states including Maryland\textsuperscript{44}. Active firefighters with a heart disease diagnosis are presumed to be suffering from a job-related injury and are compensated accordingly if the claim is approved. Compensation varies by state and can include payment of medical expenses, worker’s compensation or disability retirement benefits, lost wages, or benefits for the
family. One study into presumptive heart retirements in Massachusetts suggested that most are the result of an “excess of personal cardiovascular risk factors among older firefighters”, thus highlighting the need for risk reduction strategies\textsuperscript{45}.

Health and performance criteria for new and continuing firefighters differ by jurisdiction. National Fire Protection Association (NFPA) standard 1582 recommends annual medical examinations for all volunteer and career firefighters to identify conditions that may interfere with a firefighter’s ability to safely perform job tasks without risk to oneself or others, provide information about health status and wellness to firefighters and refer them to further medical attention as needed, and detect changes that may be related to harmful working conditions, among other reasons\textsuperscript{46}. Examinations include physical, blood, audiological, and pulmonary function tests. Additionally, annual fitness evaluations measure aerobic capacity, muscular strength, muscular endurance, and flexibility\textsuperscript{46}.

According to these standards, new recruits must be free of a number of medical conditions that may affect their ability to safely perform job tasks. This includes having uncontrolled or poorly controlled hypertension or having metabolic syndrome with aerobic capacity of less than 12 METs\textsuperscript{46}. Standards for continuing firefighters are not as stringent, if even existent\textsuperscript{47}. For instance, firefighters with an aerobic capacity below 12 METs (and above 8 METs) can continue in their current role but should receive counsel on improving fitness\textsuperscript{46}. However, below 8 METs, a mandatory fitness program should be prescribed and firefighters should be restricted from certain essential job tasks\textsuperscript{46}.

Unfortunately, compliance with these guidelines that aim to improve safety is low. Among departments where the National Institute for Occupational Safety and
Health (NIOSH) reviewed sudden cardiac fatalities as part of the Fire Fighter Fatality Investigation and Prevention Program, only 31% conducted annual screenings for all firefighters to identify cardiovascular risk factors\(^3\). Of those stations, only one-third followed up with exercise stress tests for individuals at high risk\(^3\). In another sample of 24 fire departments, only 38.7% and 23.6% of paid and volunteer firefighters respectively met the minimum 12 MET criterion, including 70% of normal weight firefighters and no firefighters with class 2 or 3 obesity\(^1\). Studies have shown that even new recruits have difficulty meeting minimum performance and safety standards\(^4\). For instance, one study demonstrated that the average aerobic capacity among a cohort of new recruits was 20% lower than the minimum necessary to safely suppress fires\(^4\).

Studies have demonstrated the profound effect of participating in exercise training programs on improving physical fitness and aerobic capacity in firefighters\(^4\). A 1 MET increase in maximal aerobic capacity is associated with a 15% reduction in risk of CHD/CVD\(^5\). However, dietary intake, which is also essential to achieving a healthy weight and minimizing cardiovascular risk factors, has been largely ignored in this population, and few nutrition programs have been developed to address these concerns.

**Occupational Contributors to Obesity in the Fire Service**

A number of occupational factors make wellness more elusive for firefighters. Shift work has been shown to have negative effects on health, in part due to the associated sleep disruptions and deprivation\(^5\). These sleep disruptions can also lead to overeating as firefighters report snacking more during the night after calls than they would if at home sleeping\(^5\). Many firefighters, especially volunteers, work multiple
jobs, adding to their stress and leaving little free time for physical activity or meal preparation\textsuperscript{50}. Firefighter culture, specifically the desire to appear competent, may also encourage firefighters to continue with fire suppression activities even if worrisome cardiovascular symptoms develop\textsuperscript{39}. However, better crew cohesion has been associated with lower accident and fatality rates\textsuperscript{39}.

Occupational factors can also play a large role in decisions of what and how much to eat. Planning healthy meals can be difficult between calls or jobs, particularly given the unpredictability of meal times\textsuperscript{39,50}. Many firefighters eat faster at the fire station than elsewhere in anticipation of needing to leave on a call, a habit that leads to more weight gain than in those who eat slower\textsuperscript{51}. Others eat larger portions, preparing for the possibility of being out on calls during subsequent meals\textsuperscript{50}. In departments with shift meals, the culture tends towards meals high in saturated fats and refined carbohydrates\textsuperscript{15,39,50}. These are meals that have been traditionally served at the fire station and continue to be favored in part because they can be prepared on a limited budget\textsuperscript{50}. There is pressure at some stations for all firefighters to participate in group meals, keeping even health-minded individuals from packing their own healthier fare\textsuperscript{50}. And in many stations, junk food is traditionally brought into the station by firefighters as recompense after mistakes or accidents, by new recruits, and by well-meaning community members\textsuperscript{50}. There is consensus that the underlying causes of obesity and cardiovascular disease in firefighters, which certainly include the above nutritional considerations, must be addressed to decrease on-duty fatalities\textsuperscript{15,37,52–54}.

\textbf{Behavioral and Environmental Interventions to Address Obesity}
Obesity is a complex problem with numerous contributing factors, such as genetics, environment, and behavior\textsuperscript{55}. There are similarly many ways to combat obesity, with treatments ranging from surgery to drugs to behavior change. While these are all viable options, programs and policies that support behavioral and environmental changes are of particular importance. These options are often more accessible and economical than ones requiring drugs or surgeries, and can be used to prevent and treat obesity.

But even though the need to address the behaviors that are contributing to the obesity epidemic is clear, it has proven to be a difficult task. As Verplankan and Wood point out, it is particularly difficult to change behaviors once they become habit, citing dietary patterns as an example\textsuperscript{56}. Early work in obesity prevention appears to arrive at the same conclusion. In a review of public health obesity interventions (including community-, school- and worksite-based interventions), Schmitz and Jeffery found that the majority focused on educating individuals and providing skills training, but showed little impact\textsuperscript{57}.

However, this may be the result of the intervention methods employed by the studies rather than a reflection on the utility of educational obesity interventions. Over the past decade, many new interventions have aimed to build upon earlier studies, with encouraging results. In a more recent review of 38 randomized, controlled trials, Brunner et al. found that giving dietary advice alone led to moderate changes in food consumption, with increases in fruit, vegetable, and fiber intake and decreases in total fat and saturated fat intake\textsuperscript{58}. These changes resulted in lower total cholesterol and LDL cholesterol levels and decreased blood pressure (weight was not an outcome included in this review). Sharma et al. concluded that the promotion of adequate water intake,
decreased soda intake, and decreased portion sizes also are important aspects of nutrition interventions\textsuperscript{59}.

Other studies and reviews have revealed additional recommendations to maximize the success of obesity interventions. Interventions lasting at least six months have fared better than shorter interventions\textsuperscript{59}. Incorporating one-on-one counseling in-person or electronically can improve compliance, as demonstrated by the success of the Diabetes Prevention Program\textsuperscript{59,60}. Programs that include formative research and process evaluations have been associated with better outcomes, possibly because these are a reflection of systematic development and implementation\textsuperscript{61}. Furthermore, the use of behavioral theory while developing interventions allows for the identification of the program components that were successful\textsuperscript{59,62}.

Though many obesity interventions target both nutrition and physical activity, Sweet and Fortier conclude that interventions with a single focus are more effective at changing behavior than those targeting both nutrition and physical activity\textsuperscript{63}. Suggested explanations include individuals’ limited capacity to make several behavior changes at once and the programs’ limited capacity to adequately address multiple issues. However, several reviews have found that interventions with both nutritional and physical activity components have led to greater weight loss than either one alone, including the review by Sweet and Fortier\textsuperscript{59,63,64}. One possible explanation is that many nutrition interventions do not have weight loss as a primary objective, and instead focus on the promotion of more nutritious foods, which will presumably lead to long-term weight-loss.

And finally, recent recommendations have emphasized the importance of modifying the food environment to improve dietary intake\textsuperscript{57,59,65}. The food environment
affects many aspects of eating behavior, such as location of food consumption, and types and amounts of food consumed\textsuperscript{65}. Availability of healthy food is associated with dietary quality and health outcomes\textsuperscript{66–68}. Based on a synthesis of peer-reviewed literature, the CDC has recommended that nutrition interventions aim to increase availability of healthy food, limit availability of unhealthy food, initiate farm to institution programs, indicate healthy food options through signage and menu labeling, and manipulate the relative pricing of healthy and unhealthy foods\textsuperscript{69}. In one such study, Lowe et al. found that reducing the energy density of foods served in a worksite cafeteria and providing nutrition labels was associated with improvements in dietary intake\textsuperscript{70}. While these strategies could greatly benefit firefighters, no combined behavioral and environmental nutrition interventions had been developed for this population.

One additional point of note is that many Americans are unaware of their overweight status. Burke et al. found that weight misperception has increased over the past decade along with the increasing overweight and obesity prevalence\textsuperscript{71}. Most strikingly, over 46% of overweight men considered themselves to be at an appropriate weight\textsuperscript{71}. Overweight individuals who do not perceive themselves as such are probably less likely to desire weight loss, and thus it follows that first informing them of their overweight status and associated health risks may improve outcomes\textsuperscript{71}.

\textbf{Worksites as Intervention Settings}

Worksites provide a prime setting for health and wellness interventions. Employed Americans spend approximately half of their waking hours at work, during which time they are likely to eat one or even two meals\textsuperscript{62}. Furthermore, work settings
allow for interventions at multiple levels, including the institutional, interpersonal, and intrapersonal levels. Specifically, it is possible to modify the workplace environment through changes in worksite policy and culture. At the interpersonal level, worksites can benefit from the team atmosphere and can enhance adherence to proposed changes through the support of social networks. And finally, individual behavioral components can benefit from having a captive audience and multiple established communication channels. These intervention components are more likely to be sustained beyond the conclusion of the program and even institutionalized within the structure provided by the worksite setting.

Worksite obesity interventions have been conducted for decades, but most of the early studies were methodologically weak. Participation rates were not reported, adequate outcome measures were not collected, and the duration of the studies was too short to assess long-term impact. Furthermore, the studies lacked a theoretical basis and instead aimed to change behavior without identifying the purported constructs responsible for the change. Thus, even positive changes could not be properly attributed in many cases.

However, more recent systematic reviews based on studies meeting specific methodological and data criteria showed promising results. The pooled effect estimate for change in weight suggest an average weight loss of 2.8 pounds in the intervention group over a 6-12 month period. Interventions that included in-person contact more than once per month more consistently resulted in significant weight loss compared to interventions with in-person contact occurring less than once per month. Furthermore, studies aiming to improve dietary intake led to increased fruit and vegetable consumption.
and decreased total fat intake, though the average effect size was small. Return on investment estimates for workplace wellness programs, the majority of which aimed to improve weight status, suggest that medical costs decreased by over $3 with every dollar spent.

The first federally-sponsored worksite obesity programs were funded by the National Heart, Lung, and Blood Institute (NHLBI) in 2004 and highlight some methodological improvements over earlier studies. Seven institutions were funded to develop and conduct obesity interventions in various types of worksites, including hospitals, hotels, garages and businesses. The studies were predominantly theory-driven and aimed to change both the environment and individual behavior, thus intervening at multiple levels of the ecological model. The methods employed in these studies are clearly outlined, and the studies all included extensive formative research and pilot testing before the final intervention was implemented. Results show the programs achieved moderate success in improving worksite nutrition and physical activity environments, and improving dietary intake and weight status for the employee populations. The processes used in the development of the programs are a good prototype for future worksite interventions.

Educational and behavioral interventions were an integral part of these and other recent studies. During formative research for an intervention at a corporate plant, participants indicated that education about cooking healthy meals would be the most feasible and successful nutrition initiative. The intervention relayed educational messages through signs, table tents, and posters, as well as through email and the company website. Another study also incorporated workshops, “quick tips tables”
cafeteria tours, and suggestions for healthy menu options at local restaurants\textsuperscript{81}. Cousineau et al. developed a tailored web-based program as a nutrition education and skill-building tool\textsuperscript{82}.

Many studies also aimed to modify the food environment at the workplace. Devine et al. identified four routes of exposure to food at one particular worksite; three of those routes, including vending machines, cafeterias, and catered food at meetings, are possible targets of the intervention\textsuperscript{83}. Zapka et al. took a different approach, organizing a weekly farmers’ market at a different worksite to make healthy foods more available\textsuperscript{81}. In one Malaysian study, the worksite was equipped with water fountains, microwaves, and a scale to help facilitate healthier eating habits\textsuperscript{84}. These approaches have the added benefit of focusing on wellness for all employees, which is preferred over interventions that target at-risk employees only\textsuperscript{85}.

However, these studies have only begun to explore the myriad options for conducting obesity interventions at worksites. Although studies have relied on formative research to understand the study population, many have not directly used input from participants and stakeholders in the study design, which creates ownership and enhances engagement. Furthermore, web-based tools and email have been used in several interventions\textsuperscript{82,86,87}, but other forms of modern technology, such as text messaging and cell phone applications, have not yet been integrated. And lastly, there are many additional worksite settings with differing needs that remain largely unexplored, including fire stations.

\textbf{Firefighter Wellness Programs}
Recognizing the importance of cardiovascular health and physical fitness, the CDC has recommended that all firefighters be required to participate in a wellness program, though current participation remains voluntary\textsuperscript{33,18}. Numerous firefighter organizations have developed guidelines for fitness and wellness programs. NFPA standard 1583 outlines a health-related fitness program complete with assessments, training programs, coordinator and peer trainer roles, and data collection recommendations\textsuperscript{88}. This is in addition to the medical guidelines, including annual fitness evaluations, indicated in standard 1582\textsuperscript{46}. The International Association of Firefighters (IAFF) and the International Association of Fire Chiefs (IAFC), through the Fire Service Joint Labor Management Wellness-Fitness Task Force, developed a wellness and fitness initiative including fitness, rehabilitation, and behavioral health components; a Candidate Physical Ability Test (CPAT) with corresponding license; a peer fitness trainer certification program; and an online resource guide\textsuperscript{89}. Lastly, the National Volunteer Fire Council’s Heart-Healthy Firefighter Program includes fitness, nutrition, and lifestyle (e.g., smoking cessation, alcohol, and stress) resources for firefighters and EMS personnel and their families\textsuperscript{90}.

However, NIOSH found that only 41% of departments with a cardiac fatality had fitness programs and only one-quarter of those required participation\textsuperscript{37}. More departments clearly need to be encouraged to take the important step of participating in a wellness program. Furthermore, while existing firefighter wellness programs include some nutritional resources, they primarily focus on physical activity and fitness since these more directly affect firefighting performance. The role of food and the food environment on health and weight status, and thus on performance, has not been
prioritized. However, studies have demonstrated an interest in nutrition education, with one finding that over three-quarters of firefighters wanted to be offered more health information at work, particularly regarding nutrition, through newsletters, presentations, and pamphlets, and another demonstrating that 90% of participating firefighters were interested in attending a lecture on diet, exercise, and reducing heart attack risk if provided by the department\textsuperscript{16,54,91}. The need for nutrition-focused wellness programs to complement fitness initiatives is clear.

To maximize the success of nutrition programs, barriers to wellness program participation should be addressed. Firefighters have identified the expectations of the crew captain and the captain’s own adherence to mandatory fitness programs as a primary factor affecting group participation in such programs, highlighting the importance of engaging leadership in wellness programs\textsuperscript{92}. Even when departments set aside on-duty time for physical activity, management often schedules other non-response activities during that window, keeping firefighters from engaging in physical activity and sending the message that fitness is not a priority\textsuperscript{92}.

Furthermore, one study of firefighters’ knowledge of cardiovascular disease found that many firefighters were not aware of their weight status. Only 44% of the firefighters in the study considered themselves to be overweight, when in actuality almost double that number (84%) met criteria for being overweight\textsuperscript{16}. Another study found that younger firefighters were concerned primarily with aesthetics when questioned about fitness, while older firefighters associated fitness with coronary health\textsuperscript{92}. These studies suggest a need to screen all firefighters for factors contributing to cardiovascular disease to
improve consistency between perceived and actual health status, and to emphasize the importance of cardiovascular health at any age.

Additionally, in order to improve the health of all firefighters, both career and volunteer firefighters should be targeted through wellness interventions. Their needs differ based on variations in the amount of time spent engaged in firefighting activities and spent at the fire station, among other factors. Most established programs target career firefighters; however, nearly 70% of all firefighters in the US are volunteer, comprising 786,150 of 1,140,750 total firefighters (down from 825,450 in 2009)\textsuperscript{93}. Furthermore, 66% of fire stations are completely volunteer and another 19% are mostly volunteer\textsuperscript{93}. Thus, an intervention targeting volunteer firefighters would benefit a larger percent of all firefighters and consequently a larger percent of U.S. communities.

At the time this research was initiated, only one nutrition-focused intervention for firefighters had been reported in the literature. The PHLAME study, funded as part of the Behavior Change Consortium, compared a team-centered curriculum to one-on-one motivational interviewing and found both to be effective in increasing fruit and vegetable intake, though only the team-focused intervention group saw increases in dietary understanding\textsuperscript{94}. While both groups gained weight over the study period, weight gain was significantly less than in the control group. Extended follow-up over several years saw the elimination of most intervention effects, though partially because the control group also increased fruit and vegetable intake and maintained weight status\textsuperscript{95}. However, the study included only paid firefighters and did not employ any environmental strategies.
Results from one more recently published study demonstrated a decrease in prevalence of Metabolic Syndrome after a 12-week nutrition and physical activity intervention focused on promoting a low-glycemic diet. However, the study included only paid firefighters with intervention activities occurring during shifts and had a particularly small sample size of 10 firefighters. Changes to dietary intake were partially addressed through the provision of meal replacement shakes and bars. Many of the improvements seen during the intervention period were not maintained, leading researchers to suggest pairing the program with additional follow-up and mandatory annual physical exams. There remains a clear need for additional research on improving firefighter diets through worksite interventions to reduce risk of cardiovascular disease and decrease on-duty fatalities.

**Theories of Health Behavior Change**

**Stages of Change**

The Transtheoretical Model suggests that behavior change is not a discrete event but instead involves progression through a number of stages of change. These stages include precontemplation (no plans for action in the foreseeable future), contemplation (planning to take action in the foreseeable future), preparation (planning to take action in the immediate future), action (recently having made a change), and maintenance (turning new behaviors into habit). Understanding these stages can help in the development of a program that effectively reaches all participants rather than targeting only one subset, such as individuals who are already in the preparation stage.
Numerous nutrition interventions have used the stages of change model to categorize study participants. Though the criteria used to define healthy eating behavior has differed (e.g., less than 30% calories from fat, consumption of at least 3 servings of vegetables daily), results from dietary intake measures have indicated that stage of change is significantly associated with healthy eating\textsuperscript{97–100}. The greatest difference is seen between the three pre-action stages (precontemplation, contemplation, and preparation) and the two later stages (action and maintenance). These studies illustrate the value of helping individuals progress through the stages to improve eating behavior. This progression can be used as an indicator of intervention success\textsuperscript{98}.

There are a number of processes of change that are used by individuals while progressing through the stages\textsuperscript{101}. These include consciousness raising, self-reevaluation (e.g., reassessing thoughts on dietary change), self-liberation (e.g., recognizing choices), and three other experiential processes often employed by individuals in the earlier stages, as well as five behavioral processes, such as helpful relationships (e.g., accepting help from others), often employed by those in later stages. Generally, in regards to nutrition interventions, individuals in the precontemplation stage will likely benefit from information about healthy eating and general increased awareness of the issue\textsuperscript{98}. Those in the contemplation stage may require discussion of perceived barriers to change, while specific strategies for healthy eating could benefit those in higher stages\textsuperscript{98}. While some studies have shown that individuals who self-identify as being in the maintenance stage may not actually be meeting appropriate criteria\textsuperscript{102}, sharing new strategies can help these individuals continue to make appropriate changes.
Social Cognitive Theory

Social Cognitive Theory (SCT), which grew out of Social Learning Theory, suggests that behavior is influenced by personal, behavioral, and environmental factors, and that through a process termed reciprocal determinism, behavior in turn influences the environment\textsuperscript{103}. Psychological determinants of behavior include outcome expectations, or beliefs about the likelihood of achieving a particular outcome, and self or collective efficacy, beliefs about an individual’s or group’s ability to successfully engage in a particular behavior. Environmental determinants of behavior include incentive motivation and facilitation. Observational learning, another key concept of SCT, highlights the influence of peers and of seeing behaviors modeled. And finally, self-regulation identifies the usefulness of self-monitoring and goal-setting in achieving a target behavior.

SCT has been applied to many public health interventions, and to nutrition interventions specifically\textsuperscript{104}. Studies have demonstrated an association between SCT concepts such as self-efficacy, outcome expectations, and self-regulation, and dietary intake and weight status\textsuperscript{105,106}. Furthermore, *improvements* in those SCT concepts have been linked to improvements in dietary intake, particularly fruit and vegetable and fat consumption\textsuperscript{107–109}. In one study, increases in self-efficacy eight weeks into the study predicted improvements in fruit and vegetable consumption at one year\textsuperscript{108}. Within self-regulation, goal-setting has been shown to be very effective in modifying dietary intake, though implementation strategies may be more important than the act of creating a goal\textsuperscript{109,110}.
Conceptual Framework for Firefighter Nutrition Intervention

The Community Preventive Services Task Force has developed a conceptual framework for worksite nutrition and physical activity interventions to improve weight status based on its recommendation of worksites as a setting for community obesity prevention and control programs (Figure 1). The Task Force produces recommendations to assist health departments, employers, communities, schools, and researchers, among other groups, in identifying public health interventions to improve health. Recommendations are based on rigorous systematic reviews and are proven to save lives and improve quality of life. The reviews synthesize information on intervention efficacy, cost, and benefits, along with specifying which interventions require additional research.

The analytic framework for worksite nutrition and physical activity interventions to improve weight status highlights components of effective programs and expected outcomes. There are three categories of worksite intervention components, including environmental changes and policy, informational messages, and behavioral and social skills or approaches. These are expected to influence knowledge, attitudes, social norms and support, and environmental conditions, which then collectively influence behavior. Changes in behaviors can then lead to changes in body size and composition, the primary outcome. This framework is applicable to most worksite settings, and indeed is a fitting model for a firefighter intervention. As stated earlier, the FFIRE study focused on nutrition and dietary change based on firefighter preference as determined during formative research and because previous firefighter interventions had addressed physical activity.
The FFIRE study integrated key concepts from Social Cognitive Theory and the Transtheoretical Model in the implementation of the analytic framework. In order to improve self-awareness, self-efficacy, and social support as included in the behavioral skills section, the intervention addressed goal-setting and self-monitoring as highlighted in SCT. Additionally, observational learning played a key role in demonstrating healthy techniques. Various informational messages were developed to reach individuals in the different stages of change. For instance, topics included firefighter mortality statistics to engage individuals in the pre-action stages and specific tips for eating a more healthful
diet for those in the action and maintenance stages. Thus, by using key concepts from these theoretical models, the worksite intervention components outlined in the analytic framework for worksite nutrition interventions had a greater chance of impacting knowledge, attitudes, social norms and support, and environmental conditions, thereby potentially improving dietary intake.

**Formative Research**

Fifteen focus groups were conducted with firefighters across Maryland as part of the formative research for this project to identify intervention topics to reduce on-duty fatalities\textsuperscript{112}. The 98 participants were mostly White (92%) and male (85%), and ranged in age from 18 to 77 years. Over half (54%) categorized themselves as being overweight or obese based on self-perception of weight status. Health was a concern of many of the firefighters, but most found it difficult to prioritize eating well or exercising. The fire service lifestyle was cited as one barrier to adopting healthier habits. Though participants were asked about both food and physical activity, discussions about food dominated many of the focus groups, suggesting that it is an area of particular concern and leading to the selection of nutrition as the intervention focus.

Eating habits at the fire station varied considerably across departments. Some departments with kitchens prepared group meals on a regular basis. Other departments cited carry-out or fast-food as being more commonly consumed. And still others reported little meal consumption at the fire station, and instead either ate at home or relied on the commissary or vending machine for snacks. Most firefighters agreed that their food options were limited and often unhealthy, both at the station and in the surrounding areas.
Further exacerbating the problem, participants said they wanted their food to be cheap, fast, filling, and good-tasting.

Participants suggested that an effective wellness program should increase access to tools and resources to improve health, as well as teach relevant skills. Ideas included improving fire station kitchens, stocking vending machines and commissaries with healthier options, and providing nutrition education and training on how to cook healthy meals. Support from department leadership and peers was considered essential, though firefighters noted that all activities should be voluntary, as mandating changes would lead to resistance. Competitions were suggested as one method for increasing interest in the program, with incentives ranging from bragging rights to fire station paraphernalia. Highlighting the relationship between health and job performance was suggested as another way to motivate firefighters. Physical exams were also considered to be helpful, presumably to inform individuals of their health status. These results suggested that a tailored nutrition intervention would be well-received by volunteer firefighters.
References


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METHODS

This chapter begins with a description of the population, subjects and sampling for the FFIRE study pilot intervention. The data collection instruments and schedules are discussed next, followed by an explanation of the intervention components. The educational intervention is described in detail, with comprehensive accounts of each of the six educational sessions. An overview of study components led by other team members, including the use of peer advocates, is then provided. The data analysis methodology is detailed next, and the chapter ends with a detailed description of each participating fire station.

Population, Subjects and Sampling

The FFIRE study was a quasi-experimental pilot intervention trial conducted from November 2010 to January 2012. All stations that participated in formative research for the study (n=12) were invited to join the pilot intervention; leadership from eight departments accepted\(^1\). The eight stations represented variation in fire stations across the state (and nation), for instance, being of varying sizes and with varying levels of resources. They included a mix of rural and suburban stations; urban stations were not represented since there are no urban volunteer or combination volunteer/paid fire stations in Maryland.

The FFIRE study included three arms (Figure 1). Both intervention arms received the same nutrition intervention (described below), with one arm receiving a supplementary peer advocate component. Peer advocates from each of the assigned stations were trained to provide additional social and informational support to study
participants. The final two stations served as control stations. These stations did not receive any intervention components during the study, but were offered study activities and materials at the conclusion of the follow-up period.

Figure 1: FFIRE Quasi-Experimental Study Design

Prior to study arm assignment, all stations were asked to select between one and three potential peer advocates, and those individuals were then asked to submit their availability for a peer advocate training. The two dates that allowed the maximum number of trainees to participate were chosen. The one station whose representatives were not available on either date was assigned to the control arm. The single participant from another station had to cancel due to a death in the family, so that station was also assigned to the control group. The first training was held as scheduled, with representatives from three stations in attendance. Due to scheduling difficulties, the second date was canceled, and the remaining three stations were assigned to the newly-
created non-peer advocate intervention arm. While this method of assignment to treatment groups is not statistically ideal, it allowed maximum utility of the small sample size and limited time frame for the pilot intervention.

After all stations were identified, participants from the individual stations were recruited to participate in the pilot intervention and evaluation. A minimum of eight participants had to sign-up from each station for the station to remain part of the study; there was no maximum enrollment. Although the focus of the intervention was on volunteer firefighters, the priority of the study funder was to be inclusive of all fire station personnel. Thus, other station personnel such as paid firefighters and emergency medical technicians (EMT) were also invited to participate. The chief of one station requested the inclusion of the head of the ladies’ auxiliary as somebody with direct control over meals served at the station. Additionally, individuals of any age were eligible for study participation, including firefighters under the age of eighteen (those with junior-level status) with parental consent, as were personnel who were unsure of their availability for the entire 12-month study and follow-up period.

Recruitment occurred at a stand-alone visit or in conjunction with the baseline measures visit, per station preference. Visits were scheduled to coincide with station meetings when possible to reach the maximum number of members. All station personnel in attendance were invited to a presentation by a study team member about the project. The station’s group assignment was explained, as were the potential benefits and risks of study participation. Compensation and confidentiality were also discussed. Interested personnel were given a consent form to review and sign once all questions were addressed, as well as a contact information form.
A total of 115 individuals enrolled in the study. Three did not complete baseline measures, resulting in an evaluation sample of 112 participants. Participation at each station ranged from eight to twenty individuals, representing 16% to 30% of all station personnel. Age ranged from 18 to 81 years, with a median age of 41. The participants were predominantly white (92%) and male (85%), reflective of the population at the stations. Fifty-four percent were volunteer firefighters only, 13% were paid firefighters only, and 4% were EMS only, with the remaining 28% falling into two or all three categories (and one participant belonging to the ladies’ auxiliary).

Human subjects approval was received from the Johns Hopkins School of Public Health Institutional Review Board.

**Data Collection**

Numerous data collection measures were completed at key points during the study (Table 1). These included physical measurements, dietary intake assessments, nutritional knowledge surveys, stages of change surveys, process evaluation measures, and health status questionnaires. Measures were collected at baseline, two months, six months (immediately post-intervention), and twelve months (six months post-intervention), with the exception of process evaluation, which was ongoing throughout the intervention.

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**Anthropometric Measures**

Members of the study team collected all anthropometric data to ensure methodical data collection. Anthropometric measurements including height (collected at baseline only), weight, waist circumference, blood pressure, and body fat percentage were performed at baseline, 2 months, 6 months, and 12 months. Height and weight were measured barefoot using the Seca 214 Portable Height Rod and the Taylor 74024102 High Capacity Stainless Steel Lithium Electronic Scale, respectively. BMI was calculated from these numbers at each time point. Waist circumference was measured twice, under clothing whenever possible, at the widest part of the waist; if the measurements differed by more than a half centimeter, a third measurement was taken.
An Omron upper arm blood pressure monitor was used to take a single seated blood pressure reading. Three cuffs of varying sizes were available to ensure proper fit.

The BioAnalogics ElectroLipoGraph Body Composition Analyzer (ELGIII) was used to measure bioimpedence; body fat percent was then calculated using the Health Management System software provided with the device. Unlike typical handheld or scale-type body fat analyzers, the ELGIII receives input from the upper and lower halves of the body. Adhesive sensors were placed on the wrist, the back of the hand, the ankle, and the top of the foot on the right side of the body. In rare instances of injury, the left side was used. If this occurred at baseline, the same side was used at future time points; if at a later visit, then the original side was used for the remaining measurements.

Additionally, non-fasting glucose, HDL, and total cholesterol were collected at baseline and at 6 months by certified technicians from L&T Health and Fitness using calibrated instruments. Fasting measurements were not attempted since it would have been difficult for participants to fast for the required time, particularly since most visits occurred in the evening. Participants were, however, encouraged to refrain from eating immediately prior to having their measurements taken. Blood specimens were collected by finger stick. The ratio of HDL to total cholesterol was calculated by the L&T technician.

Diet History Questionnaire II (DHQ II)

Dietary intake was collected at baseline, six, and twelve months using the National Cancer Institute’s Diet History Questionnaire, a semi-quantitative food frequency questionnaire developed and validated for use in American populations. The
most current version, assessing intake of 134 items, was used (DHQ II). Four versions of
the questionnaire are available, asking about frequency of consumption over the past
month or the past year, both with and without portion size. This study utilized the past-
month questionnaire with portion size. This allowed for a comparison of dietary intake at
multiple time points, whereas the year-long survey would deemphasize any changes
made during the latter part of the intervention. Additionally, the inclusion of portion size
was critical since the intervention aimed to promote smaller portions of starches and
meats and larger portions of vegetables.

The web-based DHQ II was used because it was expected to take less time to
complete than the paper-based version and is programmed to not allow missing or
inconsistent answers. The questionnaire could be saved once started and completed at a
later time if necessary. Participants were given a handout with background on the
questionnaire, detailed instructions on how to use the DHQ website, and their study code,
respondent ID, and password. They then completed the questionnaire independently
within one month of the data collection visit. All but a few participants were comfortable
completing an online survey; those requiring assistance were helped in person or over the
phone as required. All stations had computers with internet access available for
participant use.

Demographic, Health, and Nutrition Survey

Additional data were collected from participants through a paper survey covering
nutritional knowledge, eating habits, and dietary stages of change, as well as
demographics, physical activity, and health status (Appendix A). Survey questions were
developed by the study team and select questions were used from existing surveys. The survey was administered to firefighters at non-participating fire stations prior to study data collection to evaluate clarity and length. The survey was administered at baseline, and modified versions were distributed at two, six, and twelve months. The post-intervention surveys (i.e., six and twelve month surveys) for the intervention stations included intervention exposure and evaluation questions.

Demographics included fire service demographics (e.g., roles, experience) in addition to standard demographic questions. Health status questions covered a range of topics including body size, medical conditions, tobacco use, alcohol consumption, stress, injury, and depression. Questions from the following validated surveys were used: Perceived Stress Scale, CAGE (Cutting down, Annoyance by criticism, Guilty feeling, and Eye-openers) Questionnaire, Behavioral Risk Factor Surveillance System Questionnaire, National Health Interview Survey, SF-12 Health Survey, and the Center for Epidemiologic Studies Depression Scale (CES-D). The National Health Interview Survey also included questions used to assess physical activity level. Questions assessing the remaining topics were written by the study team.

Knowledge questions were included to evaluate firefighters’ understanding of the components of a healthy diet and ability to translate theoretical knowledge into the selection of healthy foods. Available knowledge scales either did not cover these preferred topics or were based on outdated nutritional guidelines; thus, a new questionnaire was developed. Fourteen nutrition knowledge questions covered nutritional properties of foods, dietary guidelines, healthy cooking methods, and the diet-disease link (Appendix A). A separate eight-question scale assessed nutrition facts label
reading comprehension. The items were tested with a diverse population prior to inclusion in the FFIRE study pilot survey. Difficulty scores for individual questions ranged from 0.26 to 0.91, with most falling between 0.61 and 0.78, consistent with guidelines for maximizing item discrimination\textsuperscript{11}. Discriminatory indices for all but one question were higher than 0.10, and a Cronbach’s alpha above 0.85 demonstrated high internal consistency. The final questionnaire was reviewed by a registered dietician unaffiliated with the FFIRE study for face validity (e.g., clarity and accuracy).

The eating habits section asked about food consumption at the station, frequency of meal preparation and prepared food consumption, fat use (e.g., during food prep) and consumption (e.g., trimming visible fat from meat), whole grain consumption, and meal composition, among other dietary habits (Appendix A). Some questions from the WellWorks Study Health Habits Questionnaire were used, though the majority of the questions were written by the study team. Additionally, stages of change questions asking about dietary intentions were written using the five-choice single-question algorithm recommended by Prochaska\textsuperscript{12,13}. The Three Factor Eating Questionnaire-R\textsuperscript{18} was also included to evaluate dietary restraint and emotional eating\textsuperscript{14}.

Post-intervention evaluation questions queried participants on the impact of various intervention components, changes they made to improve their health and their perception of improvements in their health status, changes in the food environment at their stations and in their homes, and their opinion of whether they will maintain any changes (Appendix A). Exposure questions asked participants about their exposure to individual intervention components and use of specific study resources, including sessions, handouts, books, posters, foods, and equipment.
Process Evaluation

Attendance (of participants and non-participants) was taken at all study sessions to assess reach in combination with the exposure survey. Interventionist logs completed after study sessions were used to assess dose delivered and fidelity. These included notes on presentation content (topics addressed, abbreviated, or not addressed) as well as the foods prepared and served. Level of participant involvement, audience reception to the foods, and potential improvements were also recorded. Evaluations collected from attendees asked for feedback on the session, questions, and suggested improvements. These were used along with the exposure survey and interventionist logs to assess dose received. Evaluations were reviewed after each session and, if needed, modifications were made accordingly.

Additional Data Collection

A modified version of the Checklist of Health Promotion Environments at Worksites (CHEW) was completed at each intervention station at baseline and 6-months to assess changes in the food environment\textsuperscript{15}. Additionally, a brief survey was collected from non-participants to gather information on their reasons for not participating in the study and their weight status. Surveys distributed to intervention stations also asked about participation in study activities.

Data Management
All survey data and physical measurements were recorded on paper forms using only participant ID numbers for identification. Completed forms were kept in a locked file cabinet at study headquarters. The key linking participant name and ID number was stored separately. DHQ II data were stored electronically on a secure server.

Data entry (for all data other than the DHQ) was completed by members of the study team. Quality control of all entries was conducted by other team members. Because the DHQ II was completed electronically, a spreadsheet with all raw values was downloaded from the researcher website and was converted into intakes using Diet*Calc version 1.5.1, downloaded from the Diet History Questionnaire II website. Electronic data files were password protected and stored on secured computers and flash drives.

**Nutrition Intervention**

The FFIRE study nutrition intervention, the focus of this dissertation, aimed to provide participants with the knowledge, skills, and resources needed to improve dietary intake while improving the station food environment. Other team members led complementary environmental and behavioral intervention activities. The specific topics that were included in the intervention were selected based on input from a number of sources. Transcripts from the focus groups conducted with firefighters during the formative research were read and notes taken on any relevant food comments, particularly regarding foods typically consumed at the fire station and factors affecting food choices. Additionally, input was solicited from representatives from the National Volunteer Fire Council (NVFC), partners in the FFIRE Study. A fire station observation visit provided an opportunity to observe eating habits at a station and to discuss dietary
concerns with current firefighters prior to study initiation, while recruitment and baseline
visits provided further insight.

   The overwhelming consensus was that health was not a priority when eating at the
fire station, but there was a growing understanding of its importance. The biggest
considerations, taste and cost, mirrored those of the general American population\textsuperscript{16}. Additionally, convenience was of particular importance since many volunteers are
juggling full-time employment with their volunteer responsibilities. Furthermore, career
and volunteer firefighters alike are not sure when they may get a call, making it difficult
to prepare meals at the fire station. And finally, some fire stations included in formative
data collection did not have kitchens and thus were unable to prepare food, though all
stations that participated in the intervention pilot study did have kitchens.

Organizing Framework and Theoretical Basis

   The analytic framework for worksite nutrition and physical activity interventions
to improve weight status developed by the Task Force on Community Preventive
Services served as the organizing framework for the intervention\textsuperscript{17}. It outlines three
worksite intervention components, including environmental changes and policy,
informational messages, and behavioral and social skills or approaches. While the
nutrition intervention was clearly aligned with the informational messages component,
certain aspects of the intervention overlapped with the environmental changes and
behavioral skills components. For instance, behavioral strategies for healthier eating
were addressed briefly at each session and extensively in the third session. Additionally,
equipment used in the cooking demonstrations was provided to the stations to improve
the food preparation environment, and lists of healthy vending machine recommendations were distributed to station leaders.

The principles of Social Cognitive Theory (SCT) and the Transtheoretical Model (TTM) provided additional insight on ways to structure the various intervention components. SCT constructs including self- and collective efficacy, behavioral capability, and observational learning helped to guide the selection of intervention strategies. Additionally, intervention activities were selected to reach participants at different stages of change from TTM, ranging from those who are not contemplating action to those who have successfully engaged in the promoted behavior for at least six months.

**Intervention Activities**

The foundation of the intervention was monthly sessions held at each station (Table 2). Sessions included a nutrition presentation, cooking demonstration and taste tests, and, when relevant, resource giveaways for the station. During formative research, most of the firefighters admitted to having little knowledge about nutrition. Thus, it was determined that the presentations should assume no prior knowledge and should explain the basics of nutrition. A holistic view of nutrition was promoted, emphasizing themes of energy balance and balanced meals (using a plate model: one-half vegetables, one-quarter lean protein and one-quarter whole grains). Rather than focus solely on conceptual ideas, the main concerns brought up by firefighters, such as time and money constraints, were explicitly addressed through practical tips that fit into the firefighters’ hectic lifestyles to increase self-efficacy. PowerPoint was not utilized to avoid a classroom-type
atmosphere; instead handouts and chart paper were used to emphasize important points as appropriate. The sessions were open to all station personnel and family members. Participants who missed a session were invited to other stations for a make-up session when possible, and were otherwise given a detailed summary over email.

Table 2: FFIRE Education Sessions Overview

<table>
<thead>
<tr>
<th>Session</th>
<th>Time Point</th>
<th>Topics</th>
<th>Cooking Demo</th>
<th>Handouts</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Baseline</td>
<td>Energy balance; macronutrients; discretionary calories; nutrient-dense foods; plate proportions</td>
<td>N/A</td>
<td>Eat More, Weigh Less (CDC), Balancing Your Plate</td>
</tr>
<tr>
<td>2</td>
<td>Month 1</td>
<td>Fruits and vegetables; healthy fats; microwave cooking</td>
<td>Spaghetti squash (prepared in microwave)</td>
<td>Fruits and Vegetables (CDC); What Are the Types of Fat? (MOVE!); Online resources</td>
</tr>
<tr>
<td>3</td>
<td>Month 2</td>
<td>Hunger; setting goals; handling slips; mindless eating</td>
<td>Frozen vegetable medley and fruit salad (served with Chipotle burrito halves)</td>
<td>Hunger and Fullness (MOVE!); Hunger vs. Cravings; SMART Goals; Handling Slips and Lapses; Tips to Avoid Mindless Eating; Changing your Habits (NIDDK)</td>
</tr>
<tr>
<td>4</td>
<td>Month 3</td>
<td>Whole grains; added sugars; healthy beverages</td>
<td>Meat Sauce with ground turkey and spinach; whole grain pasta</td>
<td>Whole Grains; Added Sugars/Artificial Sweeteners; Rethink your Drink (CDC)</td>
</tr>
<tr>
<td>5</td>
<td>Month 4</td>
<td>Lean protein; sodium; healthier prepared foods (in grocery stores and restaurants)</td>
<td>Turkey burgers (using indoor contact grill) with healthy fixings; low-fat coleslaw</td>
<td>Protein; Salt and Sodium: 10 Tips to Cut Back; Restaurant Tips; Healthier Grocery Store Prepared Options; Healthier Fast Food/Carryout Options</td>
</tr>
</tbody>
</table>
To increase exposure to healthy foods and facilitate observational learning, cooking demonstrations and taste tests were incorporated into the session plans. These showcased healthy cooking methods and fast, nutritious recipes that complemented the topics for each session. When appropriate, the equipment used in the demonstrations was provided to each station to facilitate continued use of that cooking method. Recipe handouts were also distributed per participant requests. The original intervention plan involved literal taste tests of the demonstrated foods. However, the meeting time slots that were most convenient for participants were in the evening around dinner time, so the taste tests were upgraded to full nutritious meals. This also had the benefit of demonstrating balanced meal selection and offering additional motivation to bring participants into the stations for the sessions. Participants aided in food preparation when appropriate to speed up the process while increasing their involvement.

Additionally, a small nutrition library was created at each station to house nutrition resources. A wide range of resources were selected to appeal to participants at different stages of change. Books included *Mindless Eating* by Brian Wansink\(^\text{19}\), former Executive Director of the USDA’s Center for Nutrition Policy and Promotion (CNPP), *The End of Overeating* by David Kessler\(^\text{20}\), former commissioner of the FDA, and *Food Rules* by Michael Pollan\(^\text{21}\), a popular food journalist. These books address problems with the current American diet in a simple, relatable way and provide concrete tips for eating
more healthfully. The most recent edition of *Eat This, Not That!* included ratings of popular chain restaurants and comparisons of different menu options, while the *CalorieKing Calorie, Fat & Carbohydrate Counter 2010* provided nutritional information for a wide range of commonly consumed foods. Additional resources included the NVFC’s Heart Healthy Firefighter Cookbook and the Johns Hopkins Weight Management Center White Papers. Subscriptions to Men’s Health and Women’s Health monthly magazines supplied new reading material throughout the intervention.

Handouts were distributed at each session to help drive home the main points and were added to the nutrition library. All four brochures available through the CDC Weight Management Research to Practice Series were ordered free of charge. The brochures are easy to understand and interesting to read, and provide clear, concrete examples. Select handouts available for print from the *Move!* weight management program for veterans website (run through the VA National Center for Health Promotion and Disease Prevention (NCP)) were also used. Other resources found through Internet searches were used or revised when appropriate, and, if no available resources were suitable, then original handouts were created. A list of online resources, including recipe sites, calorie-trackers, and other interactive tools, was also compiled. Additionally, select “big picture” handouts were instead printed as laminated posters to be displayed in the kitchen or other high-traffic areas.

To encourage healthier consumption even when eating pre-prepared foods, lists of specific healthy options and general tips for identifying healthier selections (e.g., at restaurants and grocery stores) were compiled. Furthermore, most participating stations had vending machines, a commissary or both, usually stocked entirely with high-calorie
options. In order to help stations improve vending machine selections to include more healthy options (e.g., oatmeal packets and dried fruit) and smaller portion sizes (e.g., one ounce bags of potato chips to replace larger bags), a list of recommendations was compiled and shared with station chiefs. Many of these choices would also be appropriate for rehab units, which provide food during long or strenuous calls. However, rehab units were not specifically addressed as they are used infrequently at times when caloric needs are high.

Summaries of each session are provided below, with notes on the handouts, posters, and equipment distributed at each. Detailed presentation notes and email summaries are included in Appendix B. All handouts are included in Appendix C, recipes in Appendix D, and session evaluation forms in Appendix E.

*Session One: Introduction*

The first session was an abbreviated session (lasting approximately 20-30 minutes) because it was conducted at the baseline measurement visit. No taste test was incorporated due to time constraints and because measurements were taken after the session. Before delving into specific nutrition topics in later months, this session provided an overview of the relationship between intake and weight with general guidance on achieving a healthy diet. The concepts of energy balance, macronutrients, and nutrient density were introduced. The latter explanation incorporated the CDC’s brochure *Eat More, Weigh Less*. Discretionary calories were also discussed using a budget metaphor.
A balanced plate design was then shared as a simple method for achieving a balanced meal. This was chosen over a pyramid approach because it allows individuals to focus on the proportions of foods in individual meals rather than tracking food servings over the entire day. The USDA had not yet released their MyPlate design, so a different (and more simplified) version was used with a half-plate of vegetables, quarter-plate of grains, and a quarter-plate of protein. A handout with examples of healthy options in each category was distributed, and a larger, poster-size version was given to each station. The cover of the *Eat More, Weigh Less* brochure was also used as an illustration as it features a plate of healthy food with the same proportions.

**Session Two: Fruits / Vegetables and Fats**

The second session was a stand-alone session; the presentation with cooking demonstration and questions lasted approximately 90 minutes. Topics included fruits and vegetables, healthy versus unhealthy fats, and microwave preparation of foods. In the first session, it became clear that many participants were relying on potatoes and peas for their “vegetable” consumption, so the session stressed the importance of eating a variety of fruits and non-starchy vegetables. Also, whole fruits and vegetables were promoted over juices and dried varieties since many participants incorrectly felt that juice was an appropriate replacement. It was, however, specified that frozen and canned varieties can be just as healthy if chosen wisely, while saving time and money. The CDC brochure *How to use fruits and vegetables to help manage your weight* was distributed, and tips for increasing fruit and vegetable consumption were shared.
The fats portion of the session aimed to clarify the difference between saturated and unsaturated fats and the health impacts of consuming each. The Move! handout entitled *What Are The Types of Fat?* with examples of “good” and “bad” fats was distributed. The baseline nutrition knowledge survey demonstrated that the majority of participants thought fat intake should be minimized or limited to no more than 15% of total caloric intake, so actual recommended intakes were shared. Additionally, tips for limiting intake of saturated and trans fats while (cautiously) increasing intake of good fats were discussed.

To directly address time constraints and concerns about receiving a call during food preparation, microwave cooking was introduced as a convenient and healthy cooking method. Though microwaveable meals are popular, participants did not routinely cook other items in the microwave or even realize that was an option. Spaghetti squash was steamed whole in the microwave during the presentation to demonstrate how quickly and easily vegetables can be prepared using this method. The squash was then scooped and seasoned to prepare a quick vegetable side dish. Large microwaveable mixing bowls and cutting boards were provided to each station so other vegetables could be easily prepared. While the spaghetti squash was the main taste test, other foods were also provided. Raw fruit and snacking vegetables with salsa and guacamole were taken to all stations to correspond with the main theme of the session. Stations meeting around dinner time were also given Subway sandwiches.

*Session Three: Behavioral Strategies*
The third session was abbreviated because it was conducted in the same visit as the two-month measures. It consisted of a 45-minute presentation; no cooking demonstration was included, though a healthy dinner was provided. The focus of the session was on behavioral strategies for healthier eating. This was chosen because many participants indicated that they were interested in losing weight, but did not know where or how to begin. Knowledge of healthful foods is essential but not sufficient for changing unhealthy eating habits. After two months of nutrition-focused presentations, it seemed wise to discuss ways to incorporate this knowledge into specific goals. Furthermore, the nutritional topics were all paired with cooking demonstrations, so the behavioral strategies session was appropriate for a shorter time slot.

The concept of hunger was discussed both as a scale and in contrast to cravings. The length of time that it takes the body to realize it is full was stressed as a reason to eat slowly and pay attention to hunger and satiety signals. Some firefighters had mentioned in focus groups that they often go long periods without eating and then eat large meals, so the goal of also avoiding the very bottom of the hunger scale was also discussed. Tips were also shared on how to identify and manage cravings. Handouts included Hunger and Fullness from the MOVE! program and Hunger vs. Cravings from the Johns Hopkins Weight Management Center.

Next, a summary of tips from the book Mindless Eating by Brian Wansink were presented. This was particularly important for this population since firefighters often spend many hours at the fire station waiting between calls, which can easily lead to mindless eating. Results from research studies were used to illustrate how widespread
the problem is, even though most people believe they are not affected by mindless eating. A summary handout was distributed.

The presentation ended with a discussion of setting goals and handling lapses back to unhealthy habits. Participants were encouraged to take small steps, mastering just two or three goals at a time, rather than trying to make a drastic change all at once. Also, though many participants spoke of wanting to lose weight, it was stressed that goals should be more direct than weight loss. For instance, improving specific components of one’s diet or increasing physical activity are healthy, action-oriented goals that will likely lead to weight loss. Two handouts from the Johns Hopkins Weight Management Center were used: Setting S.M.A.R.T Goals and Handling Slips and Lapses. The more detailed NIH brochure Changing Your Habits: Steps to Better Health was also introduced and added to the nutrition library, though copies were not distributed.

Two additional handouts from the Move! campaign were printed as laminated posters and given to stations. Both provided tips for eating well and choosing healthy foods throughout the day. All Foods Can Fit stressed moderation, balance and variety. Eat Frequently to Lose Weight served as a reminder to eat throughout the day and provided specific examples of healthy snacks versus foods to avoid. These posters were summarized during the presentation and then given to the station contacts to display in an appropriate location.

Prepared foods were provided for dinner to demonstrate ways to consume a healthy, balanced meal even when cooking is not an option. Healthy burritos from Chipotle (e.g., chicken with brown rice, little cheese, and no sour cream) were served alongside vegetables and fruit salad. The extra-large burritos, which can often lead to
over-eating, were cut in half to illustrate ways to avoid mindless eating; additional halves were available to take home (or to eat if the first half was truly insufficient). Frozen, unseasoned vegetables were cooked in the microwave and served with salt-free seasoning, and a fruit salad was made using a combination of fresh and frozen, unsweetened fruits, reinforcing the messages from the previous session.

Session Four: Whole Grains and Sugar

This stand-alone session continued with the presentations on food categories, this time focusing on grains and sugar. After defining whole grains and explaining benefits of their consumption, the majority of the discussion was spent on properly identifying whole grains. Many participants were unaware, for example, of the difference between wheat bread and whole wheat bread. Additionally, whole grains other than wheat were identified, and specific tips for increasing whole grain consumption were shared. A handout summarizing the discussion and including sample ingredient lists from whole wheat and non-whole wheat breads was distributed. A single serving of pasta in both dry and cooked form was also passed around to illustrate the size of a serving and to motivate participants to monitor their intake.

The sugars portion included a discussion of added sugars, artificial sweeteners, and sweetened beverages. The difference between added sugars and naturally-occurring sugars was explained, and the discrepancy between recommended and actual intakes of added sugars was highlighted. Uses for sugars other than as sweeteners were shared to explain why sugar is often added even to savory processed foods. A list of different types of added sugars was distributed to help identify sugars in ingredient lists. The back
side contained a definition of artificial sweeteners as well as a list of approved varieties. Studies suggesting that consumption of artificial sweeteners contributes to weight gain were shared, with the conclusion that artificial sweeteners and sugar alcohols should be consumed only in moderation.

Drinks were addressed specifically since sweetened beverage consumption was high at participating stations. An empty 20-ounce soda bottle was filled with 16 teaspoons of sugar, representing the sugar in a beverage of that size, to illustrate the amount of sugar packed into sweetened beverages. Research linking sweetened beverage consumption with negative health outcomes was shared, as were hypotheses of why beverages in particular are so harmful. An example from the CDC brochure Rethink Your Drink demonstrated how easily calories from drinks can add up over the course of a day, and tips for reducing consumption of sweetened beverages were discussed.

Because pasta was a popular meal at the fire stations, two types of whole grain pasta (one whole wheat and one multigrain) were included in the taste test. The cooking demonstration was of a spinach and meat sauce that could be served with pasta or eaten alone. The dish used jarred pasta sauce to keep preparation fast and affordable, but incorporated lean ground turkey and frozen spinach to make it more substantial and to increase the protein and vegetable content. Fruit and low-fat string cheese were also provided as snacks during the presentation.

Session Five: Protein, Sodium, and Prepared Foods

The fifth session started with a discussion of protein and sodium, then integrated information from all of the sessions thus far into concrete tips for choosing healthier pre-
prepared foods. The role of protein in the diet and the difference between complete and incomplete proteins was explained. The nutrition labels from plain yogurt and peanut butter were used to illustrate the difference in protein availability from complete and incomplete sources. Protein intake recommendations were clarified, and lean protein sources (as well as lean preparation methods) were identified and listed in a summary handout.

During the sodium portion of the presentation, the mechanisms by which excess sodium intake can lead to poor health outcomes were briefly explained. The discrepancy between recommended and actual intakes was highlighted, and the major sources of sodium in the diet were discussed. The importance of limiting processed food consumption was emphasized, with the explanation that most processed foods, even ones that don’t taste salty, have significant amounts of sodium. The MyPyramid handout entitled *Salt and sodium: 10 tips to cut back* was distributed.

Though participants were encouraged to avoid prepared foods when possible, the reality was that many of the participants often relied on fast food. In order to help mitigate the damage from eating out, tips for choosing healthier prepared options were shared, integrating the nutrition information that had been covered in previous sessions. The information included in the *MOVE!* handout *Restaurant Tips* was reviewed, and a list of specific healthier options at popular fast food restaurants, compiled by looking at the nutrition facts for all menu offerings, was distributed. Presumed healthier choices at local establishments favored by the individual fire stations were also discussed, though nutrition facts were not available. And finally, smart choices in different grocery store
aisles were shared, with the tip that grocery stores often have more ready-to-eat healthy options than fast food restaurants.

The cooking demonstration aimed to show participants that preparing a meal can be as efficient as picking up fast food. Lean turkey burgers were prepared on a Foreman grill (sloped contact grills designed to reduce fat), and were served with whole wheat buns, sliced vegetables, and low-calorie condiments. Healthy homemade coleslaw and fruit were also provided. When time permitted, additional vegetable toppings were grilled. After demonstrating the convenience of preparing lean meats and vegetables with an indoor grill, large Foreman grills were provided to each department. Though the meal was healthy and well-balanced, the amount of sodium in the condiments and particularly the hamburger buns was mentioned to illustrate the prevalence of sodium in most processed foods.

Session Six: Portion Size and Nutrition Labels

The final session built on the knowledge from previous sessions to address portion size, nutrition facts labels, and nutrient label claims. These topics were saved for the last presentation because they draw on an understanding of recommended intakes of various foods and nutrients. The portion size discussion began with an explanation of the difference between a portion and a serving, and a conversation about the drastic increase in portion size over the past several decades. Examples from the National Heart Lung and Blood Institute’s (NHLBI) Portion Distortion Quiz\textsuperscript{26} were presented and passed around the group. A handy refrigerator card entitled \textit{Be Wise About Portion Size} was used to guide a discussion of using common household objects to gauge servings of
various foods, with emphasis put on surprisingly small (e.g., cheese) and large (e.g., salad greens) servings. Additionally, the CDC brochure *How to avoid portion size pitfalls to help manage your weight* was summarized and distributed.

A sample label for macaroni and cheese from the NHLBI *We Can!* handout *Using the Nutrition Facts Label* was used in the nutrition facts label discussion. The presentation included an explanation of % daily values and ways to use the values when following something other than a 2000-calorie-per-day diet. The importance of noting the serving size and servings per container was emphasized before walking through all of the nutrients included in the label. A summary of the relevant points from previous sessions (e.g., the different types of fat) was included as appropriate, and the need to cross-reference the ingredients list was emphasized. The purpose of the footnote was also explained. Finally, a list of nutrient label claims was distributed, with the caveat that most claims are in reference to a single nutrient and do not give any information about other nutritional properties of the food.

Instead of a traditional cooking demonstration, the focus of the demonstration was on assembling a well-balanced salad. Various healthy salad ingredients were prepared before the session, including greens (romaine and spinach), additional vegetables (tomato, cucumber, and bell pepper), lean protein (chicken breast prepared on a Foreman grill and low-fat feta cheese), healthy carbohydrates (chickpeas and dried cranberries) and healthy fats (walnuts). Dressing options included lemon juice, balsamic vinegar, and light Italian dressing. A sample salad was made by measuring out a serving of each salad component while commenting on the approximate caloric content of each item. It was stressed that these components were only an example of items that can be included in a
healthy, filling salad; items could be replaced with other favorites, seasonal produce, or items on sale at the local grocery store to reduce cost. Participants were then encouraged to make their own salads using the measuring cups and food scale as needed.

**Team-Led Intervention Components**

*Health Screenings*

As mentioned in the background chapter, previous studies have shown that many firefighters are not aware of their health status. Thus, during baseline and 6-month data collection, all participants (from intervention and control stations) received tailored feedback on their biometric measurements from the medical doctor on the study team. Participants at intervention stations also met with either a registered dietitian or behavioral psychologist from the Johns Hopkins Weight Management Center (WMC) at baseline to further discuss individualized plans and goals, and were given the option to contact either specialist during the intervention via phone or email. A scale was also given to each station so participants could weigh themselves between data collection visits.

*Healthy Food Discounts*

Environmental components in addition to those included in the nutrition intervention (described above) were also implemented. Discounts on healthier menu options at local restaurants were negotiated to incentivize the purchase of these items when eating out. Establishments were chosen based on lists obtained from stations of popular area restaurants. Online nutrition facts were consulted, if available, to identify
the healthiest options. For smaller non-chain restaurants, potentially healthy options were discussed with the owners to ascertain whether healthy ingredients and cooking methods were actually used. Establishments with no healthy options were not approached for discounts. Additionally, lists of local farmers’ markets and community supported agriculture programs were compiled for interested stations to increase access to seasonal produce.

Interdepartmental Competitions

The study team also incorporated interdepartmental competitions as per focus group suggestions to capitalize on the strong group identity within stations and the competitive spirit across the fire service. A Biggest Loser competition held between the six intervention stations included all intervention participants and any non-participants who signed up for the contest. First and second-place winners were chosen based on highest combined weight-loss at each station over the six-month intervention period among contest participants with baseline body mass index $\geq 25$. There was also interest in a healthy chili cook-off, but this unfortunately was not held since the team was unable to find a date and location that was convenient for all stations.

Peer Advocates

Formative research showed that peer influence can be an important motivator in the fire service. Two to three peer advocates were trained from each of the three stations in the peer advocate intervention arm prior to the start of the intervention, for a total of seven peer advocates. The day-long training at the Johns Hopkins Bloomberg School of
Public Health was modeled after the NVFC’s Health and Fitness Advocates workshop, but with a nutrition focus. The Johns Hopkins Weight Management Center (WMC) staff presented on the basics of nutrition and provided resources to help the peer advocates support their fellow firefighters. The peer advocates also received ongoing support from WMC staff as needed during the intervention. They in turn provided additional support to the other participants at their stations. The nature of this support varied, with one peer advocate making a major lifestyle change and leading by example, while another provided encouragement, moral support, and health resources. The extent to which the peer advocates engaged with the others at their station again varied. Two peer advocates were very active in their role, while the others were not as involved in the study and did not provide support to others at the station.

**Data Analysis**

**Variable Creation and Data Preparation**

Raw dietary intake data from the DHQ were converted into nutrient and food group intake estimates using Diet*Calc version 1.5.0. These included total caloric intake, gram intake of fiber, saturated fat, trans fat, and sodium, ounce-equivalent intake of whole and non-whole grains, cup-equivalent intake of fruits and vegetables, and teaspoon-equivalent intake of added sugars. Food group variables are based on the U.S. Department of Agriculture's (USDA) MyPyramid Equivalents Database (MPED) and Food Patterns Equivalents Database (FPED). An older version of Diet*Calc was originally used to create intake estimates, but the values were severely underestimated due to an error in the program for the past month version of the DHQ II (e.g., mean
caloric intake at baseline using the older version was 999 calories vs 2141 using the updated program). The problem was learned of after inquiring about possible errors in the program due to the poor intake estimates, and the raw intake data were consequently rerun using the revised Diet*Calc program.

Healthy Eating Index 2010 (HEI) component and total scores were also calculated, including fatty acid ratio, empty calories, and HEI total score. The HEI is a measure of diet quality based on the U.S. Dietary Guidelines for Americans; scoring utilizes densities and ratios to remain independent of total intake. HEI scores facilitated the analysis of change in relative contribution of various foods and nutrients in the diet. Scores were calculated using the SAS macros available on the HEI website. All required input variables were available from the Diet*Calc 1.5.0 output except for whole fruit cup equivalents, which was similar to the MPED_FRUIT_TOTAL_USDA variable but without juice contributing to the total. After contacting the DHQ technical support administrator, he created a modified database that included a new variable for fruit servings without the inclusion of fruit juice. The Diet*Calc database was updated in January 2015 with the missing variable so HEI scores can now be calculated with the standard output.

Questions from the nutrition knowledge quiz were assessed individually to identify gaps in knowledge, though total scores were also calculated to facilitate group and time comparisons. The fourteen questions assessing knowledge of nutritional properties of foods, dietary guidelines, healthy cooking methods, and the diet-disease link were combined to create one nutrition knowledge score. Seven single-answer multiple-choice questions and one open-answer question were dichotomously scored. Individual
components of six multipart questions were also dichotomously scored, then averaged to obtain the proportion of correct answers for each question. Multipart questions were weighted by two in the calculation of total nutrition knowledge score, out of a total of 20 points. A separate nutrition facts label score was also calculated after dichotomously scoring each label comprehension question, with a total possible score of 8 points. The two scales were combined with the nutrition facts label scale weighted by 0.5 to create one overall score out of a possible 24 points. Additional subscales were not created due to the small number of items in each potential grouping. All data manipulation and cleaning was done in SAS to minimize errors.

A participation score was also calculated using attendance records and post-intervention evaluation surveys by assigning a value to each study component. Two points were awarded for attending each educational session (for a total of 12 points), with one point being awarded for partial attendance or self-reported reading of the email summary. One additional point was awarded for reading each handout (17 possible points), each book (eight possible points), each poster (two possible points), or any magazine (one possible point). One point was also awarded for trying a new food or food preparation method from the cooking demonstrations. The summed total out of 41 represented the participation score for each intervention group participant. The scores were then divided at the median score of 29 to form high and low study involvement categories.

Treatment of Study Arm
Though the study design included two distinct intervention arms, the peer advocate component was not implemented as intended. Only two of the trained peer advocates were active in their role; the other five were not as involved in the study and did not provide additional support to others at the station. While the use of peer advocates, and the associated successes and challenges, is beyond the scope of this manuscript, it was evident that the two intervention arms had essentially received the same intervention. Indeed, over half of the participants at peer advocate stations responded that they either did not have peer advocates at their station or were unsure if they did, while nearly one-quarter of respondents at non-peer advocate stations responded that they did have peer advocates. The two intervention arms were thus combined into one intervention group for the primary analysis and compared to the control group.

Statistical Models

All data were analyzed using SAS 9.4 (SAS Institute Inc., Cary, NC, 2012). Models assessed change over time for all dependent variables by study group. The primary dependent variables were total calories, intakes of key foods and nutrients (saturated and trans fats, whole and non-whole grains, fruits, vegetables, added sugars, sodium), fatty acid ratio, percent empty calories and HEI total score. Secondary dependent variables included frequencies of various eating habits, plate proportions of meal components, stages of change for numerous dietary behaviors, and nutrition knowledge. All models were adjusted for sex, age, and intention to lose weight; additional adjustments for income, education, and fitness level were made as appropriate. Significance was assessed at a two-tailed alpha of 0.05.
Continuous data, including all intake variables and HEI total score, were modeled using linear mixed effect models (proc mixed) with random intercepts for study participant. This model is appropriate for longitudinal studies since it considers elapsed time between measurements and accounts for correlations between an individual’s series of observations (Fitzmaurice et al. 2004, Zeger & Liang 1992). Unlike ANOVA models, linear mixed effects models do not assume identical covariance matrices between all subjects, which, for example, is an inappropriate assumption since greater variance is expected in the intervention stations. Furthermore, linear mixed effects models can account for the hierarchical study design, which is critical since individuals from the same fire station may be correlated (Fitzmaurice et al. 2004). Skewed data were first transformed (log or square root) to normalize the residuals.

Generalized linear mixed models (proc glimmix) were used to analyze ordinal and binomial data, again with random intercepts. Linear mixed effects models cannot be used in the analysis of discrete outcomes because the assumption of a linear relationship between the predictors and the outcomes does not hold\textsuperscript{30}. Ordinal data utilized a longitudinal implementation of the cumulative logit model, an extension of the logit model used for binary data. These models retain the useful features of the linear mixed effects model discussed above for analyzing longitudinal data\textsuperscript{31}. Categories with insufficient responses were combined with adjacent categories to reach the minimum size required for accurate analysis.

**Missing Data**
Given the numerous data collection time points and the large sample size, missing data were inevitable. A complete-case analysis approach (using data only from participants whose data set is complete) was not used because of its dependence on the assumption that data is missing completely at random (MCAR)\(^{30}\) and because it reduces the number of available data points. Missing data were instead assumed to be missing at random (MAR). The use of linear mixed models allowed for all available data, including incomplete cases, to be included in the analysis.

**Station Descriptions**

Stations participating in the FFIRE study varied greatly in many regards, including size, location, station type (volunteer/comination), frequency of calls, leadership style, role in the community, meal preparation and consumption, and fitness equipment availability, among others. These factors contributed to the culture at the stations and influenced the way the stations interacted with the study. The station descriptions below highlight some of the defining characteristics of each station, describe the participant sample, and summarize the station’s response to the study, while the accompanying figure shows the location of each station within the state (Figure 2).

**Station A**

Station A is a suburban station located outside Baltimore City. It is a combination station with volunteers and three rotating shifts of paid firefighters. Two baseline data collection visits were held to reach firefighters from all three shifts. One visit occurred in the morning during the transition between two shifts, and the second took place in the
evening on a day when the third shift and the volunteers were working. However, two paid firefighters who signed up for the study at a recruitment visit were unavailable for the baseline visits and were unable to have their measures taken (and thus were not able to participate in the study). Three other participants who completed their measures were transferred to other stations. The remaining participants who were paid firefighters were all from a single shift. Sessions were therefore scheduled for days when the third shift and the volunteers were working. One of the three participants who transferred to another station continued to attend the sessions.

Figure 2: County Map of Maryland with Locations of FFIRE Stations

The station had more diversity in race and gender than most of the other stations (two female and three non-white participants out of fourteen). Most participants were in their 20s and 30s, and all had college degrees or had completed some college. Nine
participants worked as paid firefighters at the station and five were volunteers. The station was busy, but participants were willing to wait for others who were out on calls before starting the sessions. At times when this was not possible, the missing participants would join upon their return. Non-participants who were at the station during sessions (e.g., firefighters from other stations substituting at this station) often attended the presentation and joined the group for dinner.

The participants were generally enthusiastic about the study sessions. The captain, who was a member of the participating shift, did not often show excitement but was involved and helpful. Two individuals joined the shift after the study started; they were unable to formally participate in the study but attended study sessions with the rest of their shift and joined the Biggest Loser contest. Participants were particularly excited about the cooking demonstrations and dinners. They were pleased to have healthy leftovers to keep in the fridge and multiple participants indicated a preference for continuing to prepare similar meals. The firefighters started a garden behind the station during the study period and were eager to use the produce in their meals.

Station B

Station B is a rural station located on the eastern shore of the state. It is a volunteer station with a large fire hall available for community rentals. Participant demographics appeared to be reflective of the makeup of the town and the station members. Participants ranged in age from young adult to senior and all were White. Most participants had completed high school or some college with few college degrees.
Many participants were looking to lose weight, while others were at a healthy weight but were looking to improve their unhealthy dietary habits.

The recruitment and baseline visits were combined at this station. A large incident call during the visit took many interested firefighters away for over two hours, but all returned and completed their baseline measures. However, the station ended up having the highest drop-out rate, with three of 17 participants dropping out and another being lost to follow-up after the baseline visit. And though attendance at sessions started off high, it dwindled drastically over the course of the study. While disinterest in the study may certainly have played a role (especially for participants who were enticed by the study compensation), many participants were shift workers (as their paid job) and were often working during study sessions. Additionally, several participants had young children (at least two of whom were born during the intervention phase), adding to the time conflicts.

The atmosphere at the sessions was positive throughout the study. During the first two sessions, the questions were minimal, as if participants were treating the presentation as a classroom lecture. But they remained attentive and became more comfortable in the later sessions, asking questions and inserting many comments. They especially liked to groan about the vegetables they were being served, though they tried it all and ended up enjoying the food (not to say they finished the vegetables, but they at least tried them). Some participants brought family members (spouses and children) to the sessions or took home copies of the handouts to share. It appeared as if many of the participants were being exposed to the presented information and were trying the healthy foods for the first time, leading to many “aha” moments.
The station was in the peer advocate arm, with the chief and another volunteer serving as advocates. Both peer advocates had conflicts that kept them from being able to attend several sessions, but were committed to the study and strove to provide support for the other participants. One successful initiative involved setting up a Facebook page so participants could remain involved outside of the station. The non-chief peer advocate was extremely overweight when he showed up for peer advocate training (two months prior to the start of the intervention), but was so motivated by the success story of one of the study role models that he had already lost 28 pounds by the time the baseline visit was conducted at the station. He continued to set a wonderful example for the other participants with his commitment to losing weight and improving his health.

**Station C**

Station C is a suburban station located in an affluent DC suburb. It is a combination station though only volunteers signed up for study participation. The study team later learned that the paid firefighters thought the study was open only to volunteers (despite the study team reaching out to all station personnel). In general, the paid firefighters seemed to remain separated from the volunteers, so even with clearer eligibility criteria, it is unclear if any paid firefighters would have joined the study. Some volunteers, including two study participants, live at the station.

The station has a monthly meeting for all volunteers in the evening that typically lasts about two hours. Meals organized by the ladies’ auxiliary are served at the meeting only on special occasions. The participants decided that their preferred meeting time was post-meeting since they would already be at the station, but this meant the sessions
usually began quite late. At this station only, the cooking demonstrations preceded the presentation since participants were very hungry by the time the session started. Participants rarely had to leave for calls during study sessions.

The chief was supportive of the study, but was extremely busy and missed many study sessions (as well as the preceding station meetings). He appointed the captain to be the study contact in his absence. All study resources (including materials for the nutrition library and kitchen equipment) were given to the chief or captain, depending on who was in attendance, to be set-up appropriately. However, most of the resources instead remained on the chief’s desk for the duration of the study, and a library was never set-up.

The participants at the station ranged in age from young adult to seniors and most had attended college. Some were interested in losing weight while others were very fit. Many already had a good understanding of nutrition, as was evidenced by the insightful questions they asked during the presentations. Even if they were familiar with the information being covered, they remained very engaged throughout the session. If anything, the biggest problem was that the number of questions and comments slowed down the pace of the presentation, which was already on a tight timeline due to the late start time. However, the relevant information was all covered and the participants did not appear to mind the length of the sessions, even staying afterward to ask more questions.

The participants clearly looked forward to the cooking presentations. They had an appreciation for healthy food and were genuinely interested in trying what was prepared, even though (or perhaps because) prior exposure to healthy options appeared to be high. Even if dinner was provided at the meeting, participants were eager to at least sample the demonstration foods (and take home the leftovers). This station (and only this
station) regularly finished all of the vegetables that were brought. Special care was taken to provide a substantial vegan option for the vegan participant. Though non-participants as a whole were uninterested in the study and did not attend the study sessions, a few did occasionally drop by to check for extra food.

Station D

Station D is a rural volunteer station located near the Pennsylvania border. The fire station is a very established institution in the town, hosting several popular fundraisers and events each year. It gives the impression of being a boys’ club of sorts, with many older volunteers remaining active at the station once they are no longer running calls. The study team was concerned that few people were interested in the study after presenting at the recruitment visit since the group had no questions or comments. Instead, the station ended up with the most participants (and had among the higher participation rates). All participants were white and there was only one female, but there was a great diversity in ages, ranging from young adult to senior. One participant had a college degree; the remaining had completed high school or some college.

One-quarter of the participants worked as paid firefighters at other stations and some held other shift jobs, making it difficult for them to attend study sessions consistently. The chief attended only the first two sessions and was unable to complete the post-intervention physical measures. However, he remained supportive of the study and was committed to improving his dietary habits. Several participants reported on his weight-loss success to the study team and appeared to be inspired by his
accomplishments. Attendance by the other participants was consistent until the last month, and several participants brought spouses (and a newborn!) to sessions.

The participants were attentive throughout the study. Though they started off somewhat reserved, they became more comfortable as the study progressed, asking more questions and helping themselves to more food. They enjoyed the cooking demonstrations and were particularly enthused by the measurement tools available while making salads at the final session. Participants said they appreciated having healthy leftovers in the fridge after study visits. One participant who made significant dietary changes proudly brought in nutrition labels from the foods he used to eat to illustrate the improvements in his diet, and another participant working as shift cook at a different station said his shift mates were benefitting from the study as well.

Station E

Station E is a volunteer station located in the Washington DC suburbs. The station is very busy with trucks constantly out on calls. A number of volunteers live at the station and others regularly stay overnight in the bunks. The recruitment and baseline visits were combined at this station, immediately following the monthly departmental meeting. Though the meeting was well-attended, only eight individuals signed up for study participation, giving this station the lowest participation rate among intervention stations. The participants skewed young (in their 20s), though some participants were middle-aged. They were racially diverse, identifying as Black, Asian and Pacific Islander, and all attended college.
Study interest among participants varied. Those who were interested in the study attempted to attend the sessions but were frequently out on calls and would only receive a summary of the session when they returned. Other participants started off attending the sessions but by later months would avoid coming or leave early even when present at the station. The station had two peer advocates; however, the other participants were not even aware of their peer advocate status. One advocate was completely uninvolved in the study. The other made an effort to attend study sessions but had conflicts on most study nights.

The station proved to be very difficult to motivate. Though some individuals were interested in learning about nutrition, the overall atmosphere at the station was one of disinterest (something not seen at any of the other intervention stations). Several factors may have contributed to the poor reception at this station. The chief was supportive of the study but felt he did not have ample time to devote himself. He thus did not sign up for study participation and selected another participant to serve as the study contact at the site. The contact attended all sessions but sometimes had a dismissive attitude toward the information presented. Furthermore, the station as a whole was younger than the other stations and many members were at a healthy weight (despite consuming rather unhealthy diets). Thus, they were not concerned with improving their dietary habits.

This led to a suboptimal and inconsistent environment during study sessions. Sessions were held in the main hall as suggested by the station, and since group meals are typically prepared every night, the cooking demonstrations were scaled up to provide dinner for the entire shift. Some months this arrangement worked well, with most
individuals listening to the presentation and eating the food that was prepared. Even though many attendees were not interested, others remained engaged and allowed the session to take on the interactive quality seen at other stations. However, other months the group did not quiet down, making it difficult for even the interested attendees to hear. Furthermore, individuals would complain that the meal was taking too long to prepare (despite being told beforehand that dinner on study nights would be served at a later time) or that they did not want to eat the food provided. This culminated in the study food being denied at the final session even though all salad bar components had been prepared in advance and dinner was ready to serve upon arrival. The presenter was told that another meal was already being prepared at the station (on a scheduled study night), quite indicative of the general attitude toward the study.

Station F

Station F is located in a suburban area on the eastern shore of Maryland. It is a combination station that receives generous funding from the city, allowing the station to be recently renovated and expanded. The recruitment and baseline visits were combined, but unfortunately, the area received the first snowfall of the year on the date of the visit. While the study team made it out to the station, the study contact indicated that many people who had expressed interest were not present. Since the visit could not be rescheduled, the study team signed up those who were present while the study contact called other members to let them know the visit was still taking place. Final participation was not as high as hoped (given the estimates from the study contact), but was still on par with the other stations.
The majority of participants were paid firefighters in their 30’s and 40’s (two were volunteer, one over 60). All were white, and all but one completed at least some college. A new fire chief was appointed just before study initiation. He was very vocally supportive of the study and attended sessions when he could, though his meeting schedule often interfered. A captain at the station served as the study contact. He was very involved and dedicated to the study, missing only one session. He reminded the other participants of the study visits each month, and spent out of his own budget to provide for things like healthy snacks at the baseline visit. He made sure the study materials were available for everyone at the station, and printed a poster-sized copy of the balanced plate handout to hang up in the kitchen (before learning the study was providing the same). He was one of three peer advocates at the station; another was also present but appeared less involved, while the third was rarely available.

The atmosphere at the station was respectful and friendly. Participants asked questions and remained engaged throughout the study sessions. Visits were held in the afternoon per participant schedules, making this the only station not meeting at a meal time. Participants were encouraged to eat a light lunch to leave room for the demonstration foods. In general, participants tried all of the foods but primarily ate the meat and fruit. Vegetables were not as popular and participants declined to keep the leftovers. According to one participant, this behavior was common at the station, with individuals complaining if vegetables were added to shift dinners. Despite this, the spaghetti squash was popular and several participants reported making it again. Non-participants were invited to join the sessions or at least take some food, though they rarely did (whether due to disinterest or being called away).
Station G

Station G, one of two control stations, is located in a rural town in western Maryland. The station receives a lot of financial support and is fully-equipped with new occupational and recreational items. The participants appeared to be very involved at the station. They were predominantly middle-aged (one senior) and white with a mix of males and females (10 and 3, respectively). Half had a high school degree and half had completed at least some college. They were very compliant, completing all paper and online surveys on time (even though several participants were not familiar with using web browsers and had to call for help).

As a whole, participants at this station were by far the most eager in the study. As a control station, the only study activities completed at the station during the intervention period were participant measures, and yet the participants were still very thankful to the study team for meeting with them. Several participants who were overweight found the baseline measurements to be very enlightening and used the upcoming study visits as motivation to lose weight. The participants were excited to receive the intervention at the conclusion of the study.

Station H

Station H, the other control station, is located in the outskirts of the Baltimore suburbs. Interest in the study was low, leading the station to have the lowest participation rate among all study stations (though it is of course impossible to know if the station’s control status played a role). Participants ranged in age from young adult to middle-aged
and, except for one participant with Native American heritage, all were white. About half had high school degrees and half had completed at least some college. While some participants were very committed, the group as a whole was difficult to contact and did not seem to make the study a priority. Survey completion at the 12-month time point was only 50%, and most participants were not interested in receiving the intervention at the conclusion of the study.
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FIGHTING FIRES AND FAT: AN INTERVENTION TO ADDRESS OBESITY IN THE FIRE SERVICE

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Abstract

A novel worksite nutrition intervention designed to address obesity within the fire service aimed to improve nutrition knowledge, demonstrate healthy cooking methods, and provide tools and resources. Participants rated the intervention favorably, reported trying new foods and cooking methods, and indicated changes to food environments at their stations and homes.

Introduction

An estimated 80% of paid and volunteer firefighters are overweight or obese.\textsuperscript{1-3} In addition to obesity-related health concerns, firefighters must also contend with an increased risk of cardiovascular stress due to the nature of their jobs.\textsuperscript{4} It is therefore not surprising the primary cause of on-duty death among both career and volunteer firefighters between 1994 and 2004 was heart attacks, accounting for over 45% of deaths.\textsuperscript{5} This suggests poor cardiovascular health endangers individual firefighters and the communities they serve.

While the primary factors contributing to excess weight are two-fold (poor nutrition and insufficient physical activity), previous programs designed to improve the health of firefighters focused on physical activity. The goal of this study was to design,
implement, and evaluate a pilot nutrition intervention to reduce obesity and risk of heart attack in firefighters.

**Program Description**

The Firefighter Food Intervention, Research and Evaluation (FFIRE) study was conducted across Maryland in volunteer and combination volunteer/paid fire departments, which together comprise 86% of departments in the United States. Focus groups with firefighters identified a desire to prioritize nutrition as a way to reduce cardiac risk factors and provided insight into preferred intervention methods. The principles of Social Cognitive Theory (SCT) then informed the development of an ecological worksite intervention with an emphasis on the dynamic interplay between personal, behavioral, and environmental determinants of dietary intake.

This article describes the intervention phase, which provided nutrition education, demonstration of healthy meal preparation and increased access to tools and resources. SCT constructs including self- and collective efficacy, behavioral capability, and observational learning helped to guide the selection of study components. A holistic view of nutrition was promoted, emphasizing themes of energy balance and balanced meals (using a plate model: one-half vegetables, one-quarter lean protein and one-quarter whole grains). The duration of the intervention was six months (December 2010 to May 2011), with additional follow-up at one year (December 2011).

Monthly ninety-minute education sessions at each station included nutrition presentations and cooking demonstrations led by a public health nutrition doctoral student (Table 1). Topics included dietary recommendations (including “good” versus
“bad” nutrient sources, short- and long-term health benefits and portion sizes), behavioral strategies for healthier eating, and food labels; detailed presentation summaries are included as supplementary material. The main concerns brought up by firefighters, such as time and money constraints, were explicitly addressed through practical tips that fit into their hectic lifestyles. Family members were encouraged to attend.

Cooking demonstrations aimed to introduce new foods and demonstrate healthier ways to prepare old favorites while avoiding the “diet” food stigma. For instance, sloped contact grills designed to drain fat were used to quickly and conveniently prepare turkey burgers and grilled vegetables. Additional fast cooking methods (e.g., microwave cooking) were highlighted since many firefighters spoke of limited time between calls. Stations were given equipment used in the demonstrations to facilitate continued use of these methods.

Handouts, brochures, and posters were disseminated to reinforce key messages. A resource library was set-up at each station to house these materials and several books on nutrition (e.g., *Eat This, Not That; Mindless Eating*). Lists of healthier options from popular food establishments were compiled, and discounts on these items were negotiated to incentivize their purchase when eating out. Additionally, a Biggest Loser contest between stations (based on highest combined weight-loss at each station over the six-month intervention period among participants with baseline body mass index ≥ 25) capitalized on the strong group identity within stations and the competitive spirit across the fire service.

**Evaluation**
Ninety participants from six intervention stations enrolled in the study; participation at each station ranged from 19-32% of all station personnel. The following results are based on the 78 intervention participants (87%) who completed a post-intervention exposure and evaluation survey written by the study team to assess the utility of individual study components. Frequencies were calculated using SAS 9.3 (SAS Institute Inc., Cary, NC, 2012).

The study components that received the highest rating (“very helpful in improving your health”) by a majority of participants were the education sessions, cooking demonstrations, handouts, and physical measurements (completed as part of data collection). On average, participants attended 70% of the education sessions and read 79% of the handouts. Eighty-eight percent reported trying a new food or food preparation method discussed at a session; spaghetti squash and ground turkey were the most popular items. Among stations with daily food preparation, 59% of respondents reported changes in the food environment. Across all respondents, 71% reported changes in the food environment at their homes, suggesting the study impact extended beyond the station.

Comments about the intervention were overwhelmingly positive. Examples include: “I have become more aware of what I eat and how I eat,” and “This program has become very helpful to me, and in return to my 10 shift mates at work. My methods of cooking have become healthier and being the head cook at work, everyone benefits.”

The results of this pilot intervention can help inform future firefighter wellness programs as well as programs for other emergency responders. The FFIRE study intervention manual (including all handouts and session summaries) is being provided to
interested stations to assist them in implementing their own nutrition programs, the
impact of which can extend beyond the workplace to play an even larger role in
addressing the obesity epidemic.

Notes

Human subjects approval was received from the Johns Hopkins School of Public Health
Institutional Review Board. Funding was through the Department of Homeland Security,
Federal Emergency Management Agency’s Assistance to Firefighters Grant Program, #
EMW-2007-FP-01040. The authors are grateful to have collaborated with the National
Volunteer Fire Council on this research. Intervention materials can be obtained by
contacting Attia Goheer at attiagoheer@gmail.com.

Tables

Table 1: FFIRE Study Education Session Topics and Cooking Demonstrations

<table>
<thead>
<tr>
<th>Session</th>
<th>Topics</th>
<th>Cooking Demonstration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Energy balance; macronutrients; discretionary calories; nutrient density; plate proportions</td>
<td>N/A</td>
</tr>
<tr>
<td>2</td>
<td>Fruits and vegetables; healthy fats; microwave cooking</td>
<td>Spaghetti squash (prepared in microwave)</td>
</tr>
<tr>
<td>3</td>
<td>Hunger; setting goals; handling slips; mindless eating</td>
<td>Frozen vegetable medley and fruit salad (served with Chipotle burrito halves)</td>
</tr>
<tr>
<td>4</td>
<td>Whole grains; added sugars; healthy beverages</td>
<td>Meat sauce with ground turkey and spinach; whole grain pasta</td>
</tr>
<tr>
<td>5</td>
<td>Lean protein; sodium; healthier prepared foods (in grocery stores and restaurants)</td>
<td>Turkey burgers (using indoor contact grill) with healthy fixings; low-fat coleslaw</td>
</tr>
<tr>
<td>6</td>
<td>Portion sizes (using salad components); nutrition facts label and nutrient claims</td>
<td>Salad bar with healthy carbohydrates, fats and proteins and light dressing</td>
</tr>
</tbody>
</table>
References


Abstract

Objective: To analyze dietary intake, knowledge, and stages of change in a sample of volunteer and paid firefighters.

Design: Nutrition data were collected at baseline for the Firefighter Food Intervention, Research and Evaluation (FFIRE) study. The web-based Diet History Questionnaire II queried intake over the past month with portion sizes. Additional eating habits, stages of change, and nutrition knowledge questions written by the study team were administered at participating stations.

Setting: Eight volunteer and combination volunteer/paid fire stations from across the state.

Subjects: Fire service personnel (n=112), primarily volunteer and paid firefighters, along with EMS and one member of the ladies’ auxiliary. Median age was 41 years and 85% were male.

Results: Total daily intake (2,135 calories) and macronutrient composition followed dietary recommendations; however, diet quality was poor. Fruit (1.2 cups), vegetable (1.8 cups), and whole grain (0.7 ounces) intake fell far below recommended amounts, while added sugars (20 teaspoons), saturated fats (28 g), and sodium (3501 mg) far exceeded recommendations. Nearly 60% of participants reported currently trying to lose
weight and consumed on average 300 fewer calories (p=0.11), with lower intake of added sugars (p<0.05) and a higher percent of calories from protein (p<0.001). Nutrition facts label literacy was higher than knowledge of other nutrition topics. Responses to stages of change questions indicated a disconnect between perceived and actual intake.

**Conclusions**: Poor dietary intake in firefighters should be addressed to combat the high incidence of cardiovascular disease. Several priority themes to include in firefighter wellness programs were identified.


Introduction

Rates of overweight and obesity in firefighters are alarmingly high. Several studies have found that the prevalence of overweight and obesity in this population nears or exceeds 80%, well above the national average.\(^1\)\(^-\)\(^5\) Even firefighter recruits, typically in their 20s, have an average body mass index (BMI) of 28.5\(^2\) kg/m\(^2\). Weight status has been confirmed using numerous measures of obesity, including body fat percent and waist circumference, thus accounting for the potential effects of muscle mass on BMI.\(^1\)

In large part because of the excess weight they carry, heart attacks are the leading cause of on-duty death among both paid (e.g., full-time) and volunteer firefighters, contributing to over 40% of fatalities.\(^6\) An additional 620 firefighters suffered a non-fatal heart attack or stroke in the line of duty in 2013, consistent with the annual average of seventeen non-fatal cardiovascular events for each on-duty death.\(^7\),\(^8\) Furthermore, while firefighting activities are most likely to trigger a cardiac event, they are not associated with increasing risk; rather, it is modifiable risk factors such as high blood pressure, total and LDL cholesterol, and triglycerides that predict cardiac events.\(^9\),\(^10\)

While dietary intake and physical activity are both critical to maintaining a healthy weight and achieving good cardiovascular health, firefighter culture has long emphasized physical activity over dietary intake. For instance, National Fire Protection Association (NFPA) standards 1582 and 1583 outline components of annual fitness evaluations assessing aerobic capacity, muscular strength and endurance, and flexibility, with exercise education and individualized exercise prescriptions based on evaluation results.\(^11\),\(^12\) These standards are certainly integral to safe and effective firefighter
performance; however, there is no specific mention of complementary nutrition standards, education or evaluation.

Meanwhile, occupational factors can make it particularly difficult for firefighters to eat a healthy diet. Planning healthy meals can be challenging between calls or jobs, particularly given the unpredictability of meal times. Many firefighters eat faster at the fire station than elsewhere in anticipation of needing to leave on a call, a habit that leads to more weight gain than in those who eat slower. Some firefighters eat larger portions, preparing for the possibility of being out on calls during subsequent meals. In departments with shift meals, the culture tends towards meals high in saturated fats and refined carbohydrates. These are meals that have been traditionally served at the fire station and continue to be favored in part because they can be prepared on a limited budget. There is pressure at some stations for all firefighters to participate in group meals, keeping even health-minded individuals from packing their own healthier fare. And in many stations, junk food is traditionally brought into the station by new recruits, by firefighters as recompense after mistakes or accidents, and by well-meaning community members.

While research into occupational factors has shed some light on food behavior within fire stations, little is known about the nutrient composition of the average firefighter diet, leaving questions about the most impactful changes to promote weight loss and improve cardiovascular risk factors. Other factors that affect dietary decisions, such as nutrition knowledge and stages of change for dietary recommendations, have also remained largely unexplored. Furthermore, much of the existing research has focused on paid (full-time) firefighters, though nearly 70% of all firefighters in the U.S. are
volunteer. Thus, an understanding of dietary intake and contributing factors in both paid and volunteer firefighters would allow for the development of interventions benefitting more firefighters. This paper presents baseline data from the Firefighter Food Intervention, Research and Evaluation (FFIRE) study, including dietary intake, eating habits, nutrition knowledge, and stages of change data.

**Methods**

**Study Design and Participants**

The FFIRE study was a quasi-experimental pilot intervention trial conducted at eight volunteer and combination volunteer/paid fire stations in Maryland, which together comprise over 91% of fire stations in the U.S. They included a mix of rural and suburban stations of differing sizes, representing variation in fire stations across the state (and nation). A more detailed description of the study design is available elsewhere.

Members from the individual stations were recruited to participate in the pilot intervention and evaluation, which ran from December 2010 to January 2012. All station personnel were eligible for study participation, regardless of position, firefighter status, age, or other factors; junior station members under 18 years of age required parental consent to participate. A total of 115 individuals enrolled in the study. Participation at each station ranged from eight to twenty individuals, representing 16% to 30% of all station personnel.

**Data Collection**

Dietary intake was assessed with the National Cancer Institute’s Diet History
Questionnaire, a semi-quantitative food frequency questionnaire developed and validated for use in American populations\textsuperscript{17,18}. The study utilized the past-month option of the current 134-item version (DHQ II) with portion sizes. Portion sizes are selected from three descriptive options for each food, relative to commonly consumed portions of that particular food (e.g., less than / equal to / more than one can or bottle of soda). The questionnaire was completed online as it is expected to take less time to complete than the paper-based version and is programmed to not allow missing or inconsistent responses. All stations had computers with Internet access available for participant use. All but a few participants were comfortable completing an online survey; those requiring assistance were helped in person or over the phone as needed. Participants were given one month windows to complete the questionnaire.

Additional questions on eating habits, dietary stages of change, and nutrition knowledge were written by the study team. The twenty-six eating habits questions were designed to be evaluated independently; topics included food consumption at the station, frequency of meal preparation and prepared food consumption, fat use (e.g., during food prep) and consumption (e.g., trimming visible fat from meat), whole grain consumption, meal composition, and other dietary habits. Additionally, six stages of change questions asking about recommended dietary behaviors were written using the five-choice single-question algorithm recommended by Prochaska\textsuperscript{19,20}.

Knowledge questions were included to evaluate firefighters’ understanding of the components of a healthy diet and ability to translate theoretical knowledge into the selection of healthy foods. Available knowledge scales either did not cover these preferred topics or were based on outdated nutritional guidelines; thus, a new
questionnaire was developed. Fourteen nutrition knowledge questions covered nutritional properties of foods, dietary guidelines, healthy cooking methods, and the diet-disease link (Table 1). A separate eight question scale assessed nutrition facts label reading comprehension. The items were tested with a diverse population prior to inclusion in the FFIRE study pilot survey. Difficulty scores for individual questions ranged from 0.26 to 0.91, with most falling between 0.61 and 0.78, consistent with guidelines for maximizing item discrimination\textsuperscript{21}. Discriminatory indices for all but one question were higher than 0.10, and a Cronbach’s alpha above 0.85 demonstrated high internal consistency. The final questionnaire was reviewed by a registered dietician unaffiliated with the FFIRE study for face validity (e.g., clarity and accuracy).

Eating habits, stages of change, and knowledge questions were administered as part of a larger paper survey also including demographic, health, and physical activity questions. The survey was pilot tested with firefighters at non-participating fire stations prior to study data collection to evaluate clarity and length. The final survey was administered at the fire station during baseline data collection. Participants who needed more time were given a stamped envelope to return the survey to the study coordinator upon completion.

The remaining study data, including anthropometric measurements, intervention exposure and evaluation, and environmental audits, are presented elsewhere\textsuperscript{16} (additional manuscripts in preparation).

\textbf{Data Preparation and Analysis}
DHQ II data were downloaded from the researcher website at the conclusion of the study. All eating habits, stages of change, and nutrition knowledge data were recorded on paper forms using only participant ID numbers for identification. Data entry was completed by members of the study team, with quality control of all entries conducted by other team members. Electronic data files were password-protected and stored on secured computers and flash drives.

Results from the DHQ II were converted into intakes using Diet*Calc version 1.5.1. In addition to reporting total calories and gram intake of dozens of nutrients, Diet*Calc also calculates cup and ounce equivalents for numerous food groups defined by the MyPyramid food intake patterns. DHQ results with extreme average caloric intake (<800 or >4500 for men; <600 or >4000 for women) were excluded from the analysis due to the high improbability of these reported intakes, consistent with other food frequency questionnaire analyses. A higher upper cutoff was used to account for the possibility of higher caloric intake and expenditure in this population. Dietary data were analyzed as a group, and separated by intention to lose weight since that is a potentially critical factor influencing dietary intake.

DHQ results were used to calculate individual Healthy Eating Index-2010 (HEI-2010) component and total scores. The HEI is a measure of diet quality based on the U.S. Dietary Guidelines for Americans. Empty calories were calculated using the definition from the HEI, including calories from solid fats, added sugars, and alcohol in excess of 13 g / 1000 kcal. HEI total score was calculated as the sum of the twelve component scores, with a maximum of 100.
Questions from the nutrition knowledge quiz were assessed individually to identify gaps in knowledge, though total scores were also calculated to facilitate group comparisons. Seven single-answer multiple-choice questions and one open-answer question were dichotomously scored, as were all eight nutrition facts label questions. Individual components of six multipart questions were also dichotomously scored, then averaged to obtain the proportion of correct answers for each question. Multipart questions were weighted by two in the calculation of total nutrition knowledge score (out of 20 points); a separate nutrition facts label score (out of 8 points) was also calculated.

All data were analyzed using SAS 9.4 (SAS Institute Inc., Cary, NC, 2012). Group comparisons were assessed using independent sample t-tests for continuous variables (dietary intake) and Wilcoxon rank-sum tests for ordinal variables (stages of change). Significance was assessed at a two-tailed alpha of 0.05.

**Results**

Three of the 115 individuals who enrolled in the study did not complete baseline measures, resulting in an analysis sample of 112 participants (Table 2). Age ranged from 18 to 81 years, with a median age of 41. Participants were predominantly white (92%) and male (85%), reflective of the population at the stations. Fifty-four percent were volunteer firefighters only, 13% were paid firefighters only, and 4% were EMS only, with the remaining 28% falling into two or all three categories (and one participant belonging to the ladies’ auxiliary). All 112 participants completed the paper survey (including eating habits, stages of change, and nutrition knowledge questions), and 106
(94.6%) completed the DHQ. After removing eleven results with extreme caloric intake, ninety-five of the completed DHQ surveys (89.6%) were included in the final analysis.

Over half of study participants (59.8%) said they were currently trying to lose weight. All but one of those participants had a BMI over 25, and 74.6% were obese. While the numbers were slightly better for participants who were not trying to lose weight, 77.8% were still at least overweight and 44.4% were obese. Among participants not currently trying to lose weight, 21.7% intended to start in the next 30 days, while 37.1% intended to start in the next six months. Eleven participants (9.8%) reported already being at a healthy weight. When queried about changes made in the past six months to improve the healthfulness of their diet, 51.8% of participants reported changing the types of food they eat, 46.4% changed the amount they eat, 25.0% changed how often they eat, 8.0% started counting calories, and 30.4% made no changes.

**Dietary Intake**

Participating firefighters reported consuming an average of 2,135 calories per day, with approximately 35% from fats, 16% from protein and 48% from carbohydrates (Table 3). One-third of calories were from nutritionally empty sources (solid fats, added sugars, and excess alcohol). Participants currently trying to lose weight consumed nearly 300 fewer daily calories on average, though the difference was not significant (p=0.11). They consumed significantly lower amounts of added sugars (p<0.05) and a higher percent of calories from protein (p<0.001). Absolute intakes of whole grains, vegetables, and sodium were similar across both groups, but not when analyzed as a function of total caloric intake. Whole grain density (p<0.05) and sodium density (p<0.0001) were both
significantly higher in participants trying to lose weight, and vegetable density approached significance (p=0.059) in the same direction. HEI total score was also higher in participants trying to lose weight, though the difference missed significance (p=0.073).

Eating Habits

Just over two-thirds of participants (68.8%) reported eating meals at the fire station, with the majority (55.8%) consuming at least two meals per week at the station. Nearly 60% brought food into the station, with food purchased from carry-outs or fast food restaurants being brought in more often than food prepared in the home. Just over 60% left the station during a shift to obtain food; of those participants, 71.2% reported going to grocery stores, 53.0% to fast food restaurants, 47.0% to carry-outs, and 37.9% to sit-down restaurants. About one-quarter (26.4%) purchased items, mainly candy, chips and soda, from the vending machine or commissary at the fire station at least once per week.

Most (54.1%) respondents rarely (less than once per week) prepared a meal from scratch at home or at the station, though one-third (33.3%) cooked at least two times per week. Over two-thirds (67.6%) ate packaged foods (canned, frozen or boxed) and 55.9% ate foods prepared by a restaurant or grocery store at least two times per week. Nearly 40% ate fried food at home at least once per week, while 54.5% ate fried food away from home at least weekly. While 68.8% removed most or all of the visible fat on their beef, pork or lamb before eating, only 32.2% rarely or never ate the skin from chicken. Whole grain bread was typically chosen by 44.5% of respondents and 23.2% always or usually chose whole grain or high-fiber non-bread products. Less than half (44.6%) of
respondents ate breakfast daily, and another 37.3% ate breakfast at least two times per week. Most participants reported filling half of their plate with meat, fish or poultry (47.3%), one-quarter with vegetables (68.8%), and one-quarter with starch (76.8%) when eating dinner.

**Stages of Change**

For all five stages of change questions asking about adherence to dietary recommendations, more participants reported being in the maintenance stage than any other single stage, ranging from 26.8% for consuming a diet high in fiber to 56.3% for limiting salt intake (Table 4). Combining participants in the precontemplation, contemplation, and preparation stages, approximately half were in the pre-action stages for high fruit and vegetable intake (48.2%), limited saturated and trans fat intake (52.7%) and high fiber intake (60.7%). About one-third of participants (32.1%) were in the pre-action stages for limited salt intake, while only 28.6% were in pre-action stages for limited soda and sugar-sweetened beverage intake.

Underlying distributions for stages of change for limited salt and solid fat intakes were significantly different (p<.01) between those trying and not trying to lose weight. In both cases, participants trying to lose weight were more likely to be in the action and maintenance stages. Participants who were not trying to lose weight were more likely to be in the pre-action stages for high fruit and vegetable intake, though the difference in underlying distributions narrowly missed significance (p=0.06). Stages of change distributions for high fiber and limited sugar-sweetened beverage intakes were similar between the two groups.
Nutrition Knowledge

Average nutrition knowledge score out of a total of 20 was 13.7 for participants who identified as trying to lose weight versus 12.7 for those not trying to lose weight (p=0.053). Scores on individual questions ranged from 22% to 84% correct (Table 1). Scores on the eight-question nutrition label scale averaged 6.5 out of 8 for both groups. Most (over 80%) of participants answered the five nutrition facts label questions asking about values for a single serving (e.g., “How many grams of sugar are in each serving?”) correctly. Fewer (66% and 80% respectively) correctly answered questions about grams of saturated fat and calories in the entire (four-serving) package, and only 57% knew where to look on the label to find the grams of fat an individual on a 2,000-calorie diet should consume each day.

Discussion

This paper provides one of the first documented examinations in the empirical literature of dietary intake of paid and volunteer firefighters in the U.S. Data suggest that average intake in this population does not meet current dietary guidelines in multiple areas. Macronutrient composition fell within recommended ranges, but the specific foods and nutrients consumed within each category were not consistent with a healthy diet\textsuperscript{23}. According to the USDA food patterns for a 2,000 calorie diet, adults should eat 2 cups of fruit and 2.5 cups of vegetables\textsuperscript{24}; in this sample, intake was a mere 1.16 and 1.76 cups, respectively. Furthermore, though total grain consumption was near the recommended intake of 6 ounce equivalents, nearly all grains were from refined sources. Whole grain
intake was extremely low, and the recommendation that at least half of grains be whole was far from being met.

Meanwhile, added sugar intake was exceedingly high, with the average intake of 20 teaspoons accounting for over 14% of total daily caloric intake. Adding in calories from solid fats and excess alcohol, a full one-third of calories were from nutritionally “empty” sources. Sodium intake exceeded the recommended maximum intake of 2300 mg per day by a full 50%. At 1.72, the ratio of unsaturated to saturated fatty acids was lower than the recommended goal of 2.5\textsuperscript{25}, and trans fat intake was over twice the recommended maximum of 1% of total daily calories, or 2 g per day on a 2,000 calorie diet. And while firefighters who are currently trying to lose weight fared better in some categories than individuals who are not trying to lose weight, their overall intake was still inconsistent with the recommended USDA food patterns.

While detailed dietary intake data is not available for firefighters, reported intake in the study population is similar to the U.S. adult population. Fruit intake in U.S. adults averages 1.1 cups while vegetable intake averages 1.7 cups per day, virtually identical to intake in the study population and to combined fruit and vegetable intake in another firefighter sample\textsuperscript{26,27}. Whole grain intake is also remarkably similar, with the U.S. population consuming an average of 0.8 ounces per day, compared to 0.7 in the firefighter sample\textsuperscript{26}. Additionally, sodium intake was close to the U.S. adult average of 3,592 mg/day\textsuperscript{28}. However, daily added sugar intakes were higher in the study sample than the national average of 16.8 teaspoons, and HEI total score in both groups fell below the U.S. adult average score of 58.3\textsuperscript{26,29}. 
Eating habits were unsurprisingly varied in this population. Some firefighters are eating multiple meals at the station, while nearly two-thirds are eating just one meal or less at the station each week. Because of the variation in eating habits, providing healthier shift meals should be only one strategy in a comprehensive nutrition intervention. These results suggest that firefighters also need tips for preparing and eating healthy food at home and choosing healthy prepared options when necessary. This firefighter population reported cooking little, relying more on packaged and restaurant foods. While cooking is one of the best ways to reduce sodium intake and incorporate more whole grains and vegetables into the diet, cooking suggestions must be tailored to the needs of this group. Firefighters face time constraints when preparing meals both at the station and at home, and thus are most likely to respond to fast, easy cooking methods. For instance, microwaving and grilling can be promoted, consistent with healthier cooking techniques adopted by firefighters who made lasting changes to their diet. And because packaged and restaurant food consumption is high, it is important that firefighters be given tips for choosing the healthiest prepared options and for bolstering the nutrition of prepared foods (e.g., by adding frozen vegetables to packaged meals). It is encouraging to see that in this sample, a large number of firefighters reported going to grocery stores to purchase food during shifts rather than frequenting only fast food and other restaurants. Strategies for identifying healthy snacks and meal components at grocery stores should be immediately applicable to participants both on- and off-duty.

Comparing stages of change responses to dietary intake highlight some misconceptions that may exist in this population. For instance, 56.3% of participants reported being in the maintenance stage for limiting salt intake, though average sodium
intake suggests this is unlikely. It is possible that respondents are unaware of the amount of sodium in prepared foods and may think they are successfully controlling their sodium intake merely by limiting the amount of table salt added to food. This is supported by the fact that 40.2% of participants incorrectly responded to a question about the biggest source of sodium in the American diet, most whom chose salt added at the table.

Likewise, nearly 70% reported being in the action or maintenance stage of limiting sugar-sweetened beverage intake, which would suggest that either they are consuming too much added sugar from other sources or are unaware of how much more their sugared beverage consumption needs to be lowered. And finally, with over half of respondents reporting high intake of fruits and vegetables, it is likely they are underestimating the size of a serving and thus believe they are reaching recommended intakes. Respondents reported filling on average one-quarter of their plate with vegetables, which is not enough to meet intake recommendations. It is encouraging, however, to see how many participants have moved beyond the preparation stage for meeting these dietary recommendations; with additional information and support, they can continue to make improvements to their diets. Comparatively fewer respondents who were not trying to lose weight reported being in the action or maintenance stages for salt and fruit and vegetable recommendations, and from both groups for fat and fiber recommendations, which suggests more support is needed in the earlier stages to help motivate action.

Results from the knowledge quiz provide additional insight into topics that should be emphasized in a nutrition intervention. Notably, two questions were answered correctly by less than one-quarter of respondents. “Minimize as much as possible” and “10-15% of total caloric intake” were each selected more frequently than the correct
option (20-35% of total caloric intake) in response to a question asking about current dietary guidelines for total fat intake. Interestingly, actual fat intake was at the high end of the recommended range. In the other, participants had trouble identifying the ingredient that was not a form of added sugar (guar gum). Three incorrect responses (sucrose, maltose, and molasses) were each chosen by over 10% of participants, with only cane syrup being readily identified as a sugar. These results mirror the difficulty experienced by participants in a recent study who were asked to classify types of sugars\textsuperscript{30}. The ability to identify different forms of added sugar is critical to lowering sugar intake, which is clearly a priority for this population. Results of the nutrition knowledge quiz are consistent with previous studies that have shown that only 20% of participating firefighters felt they possessed “very sufficient” nutrition knowledge and that 45% felt confused by the different dietary recommendations\textsuperscript{3,31}.

The nutrition facts label scale demonstrated that most participants were able to identify nutrient quantities in one serving of food, but many had trouble extrapolating from one serving to the entire package. Nutrition education in this population should include calculating total nutrient amounts in multiple servings, which is particularly important for smaller multi-serving packages that are often consumed in one sitting. This concern will also be addressed by upcoming changes to the nutrition facts label, which will reflect updated serving sizes and will require dual columns for smaller multi-serving packages\textsuperscript{32}. Furthermore, understanding how to read the label is of limited benefit if the reader does not know how much of that nutrient should be consumed in a day. The nutrition facts label footnote provides a concise summary of nutrition guidelines and
requires no memorization, but nearly half of respondents were unable to correctly reference it.

One limitation of the study is that individuals self-selected for study participation, possibly leading to selection bias, though this is typical of dietary studies. Nearly 60% of participants reported currently trying to lose weight; it is unclear if this is typical of firefighter populations, or if individuals who were interested in losing weight were more likely to volunteer for study participation. To account for the latter possibility, results were stratified by intention to lose weight to clearly highlight any differences between the two groups. However, given the high rates of overweight and obesity in the fire service and recent concerns about the high incidence of on-duty heart attacks, it is also possible that many firefighters are looking to lose weight and improve their cardiovascular health.

Additionally, the study population is somewhat homogeneous, though participant demographics are reflective of the firefighter population in the state and do not indicate a shortcoming of the sampling methodology. In fact, among paid firefighters across the country, only 4.5% are female and 2.9% are black. Nonetheless, future studies could target areas with greater racial and gender diversity in the firefighter population.

Participants did reflect diversity in age, education, income, and firefighter type, while fire stations represented variation in size, setting (rural or suburban) and funding.

The use of a food frequency questionnaire to assess dietary intake is another shortcoming of the study as respondents often underestimate intake on FFQs. However, studies have shown that underreporting on FFQs, as compared to total energy expenditure calculated using the doubly labeled water (DLW) technique, is no higher than on other dietary assessment instruments, including food diaries and 24-hour recalls. Thus, for
the purposes of this study, where the use of biomarkers would have been prohibitively expensive, an FFQ was an appropriate dietary assessment method and resulted in less participant burden than multiple 24-hour recalls or food diaries. Furthermore, the DHQ was designed using results from cognitive research into ways to improve reporting accuracy and consequently performs as good or better than other commonly used questionnaires.35,18.

Every day, firefighters risk their lives to provide a vital service for their communities. However, their greatest risk comes from lifestyle factors rather than occupational hazards. This study provides a critical analysis of firefighter dietary intake, data essential to the development of successful firefighter wellness programs. Eating habits, stages of change for recommended dietary patterns, and nutrition knowledge data help to paint a more complete picture of firefighter diet. Furthermore, through the inclusion of both volunteer and paid firefighters, the results are representative of a larger proportion of U.S. firefighters. As demonstrated, most participants were interested in losing weight, but perhaps lack the skills or knowledge to make this goal a reality, particularly when faced with numerous time and financial constraints. The results of this study highlight numerous high-priority topics for inclusion in a nutrition intervention that aims to address these concerns to improve the health of our nation’s first responders.

Acknowledgements

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Council on this research and want to thank all participating fire stations and fire service personnel, as well as all individuals who assisted with data collection and study implementation.

**Tables and Figures**
Table 1: Nutrition Knowledge Quiz and Mean Question Scores in FFIRE Firefighter Baseline Sample

<table>
<thead>
<tr>
<th></th>
<th>Mean Score* (sd)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name one medical condition associated with a diet that is high in sodium (salt).</td>
<td>0.84 (0.37)</td>
</tr>
<tr>
<td>Which of the following is the healthiest dietary strategy for losing weight?</td>
<td>0.82 (0.38)</td>
</tr>
<tr>
<td>Which of the following are good sources of healthy carbohydrates (circle all that apply)?</td>
<td>0.79 (0.15)</td>
</tr>
<tr>
<td>Diets high in which of the following types of fat are associated with elevated LDL cholesterol (bad cholesterol) and heart disease (circle all that apply)?</td>
<td>0.78 (0.20)</td>
</tr>
<tr>
<td>Which of the following is the best source of healthy fat?</td>
<td>0.75 (0.43)</td>
</tr>
<tr>
<td>Which of the following are good sources of lean protein (circle all that apply)?</td>
<td>0.72 (0.15)</td>
</tr>
<tr>
<td>Indicate whether the following methods of cooking chicken reduce, maintain or add fat.</td>
<td>0.71 (0.24)</td>
</tr>
<tr>
<td>Which of the following contributes to a diet that is high in fiber and low in added sugars?</td>
<td>0.71 (0.45)</td>
</tr>
<tr>
<td>Obesity is associated with which of the following medical conditions (circle all that apply)?</td>
<td>0.70 (0.18)</td>
</tr>
<tr>
<td>Indicate whether the following people would be considered overweight, obese or healthy by current medical guidelines.</td>
<td>0.61 (0.28)</td>
</tr>
<tr>
<td>Which of the following is the biggest source of sodium in the American diet?</td>
<td>0.60 (0.49)</td>
</tr>
<tr>
<td>As a general rule of thumb, one way to eat a balanced and healthy diet is to fill your plate using which of the following proportions?</td>
<td>0.49 (0.50)</td>
</tr>
<tr>
<td>Which of the following is NOT a form of added sugar?</td>
<td>0.24 (0.43)</td>
</tr>
<tr>
<td>What are the current dietary guidelines regarding total fat intake?</td>
<td>0.22 (0.42)</td>
</tr>
</tbody>
</table>

*equal to % correct for single-response questions
abbreviations: sd = standard deviation
Table 2: Demographic Characteristics of FFIRE Firefighter Baseline Sample

<table>
<thead>
<tr>
<th></th>
<th>All Participants</th>
<th>Currently Trying to Lose Weight</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No (40.2%)</td>
<td>Yes (59.8%)</td>
<td></td>
</tr>
<tr>
<td>N</td>
<td>112</td>
<td>45 (40.2%)</td>
<td>67 (59.8%)</td>
<td></td>
</tr>
<tr>
<td>Age (years)</td>
<td>40.2 (sd 13.6)</td>
<td>38.4 (sd 13.6)</td>
<td>41.5 (sd 13.6)</td>
<td></td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td>95 males (84.9%)</td>
<td>40 males (88.9%)</td>
<td>55 males (82.1%)</td>
</tr>
<tr>
<td>Firefighter Type</td>
<td></td>
<td>61 (54.5%)</td>
<td>27 (60.0%)</td>
<td>34 (50.75%)</td>
</tr>
<tr>
<td>Volunteer</td>
<td></td>
<td>15 (13.4%)</td>
<td>7 (15.6%)</td>
<td>8 (11.9%)</td>
</tr>
<tr>
<td>Career</td>
<td></td>
<td>32 (28.6%)</td>
<td>10 (22.2%)</td>
<td>22 (32.8%)</td>
</tr>
<tr>
<td>Combination Volunteer, Career and/or EMS</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td>103 (92.0%)</td>
<td>42 (93.3%)</td>
<td>61 (91.0%)</td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>4 (3.6%)</td>
<td>2 (4.4%)</td>
<td>2 (3.0%)</td>
<td></td>
</tr>
<tr>
<td>Black/African American</td>
<td></td>
<td>51 (45.5 %)</td>
<td>24 (53.3%)</td>
<td>27 (40.3%)</td>
</tr>
<tr>
<td>Highest Education Completed</td>
<td></td>
<td>28 (25.0%)</td>
<td>11 (24.4%)</td>
<td>17 (25.4%)</td>
</tr>
<tr>
<td>High School Graduate</td>
<td></td>
<td>51 (45.5 %)</td>
<td>24 (53.3%)</td>
<td>27 (40.3%)</td>
</tr>
<tr>
<td>Some College / Vocational School</td>
<td></td>
<td>31 (27.7%)</td>
<td>8 (17.8%)</td>
<td>23 (34.3%)</td>
</tr>
<tr>
<td>College or Advanced Degree</td>
<td></td>
<td>30 (26.8%)</td>
<td>16 (35.6%)</td>
<td>14 (20.9%)</td>
</tr>
<tr>
<td>Annual Household Income &lt;= $50,000</td>
<td></td>
<td>67 (59.8%)</td>
<td>26 (57.8%)</td>
<td>41 (61.2%)</td>
</tr>
<tr>
<td>Marital Status</td>
<td></td>
<td>13 (11.6%)</td>
<td>5 (11.1%)</td>
<td>8 (11.9%)</td>
</tr>
<tr>
<td>Married / Cohabitating</td>
<td></td>
<td>52 (46.4%)</td>
<td>18 (40.0%)</td>
<td>34 (50.8%)</td>
</tr>
<tr>
<td>Divorced</td>
<td></td>
<td>60 (53.6%)</td>
<td>27 (60.0%)</td>
<td>33 (49.3%)</td>
</tr>
<tr>
<td>Physical Activity Level</td>
<td></td>
<td>32.0 (sd 6.0)</td>
<td>29.7 (sd 6.5)</td>
<td>33.4 (sd 5.3)</td>
</tr>
<tr>
<td>Fair or Poor</td>
<td></td>
<td>25.0 (sd 8.4)</td>
<td>21.3 (sd 8.9)</td>
<td>27.4 (sd 7.0)</td>
</tr>
<tr>
<td>Body Fat %</td>
<td></td>
<td>48 (42.9%)</td>
<td>15 (33.3%)</td>
<td>33 (49.3%)</td>
</tr>
<tr>
<td>Weight Loss Recommended by Doctor</td>
<td></td>
<td>112</td>
<td>45 (40.2%)</td>
<td>67 (59.8%)</td>
</tr>
</tbody>
</table>

Abbreviations: sd = standard deviation
Table 3: Mean Daily Dietary Intake in FFIRE Firefighter Baseline Sample

<table>
<thead>
<tr>
<th></th>
<th>All Participants</th>
<th>Currently Trying to Lose Weight</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>No</td>
<td>36</td>
<td>59</td>
</tr>
<tr>
<td>N</td>
<td>95</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total Calories</td>
<td>2134.9 (854.9)</td>
<td>2316.1 (896.1)</td>
<td>2024.3 (816.8)</td>
<td></td>
</tr>
<tr>
<td>% Calories from Fat</td>
<td>34.8 (6.27)</td>
<td>35.2 (6.29)</td>
<td>34.6 (6.31)</td>
<td></td>
</tr>
<tr>
<td>Fatty Acid Ratio (unsaturated/saturated)</td>
<td>1.72 (0.44)</td>
<td>1.81 (0.58)</td>
<td>1.67 (0.32)</td>
<td></td>
</tr>
<tr>
<td>Saturated Fat (g)</td>
<td>28.1 (13.8)</td>
<td>29.7 (13.0)</td>
<td>27.1 (14.2)</td>
<td></td>
</tr>
<tr>
<td>Trans Fat (g)</td>
<td>4.74 (2.41)</td>
<td>5.15 (2.36)</td>
<td>4.49 (2.42)</td>
<td></td>
</tr>
<tr>
<td>% Calories from Protein</td>
<td>16.3 (3.53)</td>
<td>14.7 (3.31)*</td>
<td>17.3 (3.34)*</td>
<td></td>
</tr>
<tr>
<td>Animal Protein (g)</td>
<td>60.9 (31.5)</td>
<td>60.5 (36.3)</td>
<td>61.2 (28.5)</td>
<td></td>
</tr>
<tr>
<td>% Calories from Carbs</td>
<td>48.1 (8.66)</td>
<td>48.6 (9.34)</td>
<td>47.8 (8.28)</td>
<td></td>
</tr>
<tr>
<td>Whole Grains (oz)</td>
<td>0.69 (0.54)</td>
<td>0.61 (0.42)</td>
<td>0.74 (0.59)</td>
<td></td>
</tr>
<tr>
<td>Non-Whole Grains (oz)</td>
<td>4.84 (2.56)</td>
<td>5.30 (2.45)</td>
<td>4.56 (2.61)</td>
<td></td>
</tr>
<tr>
<td>Vegetables (cups)</td>
<td>1.76 (0.90)</td>
<td>1.68 (1.01)</td>
<td>1.82 (0.84)</td>
<td></td>
</tr>
<tr>
<td>Fruits (cups)</td>
<td>1.16 (1.07)</td>
<td>1.28 (1.25)</td>
<td>1.09 (0.94)</td>
<td></td>
</tr>
<tr>
<td>% Empty Calories</td>
<td>33.4 (10.2)</td>
<td>35.6 (12.1)</td>
<td>32.0 (8.65)</td>
<td></td>
</tr>
<tr>
<td>Added Sugars (tsp)</td>
<td>20.1 (18.4)</td>
<td>24.9 (22.8)*</td>
<td>17.3 (14.5)*</td>
<td></td>
</tr>
<tr>
<td>Alcohol (g)</td>
<td>8.53 (16.0)</td>
<td>11.1 (16.2)</td>
<td>6.96 (15.9)</td>
<td></td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>3501.0 (1480.7)</td>
<td>3527.3 (1649.0)</td>
<td>3485.0 (1382.6)</td>
<td></td>
</tr>
<tr>
<td>HEI-2010 Total Score (/100)</td>
<td>54.9 (12.6)</td>
<td>52.0 (12.1)</td>
<td>56.7 (12.6)</td>
<td></td>
</tr>
</tbody>
</table>

*mean values significantly different (t-test, p<0.05) between the two groups
Table 4: Self-Reported Stage of Change for Dietary Recommendations in FFIRE Firefighter Baseline Sample, n=112

<table>
<thead>
<tr>
<th>Dietary Recommendation</th>
<th>Pre-contemplation</th>
<th>Contemplation</th>
<th>Preparation</th>
<th>Action</th>
<th>Maintenance</th>
</tr>
</thead>
<tbody>
<tr>
<td>High fruit and vegetable intake</td>
<td>5.4%</td>
<td>19.6%</td>
<td>23.2%</td>
<td>17.0%</td>
<td>34.8%</td>
</tr>
<tr>
<td>High fiber intake</td>
<td>14.3%</td>
<td>21.4%</td>
<td>25.0%</td>
<td>12.5%</td>
<td>26.8%</td>
</tr>
<tr>
<td>Limited saturated and trans fats intake*</td>
<td>12.5%</td>
<td>21.4%</td>
<td>18.8%</td>
<td>13.4%</td>
<td>29.5%</td>
</tr>
<tr>
<td>Limited soda / sugary beverage intake*</td>
<td>6.3%</td>
<td>10.7%</td>
<td>11.6%</td>
<td>22.3%</td>
<td>47.3%</td>
</tr>
<tr>
<td>Limited salt intake*</td>
<td>11.6%</td>
<td>10.7%</td>
<td>9.8%</td>
<td>10.7%</td>
<td>56.3%</td>
</tr>
</tbody>
</table>

* Totals do not equal 100% due to missing responses
References


29. USDA Center for Nutrition Policy and Promotion. Healthy Eating Index.  


33. Employed persons by detailed occupation, sex, race, and Hispanic or Latino ethnicity.


Abstract

Introduction: Heart attacks are the leading cause of on-duty death among firefighters, owing in large part to their numerous cardiovascular risk factors, and current wellness interventions primarily address physical activity. The Firefighter Food Intervention, Research and Evaluation (FFIRE) study aimed to address these concerns through a novel firefighter nutrition intervention.

Methods: Firefighters were recruited for the quasi-experimental control-group study from eight volunteer and combination volunteer/paid fire stations across the state. The six-month intervention included environmental, behavioral, and educational components, e.g., monthly sessions with cooking demonstrations, provision of kitchen equipment, interdepartmental competitions, and tailored medical feedback. Study impact was assessed using the Diet History Questionnaire II at baseline, six months (post-intervention) and twelve months (six months post-intervention). Secondary outcome variables included eating habits and stages of change for five dietary recommendations.
**Results:** Study participants included 112 station members, primarily volunteer firefighters. Total caloric, saturated and trans fat, refined grain, added sugar, and sodium intakes decreased significantly in both the intervention and control groups, while Healthy Eating Index 2010 total scores increased in both groups (p<.05). The intervention group additionally reported significant improvement in eating habits, e.g., proportion of plate containing vegetables or grains, and progression through the stages of change for fruit and vegetable, fiber, sugar-sweetened beverage, solid fat, and sodium intake (p<0.05).

**Conclusion:** The FFIRE study pilot nutrition intervention successfully improved diet and promoted progression through dietary stages of change. Results show promise for use in larger firefighter populations to improve cardiovascular risk factors and reduce fatalities.
Introduction

Most paid and volunteer firefighters across the nation are at exceptional cardiovascular risk. Over 80% of firefighters are overweight or obese\(^1\)–\(^5\) and 77% are hypertensive or pre-hypertensive\(^2\). Additionally, between one-quarter and one-half of firefighters meet the criteria for Metabolic Syndrome\(^6\),\(^7\). Compounding the problem is the cardiovascular stress intrinsic in fire extinguishing activities\(^5\), when heart rates often near or even exceed age-predicted maximums\(^8\)–\(^11\). Thus, it comes as no surprise that heart attacks are the leading cause of on-duty death in both paid and volunteer firefighters, accounting for over 40% of fatalities\(^12\).

Recognizing the importance of cardiovascular health, the U.S. Centers for Disease Control and Prevention (CDC) has recommended that all firefighters be required to participate in a wellness program\(^12\). Fire stations, like other worksites, make a natural setting for wellness initiatives, and numerous firefighter organizations including the National Fire Protection Association (NFPA) and the International Association of Firefighters (IAFF) have developed guidelines for fitness and wellness programs. However, these programs have primarily addressed physical activity and have not emphasized the role of nutrition on health and performance.

Firefighters face unique challenges to eating healthfully due to their shift work schedules, the uncertainty of call times and duration, and time spent away from home\(^13\),\(^14\). While data on dietary intake in firefighters is scarce, meals that are traditionally served at stations are typically high in saturated fat and refined carbohydrates\(^2\),\(^13\),\(^14\). Additionally, results from focus groups conducted with Maryland firefighters indicate a strong desire for nutrition education and guidance\(^15\). The Firefighter Food Intervention, Research and
Evaluation (FFIRE) study aimed to address these concerns through the development of a pilot firefighter nutrition program to reduce obesity and risk of heart attack. The impact of the study on dietary intake, and secondarily on eating habits and stages of change, are presented in this paper.

**Methods**

**Study Design**

The FFIRE study was a quasi-experimental pilot intervention conducted from November 2010 to January 2012. Leadership from eight departments that had participated in formative research agreed to join the pilot. The stations included both volunteer and combination volunteer/paid stations, which together represent 91% of stations in the country. Six stations were purposefully assigned to two intervention arms based on training availability, with two suburban and one rural station assigned to each. The remaining two departments, one suburban and one rural, served as controls. Both intervention groups received the nutrition intervention described below, with one arm receiving a supplementary peer advocate component. Peer advocates from each of the assigned stations received training to provide additional support to study participants. Study participation, not limited to firefighters, was open to emergency medical technicians (EMT) and all other station personnel. Participation at each station ranged from eight to twenty individuals, representing 16% to 30% of station membership. Human subjects approval was received from the Johns Hopkins Bloomberg School of Public Health Institutional Review Board.
**Nutrition Intervention**

The FFIRE study nutrition intervention aimed to provide participants with the knowledge, skills, and resources needed to improve dietary intake while enhancing station food environments. The six-month intervention was developed with input from firefighters and representatives from the National Volunteer Fire Council (NVFC). The analytic framework for worksite nutrition and physical activity interventions to improve weight status developed by the Task Force on Community Preventive Services served as the basis for the intervention\(^1\). All three target areas, including environmental changes and policy, informational messages, and behavioral and social skills or approaches, were incorporated. Constructs from Social Cognitive Theory including self- and collective efficacy, behavioral capability, and observational learning helped to guide selection of intervention components, which additionally aimed to reach participants at different stages of change\(^2\).

The specific intervention components have been detailed elsewhere\(^3\). Briefly, each intervention station received monthly nutrition presentations highlighting a specific food group or behavioral strategy. Accompanying cooking demonstrations emphasized fast and healthy techniques and balanced meal selection. Each session, with dinner, lasted approximately two hours; families were invited to attend. Stations received kitchen equipment (e.g., indoor contact grills, cutting boards, microwavable bowls) and resource libraries with popular nutrition books and health magazines. Vending machine recommendations were provided to further improve station food environments, and discounts on healthier menu items from nearby eateries were negotiated to incentivize their purchase when eating out. An interdepartmental weight-loss competition
encouraged peer support within stations. All participants, including controls, received tailored feedback on their biometric measurements from a medical doctor at baseline and six months; intervention participants also met with either a registered dietitian or behavioral psychologist.

Data Collection

The National Cancer Institute’s Diet History Questionnaire II (DHQ) was used to measure dietary intake at baseline, six months (post-intervention), and twelve months (six months post-intervention). The online platform helped to minimize missing or inconsistent responses and to reduce average completion time. The past-month with portion size option was selected to capture potential dietary changes resulting from the intervention. Results were converted into nutrient and food group intake estimates using Diet*Calc version 1.5.0. Healthy Eating Index 2010 (HEI) component and total scores were also calculated to analyze change in dietary quality.

Additional multiple-choice questions assessing eating habits and stages of change were included in a survey developed by the study team. Eating habit questions asked about food consumption at the station, frequency of meal preparation and prepared food consumption, fat use and consumption, whole grain selection, and meal composition. Stages of change questions asked about eating a diet high in fruits and vegetables and fiber, and limiting consumption of saturated and trans fat, sugar-sweetened beverages, and salt. The survey was administered at baseline, two months, six months (post-intervention), and twelve months (six months post-intervention). Participants were given one month from each data collection visit to complete the questionnaires.
Data Analysis

All data were analyzed using SAS 9.4 (SAS Institute Inc., Cary, NC, 2012). Pilot study feasibility outcomes are presented elsewhere\textsuperscript{19}. Models presented here assessed change over time for all dependent variables by study group. The primary dependent variables were total calories, intakes of key foods and nutrients (saturated and trans fats, whole and non-whole grains, fruits, vegetables, added sugars, sodium), fatty acid ratio, percent empty calories, and HEI total score. Secondary dependent variables included frequencies of various eating habits, plate proportions of meal components, and stages of change for dietary behaviors. An exposure score was calculated by assigning a value to each study component (e.g., two points for attending each session, one point for reading each handout) and summing the total out of 41 for each participant. The scores were then divided at the median score of 29 to form high and low exposure categories.

Though the study design included two distinct intervention arms, the peer advocate component was not implemented as intended. Only two of the trained peer advocates were active in their role; the other five did not provide support to others at the station. While the use of peer advocates, and the associated successes and challenges, is beyond the scope of this manuscript, it was evident that the two intervention arms had essentially received the same intervention. Indeed, over half of participants at peer advocate stations responded that they either did not have peer advocates at their station or were unsure if they did, while nearly one-quarter of respondents at non-peer advocate stations responded that they \textit{did} have peer advocates. The two intervention arms were thus combined in the analysis and compared to the control group.
Continuous data were modeled using linear mixed effects models (proc mixed) with random intercepts for study participant. Skewed data were first transformed (log or square root) to normalize the residuals. Ordinal and binomial data (from the eating habits and stages of change surveys) were analyzed using generalized linear mixed models (proc glimmix), again with random intercepts; results are reported as person-specific odds ratios. Categories with insufficient responses were combined with adjacent categories to reach the minimum size required for accurate analysis. All models included study arm, time, and time by arm interaction, and were adjusted for age, gender, and intention to lose weight; additional adjustments for income, education and fitness level were made as appropriate. Missing data were assumed to be missing at random; the use of linear mixed models allowed for all available data to be included in the analysis. Significance was assessed at an alpha of 0.05.

**Results**

**Study Sample**

A total of 115 individuals enrolled in the study; three did not complete baseline measures, resulting in an evaluation sample of 112 participants (Table 1). Participants were predominantly white (92%) and male (85%); age ranged from 18 to 81 years with a median age of 41. Over 90% had a BMI in the overweight or obese range at baseline, with 62.5% obese.

**Survey Completion**
The baseline DHQ was completed by 106 of 112 participants (94.6%). Of these participants, 93 (87.7%) and 88 (83.0%) completed follow-up questionnaires at 6 and 12 months. Results with extreme caloric intake (<800 or >4500 for men; <600 or >4000 for women) were excluded from the analysis due to the high improbability of these reported intakes, consistent with other food frequency questionnaire analysis strategies. A higher upper cutoff was used to account for the possibility of higher caloric intake and expenditure in this population. Nearly 90% of completed questionnaires (95 baseline, 82 6-month, 79 12-month) were included in the final analysis. All participants completed the baseline eating habits and stages of change survey. Follow-up surveys were completed by 99 (88.4%), 100 (89.3%), and 93 (83.0%) participants at two, six, and twelve months.

**Impact on Dietary Intake and Eating Habits**

Average dietary intake at each of the three study time points is presented in Table 2. Total caloric intake decreased significantly at 6 and 12 months for both intervention and control, as did intake of numerous de-promoted nutrients and food groups, including saturated fat, trans fat, refined grains, added sugar, and sodium. Fruit intake increased for the intervention group at 6 months only, while vegetable intake (but not density) decreased at both timepoints. Whole grain intake remained steady; whole grain density increased in the intervention group at 12 months, though the change was not statistically significant (p<.08). Percent calories from empty sources decreased across groups at both timepoints, though the change narrowly missed significance in the intervention group (6-
month $p=.051$, 12-month $p=.054$). HEI total scores for the intervention and control groups increased at both follow-up timepoints.

An analysis of the intervention group only, comparing participants with high and low exposure, showed that caloric intake decreased in both subgroups, but HEI total score significantly increased in the high exposure group only. Fruit intake similarly increased in the high exposure group only, while the decrease in vegetable intake was found in only the low exposure group. The high exposure group experienced a decrease in percent empty calories, though the change did not reach statistical significance ($p<0.08$).

Many improvements reported in eating habits compared to baseline were seen in the intervention group only. They significantly increased the proportion of each meal consisting of vegetables (6-month OR 5.19; 12-month OR 3.01) and decreased the proportion consisting of grains (6-month OR 3.67; 12-month OR 3.34) and meat (12-month OR 2.25). Frequency of selecting whole grains over refined grains increased (6-month OR 4.28; 12-month OR 3.85), while white bread consumption decreased (6-month OR 2.57; 12-month OR 3.29). The intervention group also reported removing skin from chicken more frequently at follow-up compared to baseline (6-month OR 2.51; 12-month OR 2.01) and, on the 12-month survey only, preparing meals more frequently (OR 2.65). Both groups reported a decrease in consumption of packaged foods (intervention: 6-month OR 2.02; control: 6-month OR 3.33, 12-month OR 3.18) while the control group also reported a decrease in prepared food consumption (6-month OR 4.50; 12-month OR 5.44). There was no change in frequency of fried food consumption at home, but a significant decrease in fried food consumption away from home (intervention: 6-month
OR 2.64, 12-month OR 1.94; control 6-month OR 11.4, 12-month OR 5.90). The control group also reported an increase in frequency of removing visible fat from meat (6-month OR 5.74; 12-month OR 5.29).

Impact on Stages of Change

The intervention group saw significant progression through the stages of change in all five queried areas. Limiting saturated and trans fats intake (6 month OR 2.92; 12 month OR 3.77), increasing fiber intake (6 month OR 2.46; 12 month OR 2.32), and increasing fruit and vegetable intake (6 month OR 2.78; 12 month OR 2.54) improved at all timepoints, while limiting sugar-sweetened beverages (12 month OR 2.28) and limiting sodium (12 month OR 3.11) improved by the 12-month timepoint. The control group did not report significant progression through the stages for any of the promoted behaviors.

Discussion

This is the first firefighter intervention to include a complete assessment of dietary intake, with eating habits and stages of change data providing further insight into consumption patterns. Changes in dietary intake were observed in both the intervention and control groups, while improvements in eating habits and stages of change were primarily observed in the intervention group. Within the intervention group, more positive dietary changes were observed in participants with high study exposure, after controlling for intent to lose weight. Most changes were sustained through the follow-up period, six months after monthly visits to the stations ended.
The results of this trial are consistent with worksite interventions in achieving moderate impact on dietary intake\textsuperscript{22,23}. Many interventions have successfully reduced total fat intake and increased fruit and vegetable intake, though effect sizes of joint consumption for the latter remain below a half-serving per day\textsuperscript{22,23}. Published results specific to firefighters are sparse. One study reported increased fruit and vegetable consumption, but only reduced weight gain in the intervention groups\textsuperscript{24}. Two smaller studies provided participating firefighters with meal replacement shakes and bars, and thus cannot be easily compared to studies of participant-driven dietary changes\textsuperscript{7,25}.

The FFIRE study intervention group significantly increased consumption of fruit, but not vegetables. Both study groups significantly reduced solid fat intake, consistent with current dietary guidelines, as well as intake of added sugars, refined grains, and sodium. Though the wide study focus may have resulted in smaller effect sizes for any one dietary recommendation, overall improvement in diet quality was captured by an increase in HEI total score. Furthermore, total caloric intake in both groups decreased substantially, by an average of 18.8\% from baseline to twelve months. As expected with this level of caloric reduction, anthropometric results demonstrate significant weight loss (manuscript in preparation).

Although intake of calories and de-promoted nutrients decreased across both groups, the intervention group reported more changes to dietary composition. They significantly increased density of fruit consumption, and saw improvement in whole grain and refined grain densities, though these did not reach statistical significance. They also reported decreased grain consumption in relation to vegetable consumption during meals, an essential first step to adopting a healthier eating pattern that incorporates more fruits
and vegetables. The balanced plate concept promoted through the intervention is similar to the United States Department of Agriculture’s (USDA) MyPlate launched the following year\textsuperscript{26}. Additionally, when eating grains, intervention participants reported choosing whole grains more frequently.

This pattern of change follows from the intervention received by each group. Anthropometric measurements were taken at all intervention and control stations at baseline and throughout the study, which was enough to prompt change in firefighters participating in a weight surveillance study\textsuperscript{27}. Participants also met individually with a medical doctor to go over baseline and post-intervention results. They may have been motivated to lose weight based on the doctor’s recommendation, particularly if they were previously unaware of their overweight status as were half of firefighters in another study\textsuperscript{3,28}. Meanwhile, participants in the intervention group additionally received guidance on changing the composition of their diet.

Intervention participants also made significant progress through the stages of change for each of the five promoted dietary patterns. The study utilized a self-rated staging algorithm rather than intake criteria so the stages would correspond to cognitive progress; however, dietary intake data corroborates many of the changes\textsuperscript{29}. Notably, control participants reported no significant progress through the stages of change, suggesting intentions to address specific dietary recommendations did not improve without the knowledge and behavioral strategies shared through the intervention.

While the results of this pilot study are promising, there are limitations of the study design. Fire stations were not randomly assigned to treatment arms, though the criteria that was used for assignment was, to a certain extent, random as all stations
provided their availability for training without either party knowing which dates would be most convenient. Regardless, including only firefighters that volunteered for study participation can create selection bias and reduces generalizability of study results, as does the small sample size. These limitations make it difficult to interpret the improvement seen in the control group, whether it suggests that health screenings with personalized feedback can motivate significant change or that the small control group was unusually motivated. Furthermore, the peer advocate component of the intervention was not implemented as intended, and the decision to combine the two intervention arms for analysis created a large imbalance in group sizes. However, as a pilot study, the primary goals of developing intervention components, assessing feasibility, and evaluating pilot data were all successful and suggest great promise in broadening the scope of future firefighter nutrition interventions.

Additionally, studies have demonstrated that respondents tend to underestimate intake on food frequency questionnaires (FFQs), though FFQs fare as well as other dietary intake instruments when compared to doubly labeled water estimates. The DHQ was designed to improve reporting accuracy and performs as well or better than other nationally available FFQs. Moreover, because the study utilized a pre-post analysis concerned primarily with change in intake, problems associated with chronic underestimation are theoretically minimized. Additional data collected through the eating habits and stages of change surveys help to bolster the DHQ data by providing a more complete picture of dietary patterns.

The study had numerous strengths, most notably its contribution to the scarce literature on improving firefighter diet. Firefighters are a high-risk population that could
benefit tremendously from dietary interventions, and study results may be informative in designing interventions for other first responders and shift workers as well. The dietary data collected through this study provide a more complete picture of firefighter diet than is currently available in the published literature. Additionally, participating stations were chosen to represent variability in fire departments resulting from such factors as setting and funding; the resulting sample was representative of the national sample of firefighters. And while many firefighter studies have focused on paid firefighters, nearly 70% of firefighters nationwide are volunteer; this study included both categories with an emphasis on volunteers.

Obesity is threatening the lives of U.S. firefighters, but to date very few nutrition interventions have been developed to address this grave problem. The FFIRE study, while small in scale, was able to affect significant improvement in diet and promoted progression though the stages of change for numerous dietary recommendations. These promising results speak to the importance of building on this research to reach firefighters across the nation, with the overarching goal of reducing cardiovascular-related fatalities and improving the health of these essential first responders.

**Acknowledgements**

Funding for the research was received through the Department of Homeland Security, Federal Emergency Management Agency’s Assistance to Firefighters Grant Program, # EMW-2007-FP-01040. The authors are grateful to have collaborated with the National Volunteer Fire Council on this research and want to thank all participating fire
stations and fire service personnel, as well as all individuals who assisted with data
collection and study implementation.

Tables and Figures
Table 1: Demographic Characteristics of Participants in the FFIRE Study

<table>
<thead>
<tr>
<th></th>
<th>All Participants</th>
<th>Study Group</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Intervention</td>
</tr>
<tr>
<td>N</td>
<td>112</td>
<td>87</td>
</tr>
<tr>
<td>Age (yrs)*</td>
<td>40.2 (sd 13.6)</td>
<td>40.0 (sd 13.9)</td>
</tr>
<tr>
<td>Gender</td>
<td>95 male (84.8%)</td>
<td>75 male (86.2%)</td>
</tr>
<tr>
<td>Firefighter Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Volunteer</td>
<td>61 (54.5%)</td>
<td>43 (49.4%)</td>
</tr>
<tr>
<td>Career</td>
<td>15 (13.4%)</td>
<td>15 (17.2%)</td>
</tr>
<tr>
<td>Combination Volunteer, Career and/or EMS</td>
<td>32 (28.6%)</td>
<td>27 (31.0%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>103 (92.0%)</td>
<td>79 (90.8%)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>4 (3.6%)</td>
<td>4 (4.6%)</td>
</tr>
<tr>
<td>Highest Education Completed</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High School Graduate</td>
<td>28 (25.0%)</td>
<td>17 (19.5%)</td>
</tr>
<tr>
<td>Some College / Vocational School</td>
<td>51 (45.5%)</td>
<td>43 (49.4%)</td>
</tr>
<tr>
<td>College or Advanced Degree</td>
<td>31 (27.7%)</td>
<td>25 (28.7%)</td>
</tr>
<tr>
<td>Annual Household Income &lt;= $50,000</td>
<td>30 (26.8%)</td>
<td>22 (25.3%)</td>
</tr>
<tr>
<td>Married / Cohabitating</td>
<td>67 (59.8%)</td>
<td>51 (58.6%)</td>
</tr>
<tr>
<td>Physical Activity Level</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fair or Poor</td>
<td>52 (46.4%)</td>
<td>37 (42.5%)</td>
</tr>
<tr>
<td>Good, Very Good or Excellent</td>
<td>60 (53.6%)</td>
<td>50 (57.5%)</td>
</tr>
<tr>
<td>BMI*</td>
<td>32.0 (sd 6.0)</td>
<td>31.8 (sd 6.0)</td>
</tr>
<tr>
<td>Body Fat % *</td>
<td>25.0 (sd 8.4)</td>
<td>24.7 (sd 8.2)</td>
</tr>
<tr>
<td>Weight Loss Recommended by Doctor</td>
<td>48 (42.9%)</td>
<td>37 (42.5%)</td>
</tr>
<tr>
<td>Currently Trying to Lose Weight</td>
<td>67 (59.8%)</td>
<td>52 (59.8%)</td>
</tr>
</tbody>
</table>

* all reported averages are mean values
abbreviations: sd = standard deviation
Table 2: Change in Dietary Intake by Treatment Group in FFIRE Study Participants

<table>
<thead>
<tr>
<th></th>
<th>Intervention</th>
<th>Control</th>
<th></th>
<th>Interven</th>
<th>Baseline</th>
<th>6 Months</th>
<th>12 Months</th>
<th>Baseline</th>
<th>6 Months</th>
<th>12 Months</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Baseline</td>
<td>6 Months</td>
<td>12 Months</td>
<td>Baseline</td>
<td>6 Months</td>
<td>12 Months</td>
<td>Baseline</td>
<td>6 Months</td>
<td>12 Months</td>
</tr>
<tr>
<td>Total Calories</td>
<td>2070.9 sd 854.6</td>
<td>1707.8*</td>
<td>1735.5*</td>
<td>2374.7 sd 833.5</td>
<td>1796.7*</td>
<td>1722.9*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Calories from Fat</td>
<td>34.4 sd 6.2</td>
<td>32.5^</td>
<td>32.5^</td>
<td>36.23 sd 6.6</td>
<td>36.6^</td>
<td>37.1^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fatty Acid Ratio</td>
<td>1.7 sd 0.46</td>
<td>1.80</td>
<td>1.81</td>
<td>1.66 sd 0.39</td>
<td>1.76</td>
<td>1.92</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Saturated Fat (g)</td>
<td>26.7 sd 13.2</td>
<td>20.5*</td>
<td>20.7*</td>
<td>33.3 sd 14.9</td>
<td>24.5*</td>
<td>23.1*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trans Fat (g)</td>
<td>4.54 sd 2.3</td>
<td>3.32*</td>
<td>3.56*</td>
<td>5.49 sd 2.8</td>
<td>3.4*</td>
<td>4.4*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Calories from Protein</td>
<td>16.4 sd 3.7</td>
<td>16.3^</td>
<td>16.3^</td>
<td>15.9 sd 2.8</td>
<td>17.3^</td>
<td>16.4^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Animal Protein (g)</td>
<td>58.7 sd 31.2</td>
<td>47.4^</td>
<td>48.3^</td>
<td>69.3 sd 32.3</td>
<td>55.1^</td>
<td>48.6^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Calories from Carbohydrates</td>
<td>48.3 sd 8.5</td>
<td>50.2^</td>
<td>49.6^</td>
<td>47.6 sd 9.5</td>
<td>47.0^</td>
<td>47.7^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whole Grains (oz)</td>
<td>0.66 sd 0.51</td>
<td>0.66</td>
<td>0.65</td>
<td>0.81 sd 0.64</td>
<td>0.61</td>
<td>0.72</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Non-Whole Grains (oz)</td>
<td>4.85 sd 2.7</td>
<td>3.66*</td>
<td>3.97*</td>
<td>4.81 sd 1.8</td>
<td>3.51*</td>
<td>4.03*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Vegetables (cups)</td>
<td>1.77 sd 0.92</td>
<td>1.59*</td>
<td>1.47*</td>
<td>1.75 sd 0.85</td>
<td>1.63</td>
<td>1.58</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fruits (cups)</td>
<td>1.2 sd 1.1</td>
<td>1.41*</td>
<td>1.23</td>
<td>1.04 sd 1.1</td>
<td>1.09</td>
<td>1.03</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>% Empty Calories</td>
<td>32.4 sd 9.7</td>
<td>30.1</td>
<td>30.7</td>
<td>36.8 sd 11.4</td>
<td>32.4*</td>
<td>32.2*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Added Sugars (tsp)</td>
<td>18.8 sd 17.7</td>
<td>14.5*</td>
<td>14.3*</td>
<td>25.3 sd 20.2</td>
<td>16.8*</td>
<td>14.0*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Alcohol (g)</td>
<td>8.53 sd 13.1</td>
<td>8.13^</td>
<td>10.7^</td>
<td>8.51 sd 24.6</td>
<td>2.70^</td>
<td>1.61^</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sodium (mg)</td>
<td>3402.3 sd 1519.5</td>
<td>2761.6*</td>
<td>2774.1*</td>
<td>3871.0 sd 1293.0</td>
<td>2905.1*</td>
<td>3028.4*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HEI-2010 Total Score (/100)</td>
<td>55.7 sd 12.0</td>
<td>61.3*</td>
<td>58.8*</td>
<td>51.9 sd 14.4</td>
<td>57.3*</td>
<td>57.7*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*significant (<0.05) change from baseline; all models adjusted for age, gender, education, income, fitness level and intent to lose weight.
^included for descriptive purposes only; not targeted by intervention or analyzed for significance

#no statistically-significant differences between groups at baseline

| abbreviations: sd=standard deviation, oz=ounces, tsp=teaspoons |
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DISCUSSION

The Firefighter Food Intervention, Research and Evaluation (FFIRE) study successfully applied the results of formative research conducted within the fire service to develop and implement a nutrition-based firefighter intervention. Based on focus group results that highlighted the need for nutritional guidance, the FFIRE study incorporated educational, behavioral, and environmental components in a novel firefighter nutrition intervention\(^1\). Furthermore, it is among the first (possibly the first) firefighter studies in the empirical literature to include a complete assessment of dietary intake and to assess program impact on diet. Baseline results provide nutritional data on a demographically-representative sample of U.S. firefighters, while impact analysis demonstrates the efficacy of the intervention in improving the healthfulness of participant diets. This chapter presents key findings, study strengths and limitations, future directions, and practice and policy implications.

**Aims 1 & 2: Developing and Piloting a Firefighter Nutrition Intervention**

The FFIRE study nutrition intervention incorporated firefighter input in the development of educational and environmental components; behavioral components led by other members of the study team are beyond the scope of this dissertation\(^3\). Strategies recommended by focus group participants, including increasing access to tools and resources, teaching relevant skills, providing nutrition education, and organizing interdepartmental competitions, were integrated into the intervention design. The needs of volunteer and paid firefighters were considered while developing the intervention,
unlike previous studies that primarily targeted paid firefighters, to benefit a higher proportion of firefighters\textsuperscript{4}.

The resulting intervention was implemented with high fidelity at all participating stations, with nearly all educational and environmental components being implemented as planned. Dose delivered was likewise high. Educational sessions were delivered in full at each station every month; only one cooking demonstration at a single station was not completed. All equipment and resources were given to each station, and participants at all stations received health screenings with individualized counsel.

The behavioral components (interdepartmental competitions and peer advocates) were not fully realized. One competition was successfully implemented (Biggest Loser weight loss competition), though the other (healthy chili cookoff with nutrition-related games and activities) was canceled. Peer advocates were not part of the main nutrition intervention since they were planned for only half of the intervention stations; however, the intention of assessing added impact of this component was also not realized.

Reach, as assessed by enrollment, was moderate, with station participation rates ranging from 16\% to 30\%. While lower than hoped, this level of enrollment is typical of worksite interventions\textsuperscript{5}. Furthermore, part-time and shiftwork patterns have been cited as a barrier to participation, as have programs conducted outside of work hours, both applicable to this population of primarily volunteer firefighters\textsuperscript{6–8}. Many stations had non-participants attend study sessions; however, the number of individuals was not enough to impact reach.

Dose received varied by station. On average, participants attended 70\% of the education sessions and read 79\% of the handouts. Participants at most stations had
moderate to high attendance and were engaged in study activities when present. However, one station struggled to find a convenient time for all participants to meet, and participants at another were, as a group, not engaged in the intervention. Nutrition books and magazines at another station were not displayed in a resource library but instead remained on the chief’s desk for the duration of the study.

The intervention was well-received by participants as demonstrated by the overwhelmingly positive comments shared in the post-intervention evaluation survey. Several participants commented directly on strategies learned for eating more healthfully, such as “I have become more aware of what I eat and how I eat” and “I am much more mindful of my portions and eating habits now.” Others commented on the wide impact of the study, noting that “I really enjoyed the sessions and the knowledge passed on to me to share with my family” and “This program has become very helpful to me, and in return to my 10 shift mates at work. My methods of cooking have become healthier and being the head cook at work, everyone benefits.” Others requested that these types of programs continue, with one participant specifying “Thank you for doing this. If you were to do it again, I would suggest more visits because those are what kept me the most motivated.”

Additional feedback received through the post-intervention survey help to highlight the many successful components of the program. Education sessions, cooking demonstrations, handouts, and physical measurements were rated “very helpful in improving your health” by most participants, showing the diversity of helpful study activities. Knowing that learning about healthier foods and cooking techniques is not always enough to motivate change, the taste tests allowed participants to try the suggested foods without having to purchase or prepare the food themselves. The most
popular trial foods, spaghetti squash and ground turkey, were excellent examples of the
healthy vegetable and lean protein swaps that were being promoted. Those participants
may now be more likely to prepare vegetables or replace the beef in many firehouse
staples such as burgers and sloppy joes with turkey.

Nearly 60% of respondents at stations with daily food preparation reported
changes to the food environment at the station. This number is encouraging knowing the
barriers firefighters face in trying to eat more healthfully. Notably, with only partial
participation at each station, changes in the food environment could potentially reach
firefighters who were not a part of the study. Surprisingly, even more respondents
reported changes to the food environment at their home. Over 70% of respondents across
all intervention stations noted improvement in their home food environment. The
expectation was that changes in the food environment at the station would precede
changes at the home. It is possible that changes were made in that order, but that some
participants who encountered resistance at the station were able to achieve change in their
own homes. Or perhaps participants found it easier to first change their own behaviors
before trying to enact change at the station. In either case, it is promising to see the
exceptionally high number of participants who reported changes in their home food
environment, and it again highlights the extended reach of worksite health promotion
programs as the families of participants presumably benefited from the changes as well.

**Aim 3: Analyzing Baseline Nutrition Data**

While the problems of cardiovascular disease and heart attacks are well-
documented in firefighters, a study of their dietary intake is essential to determining best
methods for improving these risk factors. Nutrition data on firefighters is extremely limited, and what little published data does exist is based on screeners. The FFIRE study was unique in the depth of dietary data collected, which included a food frequency questionnaire and an eating habits survey, as well as stages of change and nutrition knowledge data to further understand factors contributing to dietary choices.

The baseline data presented in chapter 5 is pooled across treatment arms to present data on the full firefighter sample. Though small, the sample is demographically representative of the U.S. fire service, with volunteer and paid firefighters of both genders with a wide range of ages, education levels, and incomes. Dietary intake data is separated by intention to lose weight since that may factor largely into food consumption. Over half of study participants (59.8%), all but one of whom was overweight or obese, reported currently trying to lose weight, suggesting that many are clearly aware of their overweight status and of the importance of achieving a healthy weight. This is somewhat higher than the estimated 30-50% of the U.S. population that is interested in losing weight, though that number jumps to over 80% when looking at a population of overweight and obese adults\textsuperscript{9–11}.

Notably, 80% of participants who were not currently trying to lose weight were also overweight or obese. It is unclear whether they were unaware of their overweight status and of the importance of achieving a healthier weight, or if they were aware but were not interested in or ready to make changes. Since only one-third had been told by a doctor in the past five years that they need to lose weight, it is possible that others may have thought they were at an appropriate weight. Meeting with a physician to review the
results of their physical screening was an important first step in helping to identify weight-related health concerns.

**Dietary Intake and Eating Habits**

Baseline DHQ data suggest that average intake in this population fell short of current dietary guidelines, though intake was generally consistent with the U.S. adult population\textsuperscript{12,13}. Fruit, vegetable, and whole grain intakes were far lower than recommended amounts, while sodium, trans and saturated fat, and added sugar intakes far exceeded them. A full one-third of calories were from nutritionally “empty” sources. And while firefighters who are currently trying to lose weight consumed fewer calories and less added sugar than individuals who are not trying to lose weight, their overall intake was still inconsistent with the recommended USDA food patterns. The HEI total score in both groups fell below the U.S. adult average score of 58.3\textsuperscript{14}.

Eating habits data provide additional insight into dietary intake patterns. Firefighters reported cooking little, at the station or at home, relying more on packaged and prepared foods. This confirmed the need to address fast and easy cooking techniques in the intervention, but also highlighted the importance of providing tips and tools to improve packaged meals and to select healthier prepared options. Participants also reported filling on average only one quarter of their plates with vegetables during meals, making it difficult to reach recommended intakes, and whole grain products were not chosen frequently. Meanwhile, only one-quarter of participants purchased items from the vending machine or commissary at the fire station at least once per week. While the foods chosen, mainly candy, chips, and soda, are unhealthy, consumption of foods from
vending machines did not appear to occur with enough frequency to substantially affect participant diets.

**Stages of Change**

Baseline stages of change responses suggest a disconnect between actual and perceived intake. Approximately half of study participants reported being in the maintenance stages for limiting salt and sugar-sweetened beverage intake, results that were inconsistent with DHQ data. Likewise for consuming a diet high in fruits and vegetables, where half of study participants reported being in either the action or maintenance stages. However, this does suggest that firefighters were beyond the pre-action stages for these behaviors and were at least considering dietary intake recommendations when selecting food. Use of the self-staging algorithm is recommended over intake criteria when staging individuals to assess cognitive progress. Comparatively fewer respondents reported being in the action or maintenance stages for limiting saturated and trans fats and eating a high fiber diet, which suggest more support was needed in the earlier stages to help motivate action.

**Nutrition Knowledge**

Responses to individual questions on the baseline nutrition knowledge quiz provided useful background on firefighter knowledge and highlighted topics to cover in the intervention. A total score was calculated to facilitate group comparisons and to assess improvement in knowledge over the study period. Though not significant, participants currently trying to lose weight on average scored one point higher than those
not trying to lose weight. Participants had the most difficulty with questions asking about recommendations for daily fat intake, biggest sources of sodium in the diet, and types of added sugars. They fared better on questions asking about the diet-disease link and healthy strategies for losing weight, and performed moderately well on questions asking about sources of healthy fats, carbohydrates and proteins. On the nutrition label questions, most participants were able to identify nutrient quantities in one serving of food, but many had trouble extrapolating from one serving to the entire package.

**Aim 4: Assessing Impact of the Pilot Intervention**

FFIRE study participants successfully improved diet and progressed through the stages of change for numerous dietary goals. These changes were mostly sustained through the follow-up period, six months after monthly visits to the stations ended, and new improvements were seen in stages of change at the 12-month mark. Changes in dietary intake were observed in both the intervention and control groups, controlling for intention to lose weight and other key confounders, while improvements in eating habits and stages of change were primarily observed in the intervention group. Furthermore, within the intervention group, high participators made more dietary improvements than low participators.

**Dietary Intake and Eating Habits**

Total caloric intake in both the intervention and control groups decreased significantly, dropping on average by 18.8% over the 12-month study period. Under typical conditions this level of caloric reduction is expected to result in a caloric deficit,
and indeed, anthropometric results presented elsewhere demonstrate significant weight loss in both groups (manuscript in preparation). Additionally, intake of all depromoted nutrients (saturated and trans fat, refined grains, added sugars, and sodium) decreased in both groups. Vegetable intake decreased in the intervention group only, though further analysis suggest the change was only among low participators and that density per 1,000 calories remained steady. Fruit intake increased significantly in the intervention group only and their whole grain intake remained steady, suggesting small improvements in dietary composition for the intervention group.

Eating habits data reveal additional changes in dietary composition for the intervention group. Intervention participants reported increasing the proportion of their dinner plates filled with vegetables and decreasing the proportion filled with grains and meats. They also reported choosing whole grains more frequently and consuming white bread less frequently. These are crucial steps in increasing fruit and vegetable consumption and shifting carbohydrate intake to healthier sources. Both groups reported a decrease in packaged food consumption and fried food consumption away from home; these may have been more intuitive steps in improving intake compared to the balanced plate concept.

The results of this trial are consistent with worksite interventions in achieving moderate impact on dietary intake\textsuperscript{16,17}. Many worksite nutrition studies have successfully reduced total fat intake\textsuperscript{16}. This study instead emphasized lowering saturated and trans fat intake, consistent with current dietary guidelines. Other studies highlighted increased fruit and vegetable intake, though effect sizes of joint consumption remain below a half serving per day\textsuperscript{16,17}. This study achieved an increase in fruit, but not vegetable,
consumption in the intervention group. The FFIRE study also stressed reductions in added sugar, refined grain, and sodium intake to improve overall diet quality. While successful, the wide focus of the study may have resulted in smaller effect sizes for any one dietary recommendation.

Very few firefighter studies have reported nutrition outcomes. One that used dietary screeners saw improvement in fruit and vegetable intake and a decrease in percent calories from fat; however, participants saw only a reduction in weight gain\textsuperscript{18}. Other studies have incorporated nutrition components, but have reported only anthropometric changes. One study included “health/wellness/nutrition educational classes”; the study did not achieve significant weight loss, though other CVD risk factors improved\textsuperscript{19}. However, additional information on the intervention is not available, and dietary outcomes were not assessed. Two other small studies provided participating firefighters with meal replacement shakes and bars; dietary analysis is again not available, and, in one, the significant weight loss that was achieved during the intervention dissipated over the six-month follow-up period\textsuperscript{20,21}. Furthermore, results from these studies cannot be easily compared to studies of participant-driven dietary changes.

**Stages of Change**

Participants in the intervention group only made significant progress through the stages of change for each of the five promoted dietary patterns. Interestingly, improvement in two behaviors (limiting consumption of salt and sugar-sweetened beverages) was not seen until the 12-month survey. Perhaps individuals needed more time to reflect on the information provided before engaging in action, or perhaps they
adjusted their belief that they were already engaging in the behavior after learning more about the recommendations. In either case, it is encouraging that improvement continued beyond the intervention period and suggests that further follow-up would possibly capture more improvements in stages of change and dietary intake.

**Nutrition Knowledge**

Impact of the intervention on knowledge was not reported in paper 3 due to space concerns (owing to the target journal having a much lower word limit than for paper 2). However, analyses indicted a small increase in total knowledge score in the intervention group only, but one that was not significant (p=0.11). Positive responses to a question asking whether participants felt they know enough about daily caloric requirements to make lower calorie choices (the only question asking about self-assessed nutrition knowledge) went up significantly at 2 and 6 months among intervention group participants. This suggests participants felt their knowledge increased, even though knowledge scores did not reflect that. Perhaps the scale did not capture the increases in knowledge that were made, or perhaps overall nutrition knowledge did not improve, only knowledge of caloric requirements. A longer quiz may have allowed for a better assessment of nutrition knowledge, thought it would have also increased participant burden.

Use of a validated instrument could have confirmed that knowledge was indeed being appropriately tested; however, no existing surveys were found that were based on current nutritional guidelines and that covered the topics of interest. Since a new scale was written for this study, the specific survey results also cannot be compared to other
populations. However, overall, results are consistent with other firefighter studies that have found that only 20% of participating firefighters felt they possessed “very sufficient” nutrition knowledge and that 45% felt confused by the different dietary recommendations\textsuperscript{22,23}.

**Improvement in Control Group**

An unexpected finding was the significant decrease in total caloric intake experienced by the control group at the 6 and 12-month time points. Though there were few reported changes in the relative contribution of various foods, the decrease in caloric intake was enough to lead to significant weight loss. The average American gains one to two pounds per year, and the control groups in previous firefighter wellness studies have indeed experienced weight gain over the study period\textsuperscript{18,24,25}. It thus was expected that the control group in the FFIRE study would either experience weight gain or would demonstrate no significant change in weight over the year-long study, which would most likely correspond to no change or an increase in total caloric intake.

One possible explanation for the decreased caloric intake is that the anthropometric measurements that were taken at all intervention and control stations at baseline and again at three other time points throughout the study period may have been enough to spur change in the control participants. Indeed, one study that followed career firefighters for nine months concluded that surveillance may have been the catalyst for behavior change that resulted in weight loss, and firefighters in another study reported being more aware of their eating and exercise habits leading up to study measurements\textsuperscript{19,25}. Specifically, all participants met individually with the medical doctor.
on the study team to go over their results. Since doctors are unlikely to bring up weight loss with their overweight patients, the discussion with the study doctor may have been many participants’ first conversation about weight with a medical professional\textsuperscript{26–29}. Furthermore, studies have shown that even a single instance of receiving dietary advice can spur dietary change, particularly in individuals with cardiovascular disease risk factors\textsuperscript{30}.

A study by Kay et al. found that only 44\% of participating firefighters considered themselves to be overweight, when in actuality almost double that number (84\%) met criteria for overweight, a phenomenon also reported in other firefighter studies\textsuperscript{23,31,32}. Firefighters who learned of their overweight status or other medical problems during baseline data collection may have been motivated to lose weight by restricting caloric intake, following the advice given by the study doctor. Other control participants, including those who already knew of their overweight status, may still have used the scheduled visits as motivation to improve their numbers, for their own benefit or to please the study team. Indeed, participants at one control station proudly reported on their improvements at follow-up data collection visits and were eager to receive their “official” results.

Furthermore, the response rate for the 12-month DHQ was substantially lower at one of the two control stations than at any other station. While there was a perfect response rate at the highly-motivated station referenced in the previous paragraph, the response rate at the second control station was hardly over 50\%. The same number of attempts were made to contact all participants for data collection; however, one of the control stations was simply more committed to the study (and to losing weight).
Meanwhile, with additional time spent at intervention stations during the intervention period, the study remained more salient for those participants and perhaps increased their likelihood of complying with data collection requests. The overrepresentation of DHQ data from participants at the more committed control station potentially overstated the control group’s progress. If complete dietary intake data had been available from the second control station, it may have balanced out the data from the more motivated participants. This concern could have been alleviated with the inclusion of more control stations, as discussed in the limitations section.

Notably, control participants decreased caloric intake, but did not experience improvements in other areas of dietary data collection. They experienced little change in the composition of their diet, as assessed through the DHQ and the eating habits survey. Participants in the intervention group meanwhile received guidance on choosing healthier foods, leading to small improvements in dietary composition. Control participants also reported no significant progress through the stages of change, which suggests that intentions to address specific dietary recommendations did not improve without the knowledge and behavioral strategies shared through the intervention.

**Study Limitations**

While the results of this pilot study are very promising, there are limitations of the research. Fire stations were not randomized to treatment arms and were instead assigned by the study team. It however resulted in two suburban and one rural station in each intervention arm, and one suburban and one rural station in the control arm, a more even split than would be expected from random assignment. And though the stations were not
randomly assigned to treatment arms in a conventional sense, the criteria that was used for assignment was still, to a certain extent, random as all stations provided their availability for training without either party knowing which dates would be most convenient.

Furthermore, because the firefighter sample within stations was not random, random assignment to treatment arms would have likely had only minimal impact on the generalizability of the results. Including only firefighters that volunteered for study participation may have created selection bias and reduced generalizability of study results, though this is typical of dietary studies since individuals cannot be forced to participate. One possibility is that individuals who were already trying to lose weight, nearly 60% of the sample, were more likely to sign up for the study. Baseline results were stratified by intention to lose weight to clearly highlight any differences between the two groups, and intention to lose weight was added as a covariate to statistical models.

Although the study population was somewhat homogeneous, participant demographics are reflective of the firefighter population in the state and do not indicate a shortcoming of the sampling methodology. In fact, among paid firefighters across the country, only 4.5% are female and 2.9% are black\textsuperscript{33}. Nonetheless, future studies could be conducted in different geographical areas, including those with greater racial and gender diversity in the firefighter population. And as a pilot study, the total sample size was small. However, the primary goals of developing intervention components, assessing feasibility, and evaluating pilot data were all successful and suggest great promise in broadening the scope of future firefighter nutrition interventions.
While the intervention integrated key concepts from Social Cognitive Theory, such as self-efficacy, these constructs were not measured. It thus was not possible to explore associations between these constructs and diet at baseline, or to assess whether improvements in diet were precipitated by changes in these variables. However, other psychosocial measures that were predicted to stand in the pathway between intervention participation and behavior change were measured, namely nutrition knowledge and stages of change.

Additionally, the two intervention groups were combined in the analysis, potentially obscuring differences between the groups. Both intervention arms received the same educational and environmental intervention, though one received an enhanced behavioral intervention using peer advocates. Seven peer advocates from the three peer advocate intervention stations received training to provide additional support for participants at their stations, particularly between study sessions and after the conclusion of the intervention. It was hypothesized that the peer advocate stations would have higher social support and collective efficacy, with the peer advocates helping to unify and motivate the participants as a group.

Unfortunately, the peer advocates as a whole were not as involved as hoped and there ended up being little difference in the intervention received by participants in the two intervention arms. Only one peer advocate attended five (of six) sessions and another attended four; two attended just one session each. While session attendance was not essential to facilitating dietary changes at the station, it turned out to be a good indicator of commitment to the role. The two who attended over half of the sessions took their roles seriously and genuinely tried to motivate their peers, both by example and by
developing additional activities to engage participants at their stations. However, the other peer advocates were not as involved, including both advocates from one station. This led to over half of participants at peer advocate stations responding that they either did not have peer advocates at their station or were unsure if they did. Meanwhile, nearly one-quarter of respondents at non-peer advocate stations responded that they did have peer advocates.

Conceptually, because the peer advocate component of the intervention was not fully realized, it made sense to combine the two groups. To confirm this position, DHQ data were analyzed separately for the two intervention groups and demonstrated minimal differences between the two, with the existing differences having no pattern (i.e., in two cases the peer advocate group showed greater improvement while in two cases the non-peer advocate group was more successful). This can certainly be attributed to chance, and thus for conciseness and to increase the group size and power to detect intervention impact, the two groups were combined for the remaining analyses. This did, however, create a large imbalance in the control and intervention group sizes, making it easier to detect change in the intervention group as compared to the control group.

The use of a food frequency questionnaire to assess dietary intake is another limitation of the study as respondents often underestimate intake on FFQs. However, studies have shown that underreporting on FFQs, as compared to total energy expenditure calculated using the doubly labeled water (DLW) technique, is no higher than on other dietary assessment instruments, including food diaries and 24-hour recalls34. Thus, for the purposes of this study, where the use of biomarkers would have been prohibitively expensive, an FFQ was an appropriate dietary assessment method and resulted in less
participant burden than multiple 24-hour recalls or food diaries. In particular, the DHQ was selected since it was designed using results from cognitive research into ways to improve reporting accuracy and consequently performs as well or better than other nationally available FFQs\textsuperscript{35,36}. Moreover, because the study utilized a pre-post analysis concerned primarily with change in intake, problems associated with chronic underestimation are theoretically minimized. Additional data collected through the eating habits and stages of change surveys help to bolster the DHQ data by providing a more complete picture of dietary patterns.

**Study Strengths**

The study had numerous strengths, most notably its contribution to the very scarce literature on firefighter diet and interventions to improve their diet. Existing firefighter research has focused on other areas of wellness, including physical activity, injury prevention, and mental health, but few studies have examined diet. Addressing dietary intake is crucial to improving health and reducing injuries and fatalities. Firefighters are a high-risk population that could benefit tremendously from dietary interventions, and study results may be informative in designing interventions for other first responders and shift workers as well.

Furthermore, previously published research on firefighter diet have only used screeners or weight loss as outcome variables. No published studies were found that included an assessment of complete dietary intake using a food frequency questionnaire, 24-hour recall, food diary, or other dietary intake instrument. The FFIRE study used the Diet History Questionnaire, a validated food frequency questionnaire developed by the
National Cancer Institute, to gain a more complete understanding of firefighter diet. Additional anthropometric data served to confirm changes suggested by the DHQ, rather than relying solely on self-reported intake. To increase the accuracy of anthropometric data, study staff collected all measurements.

In addition to post-intervention data collection, additional data were collected six months after the conclusion of the intervention. Though previous analyses have indicated that six months is sufficient time to see changes in nutritional and physical outcomes, behavior change is a slow process and the impacts on such measures as body fat percentage can be even slower. On the other hand, other studies have shown that behavior change is often most pronounced during the intervention period, with regression back to previous habits after the study ends. The twelve-month data collection allowed an assessment of longer-term impact and maintenance of changes.

Additionally, the preponderance of existing firefighter health research has focused on paid career firefighters, most likely because their occupational risks are presumed greater than volunteers, whose hours vary greatly\(^25,37\). However, there are over twice as many volunteer firefighters in the U.S. as there are paid career firefighters, highlighting the importance of targeting both paid and volunteer firefighters\(^4\). Through a partnership with the National Volunteer Fire Council, the study team was able to better consider the unique concerns of volunteer firefighters, such as the added time constraints of balancing a paid position with firefighting duties and fewer meal provisions at the station. Though volunteers are a more difficult group to target since their schedules at the fire station are more varied, study activities were scheduled on monthly meeting days when possible, thereby reaching participants at times when many were already at the station.
Participating stations were chosen to represent variability in fire departments resulting from such factors as setting (rural or suburban) and level of funding. Some were volunteer only while others were combination volunteer/paid departments. Some had fitness rooms, others housed firefighters long-term, and others served as a local gathering place. The culture at each station was unique and together they represented variability in fire stations across the country. Study participants reflected diversity in age, education, income, years in the fire service, and firefighter type.

And finally, the intervention followed a rigorously-developed conceptual framework combined with key constructs from Social Cognitive Theory and the Transtheoretical Model. It incorporated educational, environmental, and behavioral components to support the behavior change process from numerous angles, and families were invited to attend study sessions to support changes in the home. Topics for inclusion were based partly on results of formative research with firefighters, and feedback collected at the end of every study session was used to continuously revise the program to best meet the needs of study participants.

**Future Research**

The promising results of the FFIRE study pilot intervention, both in terms of feasibility and impact, clearly speak to the importance of expanding the program to a large-scale, randomized, nationally-representative trial. Future studies could expand on the success of the pilot study to explore:
• Impact on dietary intake, food behavior, and health status. With a larger sample size, future studies can be better powered to detect changes that result from the intervention.

• Effects of health monitoring on dietary intake and health status. Randomization can help to identify improvements in the control group that are attributable to health monitoring versus improvements in the intervention group from additional study activities.

• Long-term benefits. Pilot study results show many changes were maintained six months after the intervention ended, and that new improvements continued to be made. Additional data collection at two or three years could be used to evaluate lasting effects.

• Return on investment (ROI). Fire departments have limited budgets and are hesitant to use funds to support wellness initiatives. Studies that demonstrate cost savings, for instance, though fewer injuries, can help make the case for prioritizing health.

• Dietary intake as measured by other instruments or approaches. Participants tend to underestimate intake on FFQs and other self-report dietary intake instruments. Future studies could compare the results from FFQs to these other measures (24-hour recalls, food diaries) or to total energy expenditure as measured by the doubly labeled water technique. Nutritional analyses of meals prepared at the station could also provide useful data.

• Ancillary benefits to non-participating station members and families of participants. Study participants indicated that station and home food environments were
improved after study participation. This raises the question of whether non-participants in these environments experienced any health improvements.

- Use of peer advocates to advance behavior change. The study highlighted some of the difficulties associated with supporting peer advocates at individual stations, but through the motivated peer advocates (official and not!) demonstrated the potential benefits. Research can investigate how much and what types of support is needed to help peer advocates serve their stations, in addition to assessing the impact of peer advocates on study outcomes.

- Additional intervention strategies. While the pilot intervention focused on activities identified by firefighters in focus groups, future studies could incorporate other strategies as well, for instance, the use of social media to disseminate information and increase social support.

- Validation of the nutrition knowledge quiz. Nutrition knowledge quizzes based on current dietary recommendations are needed, and item analysis results from this quiz are encouraging.

**Practice Implications**

The FFIRE study pilot intervention demonstrated both the need to improve cardiovascular risk factors in firefighters through better nutrition and the ability of a nutrition-based wellness program to do so. Most of the firefighters that participated in the study reported currently trying to lose weight, but, based on focus group and baseline results, lacked the skills or knowledge to succeed. This speaks to the importance of
implementing programs that address these gaps while also improving the nutritional environment to facilitate change.

While using trained interventionists to implement wellness programs has merits, that may be impractical given the number of fire departments across the country. Instead, encouraging stations to implement programs on their own will allow more individuals to benefit. Numerous stations requested access to study materials following a presentation at the Maryland State Firemen’s Association (MSFA) annual convention in 2012. All sessions outlines, handouts, and posters were shared with interested departments, and session outlines are also available online through the Journal of Nutrition Education and Behavior as supplementary material to the published intervention manuscript. Given the interest in these materials, final recommendations and study materials from the larger trials should be disseminated through national firefighter organizations and the U.S. Fire Administration.

Individual departments know the needs of their members and can elect to utilize the most relevant study materials and environmental changes recommended by the program. Certainly, the differences in station cultures necessitates having a menu of options and recommendations from which individual stations can choose. This is even more important at volunteer stations. Since many volunteers have other paid positions, their time spent at the fire station may be limited. For some, changes to the environment may have little effect if individuals do not eat at the station; for others, educational sessions may be difficult to schedule at a time convenient for all interested members. Stations can prioritize the interventions they feel will have the greatest effect, and if interested, can later implement more components.
Stations will need strong leadership to implement a nutrition program. Level of interest and commitment to the study varied across the study stations, but generally, stations with strong leadership support for the study were more enthusiastic. Additionally, stations will need to be encouraged to choose activities based on need and not just interest. Many participants who started off hesitant about attending sessions ended up engaged and interested. Others initially refused to try the healthy meals prepared at the station, claiming they didn’t eat vegetables or they knew they would not like it; however, after seeing others enjoying the food, tried and liked it. It is difficult to know which components will be most successful, and in many ways, the ones that take participants further out of their comfort zone might have the greatest impact. And as one firefighter commented in the focus groups, while firefighters are concerned about nutrition and interested in learning more, they might still need to be “tricked” into participating.

This study can also be used as a starting point to develop wellness programs for other first responders, such as police officers and EMS personnel, as well as other shift workers. While the program was developed to address the specific needs of firefighters, other worker groups have similar working conditions and may face similar barriers to change. Formative research could identify revisions to the content and study activities to best meet the needs of these groups.

**Policy Implications**

Fire stations have already been advised to implement wellness programs, but participation remains low. Results from successful programs may boost willingness to
implement nutrition programs, but even still, changes to policy will help to maximize the benefits.

**Departmental policy:** Individual departments can elect to implement policies that will improve the health of members, such as restricting the types of foods that will be available through commissaries and vending machines, or at least ensuring that healthy options are available\(^3^8\). These can be combined with fitness programs to create a well-rounded approach to fighting overweight and obesity.

**Local policy:** Local jurisdictions can mandate recommended annual health screenings for all fire service members to improve consistency between perceived and actual health status and to motivate behavior change\(^3^9,^4^0\). Medical professionals or dieticians can be hired to support individual or station-level wellness objectives\(^4^1\). Stricter minimum health and fitness standards can be adopted for new recruits and for continuing members.

**State and federal policy:** Even volunteer departments may be eligible for grants through federal and state funding programs\(^4^2\). These grants can be earmarked for stations that meet certain health and fitness criteria, or have specific wellness policies in place to help members improve their health. Fire stations then have financial incentives to prioritize health while federal and states funds can be directed to keeping firefighters and communities safe, rather than fighting the myriad consequences of poor cardiovascular health.
Presumptive Disability Legislation: Most U.S. states have laws that presume certain medical conditions suffered by firefighters are the result of engaging in firefighting activities. However, many beneficiaries have cardiovascular risk factors that may be unrelated to their firefighter status, such as obesity and diabetes. States can revise their laws to require that firefighters maintain minimum health and fitness standards to be eligible for such awards, thereby acknowledging both the professional and individual contributors to coronary heart disease and other medical conditions.

Conclusions

Obesity is threatening the lives of firefighters, but to date, few nutrition interventions have been developed to address this grave problem. Effective interventions must take into account the barriers to healthy eating faced by all firefighters and especially volunteers. The FFIRE study, while small in scale, was able to affect significant improvement in diet and promoted progression though the stages of change for numerous dietary recommendations. These promising results speak to the importance of building on this research to reach firefighters across the nation, with the overarching goal of reducing cardiovascular fatalities and improving the health of these essential first responders.
References


APPENDIX A: FFIRE STUDY SURVEY

The 6 month FFIRE study survey includes all eating habits, stages of change, nutrition knowledge, and health status questions, as well as the post-intervention exposure and evaluation survey. Similar surveys were administered at baseline (excluding post-intervention exposure and evaluation section; including demographics and fire service demographics sections), 2 months (excluding post-intervention exposure and evaluation section and nutrition facts label quiz), and 12 months (with an abbreviated post-intervention exposure and evaluation survey).

The specific survey sections are as follows:

1. FFIRE Study – Introduction to 6 month Follow-up Survey
2. Weight
3. Physical Fitness Level
4. Diet (this includes stages of change questions)
5. Stress
6. Tobacco
7. Alcohol
8. Health Status 1
9. Health Status 2
10. Knowledge
11. Label Questions
12. Intervention 1
13. Intervention 2
14. Additional Comments
FFIRE Study 6 Month Survey PILOT (yes 2m)

1. FFIRE Study - Introduction to 6 month Follow-up Survey

Thank you for continuing to be part of the FFIRE Study which is being led by researchers from Johns Hopkins University. This is a follow-up survey that should take about 20-25 minutes to complete. Please be honest with your responses and check only one answer for each unless otherwise specified. In addition, we ask that you please not look up any answers—choose what you think is the best response.

You will be paid $30 cash for completing this survey. Thank you!

1. Your Study ID#

2. Weight

These next questions are about your weight. Please check only one answer for each question unless otherwise specified.

1. Which of the following best describes your current weight?
   - [ ] Extremely overweight or obese
   - [ ] Overweight
   - [ ] Ideal weight
   - [ ] Underweight

2. Have you been told in the past 4 months by a doctor or health care provider that you needed to lose weight for health reasons?
   - [ ] Yes
   - [ ] No

3. Which of the following best describes what you are currently doing regarding your weight?
   - [ ] I am trying to lose weight
   - [ ] I am trying to maintain my weight
   - [ ] I am trying to gain weight
   - [ ] I am currently not doing anything regarding my weight
4. Have you been trying to lose weight in the last 4 months?
- No, and I do not intend to in the next 6 months
- No, but I intend to in the next 6 months
- No, but I intend to in the next 30 days
- No, I am already at a healthy weight
- Yes, and I have been for less than 6 months
- Yes, and I have been for more than 6 months

5. If yes, how have you tried to lose weight over the past 4 months? Check all that apply.
- Diet
- Exercise
- Saw a doctor or other healthcare provider
- Took prescribed weight loss medication
- Took over-the-counter weight loss products and/or herbal supplements
- Had gastric bypass or LAP-BAND surgery
- Other (specify)_______________________

6. If you need to lose weight, but are not trying, what is/are the reason(s)? (Check all that apply)
- It’s too hard to change the types of food/drinks I consume
- It’s too hard to decrease how much I eat
- I can’t afford (the money) to eat healthier
- I don’t have time to exercise
- I don’t care
- I’m not motivated
- I don’t think it will make a difference to my health
- Other (please specify)_________________________

3. Physical Fitness Level

These next questions are about your level of fitness and physical activity. Please check only one answer for each question.

1. What do you currently perceive to be your fitness level?
- Excellent
- Very Good
- Good
- Fair
- Poor
2. In the PAST 6 MONTHS how has your fitness level changed?

- I am less fit now
- My fitness level has not changed
- I am more fit now

3. In the PAST 4 MONTHS have you increased your physical activity level?

- No, and I do not intend to in the next 6 months
- No, but I intend to in the next 6 months
- No, but I intend to in the next 30 days
- Yes

4. Diet

These next questions are about what you eat and your eating habits. Please check only one answer for each question unless otherwise specified.

First are some questions about eating at the fire station.

1. Do you eat any meals while you are at the fire station?

- Yes
- No

2. If yes, how often do you eat at the fire station?

- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily

3. Do you bring food into the fire station to eat?

- Yes
- No
4. If yes, how many times per week do you bring food prepared at your home?
   - Less than once a month
   - 1-3 times a month
   - Once a week
   - 2-3 times a week
   - 4-6 times a week
   - Daily

5. How many times per week do you bring carryout or fast food to the fire station?
   - Less than once a month
   - 1-3 times a month
   - Once a week
   - 2-3 times a week
   - 4-6 times a week
   - Daily

6. Do you leave the fire station during a shift to obtain food?
   - Yes
   - No

7. If yes, where do you usually go? (Check all that apply)
   - Fast food restaurant/drive thru
   - Restaurant
   - Grocery store
   - Carry-out
   - Convenience store
   - Carry-out
   - Other (specify)__________________
8. How often do you consume items from the vending machine(s) or commissary at your fire station?

- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily
- Not applicable - our station does not have a vending machine or commissary

9. If you buy items from the vending machine(s) or commissary at your fire station, what do you usually buy?

These next questions are about eating anywhere, not just at the fire station.

10. How often do you eat breakfast (including instant breakfast foods or shakes)?

- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily
- Only on weekends

11. If you take vitamins, which ones do you take? Please write "none" if you take none.

12. How much of the visible fat on your beef, pork, or lamb do you remove before eating?

- Remove all visible fat
- Remove most
- Remove small part of fat
- Remove none
- Don’t eat meat
13. How often do you eat the skin from chicken?
- Always
- Usually
- Sometimes
- Rarely
- Never

14. When cooking at home, what kind of fat is usually used?
- Don't cook with fat
- Reduced-fat margarine
- Vegetable shortening
- Cooking spray
- Vegetable oil
- Lard
- Butter
- Canola oil
- Don't know
- Margarine
- Olive oil

15. At home, how often do you eat fried food (for example french fries, fried chicken, fried fish)?
- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily

16. Away from home, how often do you eat fried food?
- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily
### 17. How often do you prepare a meal from whole ingredients (i.e., making something from scratch)?

- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily

### 18. How often do you eat pre-prepared foods (canned, frozen or boxed)?

- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily

### 19. How often do you eat foods prepared by a restaurant or grocery store (including fast food)?

- Less than once a month
- 1-3 times a month
- Once a week
- 2-3 times a week
- 4-6 times a week
- Daily

### 20. Which type of bread do you usually eat?

- White
- Brown
- Multigrain
- Whole wheat
- Other (specify): ______________________
21. When eating pastas, rice, cereals or snacks, how often are they whole grain or high fiber (for example, brown rice)?

- Always
- Usually
- Sometimes
- Rarely
- Never

22. How often do you add salt to your food?

- Always
- Usually
- Sometimes
- Rarely
- Never

23. When you fill a plateful of food for dinner, what portion of the plate do you typically cover with meat, fish or poultry?

- The entire plate
- Three quarters of the plate
- Half of the plate
- One quarter of the plate
- None of the plate

24. When you fill a plateful of food for dinner, what portion of the plate do you typically cover with vegetables?

- The entire plate
- Three quarters of the plate
- Half of the plate
- One quarter of the plate
- None of the plate
25. When you fill a plateful of food for dinner, what portion of the plate do you typically cover with pasta, rice, potatoes or bread?

- The entire plate
- Three quarters of the plate
- Half of the plate
- One quarter of the plate
- None of the plate

26. On average, how many calories do you actually consume each day?

27. Do you consistently avoid eating foods high in saturated and trans fat?

- No, and I do not intend to in the next 6 months
- No, but I intend to in the next 6 months
- No, but I intend to in the next 30 days
- Yes, and I have been for less than 6 months
- Yes, and I have been for more than 6 months

28. Do you consistently eat a diet high in fiber? For example, beans, peas and lentils.

- No, and I do not intend to in the next 6 months
- No, but I intend to in the next 6 months
- No, but I intend to in the next 30 days
- Yes, and I have been for less than 6 months
- Yes, and I have been for more than 6 months

29. Do you consistently eat a diet high in fruits and vegetables?

- No, and I do not intend to in the next 6 months
- No, but I intend to in the next 6 months
- No, but I intend to in the next 30 days
- Yes, and I have been for less than 6 months
- Yes, and I have been for more than 6 months
### 30. Do you consistently limit your consumption of soda and other sugar-sweetened beverages?

- [ ] No, and I do not intend to in the next 6 months
- [ ] No, but I intend to in the next 6 months
- [ ] No, but I intend to in the next 30 days
- [ ] Yes, and I have been for less than 6 months
- [ ] Yes, and I have been for more than 6 months

### 31. Do you consistently limit your consumption of salt?

- [ ] No, and I do not intend to in the next 6 months
- [ ] No, but I intend to in the next 6 months
- [ ] No, but I intend to in the next 30 days
- [ ] Yes, and I have been for less than 6 months
- [ ] Yes, and I have been for more than 6 months

### 32. Please select the choice that best describes you. Check one answer for each.

<table>
<thead>
<tr>
<th>Statement</th>
<th>Definitely true</th>
<th>Mostly true</th>
<th>Mostly false</th>
<th>Definitely false</th>
</tr>
</thead>
<tbody>
<tr>
<td>When I smell a sizzling steak or juicy piece of meat, I find it very difficult to keep from eating, even if I have just finished a meal.</td>
<td></td>
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<tr>
<td>I deliberately take small helpings as a means of controlling my weight.</td>
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<tr>
<td>When I feel anxious, I find myself eating.</td>
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<tr>
<td>Sometimes when I start eating, I just can’t seem to stop.</td>
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<tr>
<td>Being with someone who is eating often makes me hungry enough to eat also.</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>When I feel blue, I often overeat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>When I see a real delicacy, I often get so hungry that I have to eat right away.</td>
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<td></td>
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<tr>
<td>I get so hungry that my stomach often seems like a bottomless pit.</td>
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<td></td>
<td></td>
<td></td>
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<tr>
<td>I am always hungry so it is hard for me to stop eating before I finish the food on my plate.</td>
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<tr>
<td>When I feel lonely, I console myself by eating.</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>I consciously hold back at meals in order not to weight gain.</td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I do not eat some foods because they make me fat.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>I am always hungry enough to eat at any time.</td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
FFIRE Study 6 Month Survey PILOT (yes 2m)

33. How often do you feel hungry?
- [ ] Only at meal times
- [ ] Sometimes between meals
- [ ] Often between meals
- [ ] Almost always

34. How frequently do you avoid "stocking up" on tempting foods?
- [ ] Almost never
- [ ] Seldom
- [ ] Usually
- [ ] Almost always

35. How likely are you to consciously eat less than you want?
- [ ] Unlikely
- [ ] Slightly likely
- [ ] Moderately likely
- [ ] Very likely

36. Do you go on eating binges though you are not hungry?
- [ ] Never
- [ ] Rarely
- [ ] Sometimes
- [ ] At least once a week

37. On a scale of 1 to 8, where 1 means no restraint in eating (eating whatever you want, whenever you want it) and 8 means total restraint (constantly limiting food intake and never "giving in"), what number would you give yourself?
- [ ] 1
- [ ] 2
- [ ] 3
- [ ] 4
- [ ] 5
- [ ] 6
- [ ] 7
- [ ] 8
38. Which of the following changes have you made in the past four months to improve the healthfulness of your diet? Check all that apply.

- Changing the types of food and/or food components that I eat
- Changing the amount of food I eat
- Changing how often I eat
- Counting calories
- Other (specify) ______________________________
- I have made no changes in the past 4 months

5. Stress

These next questions are about stress. Please check only one answer for each question.

1. During the PAST 4 MONTHS, how much stress did you experience at work while carrying out your duties in the fire service?

- A lot
- Some
- A little
- None at all

2. During the PAST 4 MONTHS, how much did stress at work interfere with your ability to perform your duties in the fire service?

- A lot
- Some
- A little
- None at all

6. Tobacco

These next questions are about tobacco and smoking. Please answer them even if you do not smoke. Non-smokers and ex-smokers will be asked to skip some questions.
1. Which of the following tobacco products do you CURRENTLY use? Check all that apply.

- Cigarettes
- Cigars
- Pipe
- Tobacco "dip" or "snuff"
- Chewing tobacco
- None of the above

IF YOU HAVE NOT SMOKED CIGARETTES IN THE PAST 6 MONTHS, please skip to the section entitled "Alcohol."

IF YOU HAVE SMOKED CIGARETTES IN THE PAST 6 MONTHS, please go to the next question.

2. Do you now smoke cigarettes every day, some days, or not at all?

- Every day
- Some days
- Not at all

3. If you quit smoking cigarettes, how long has it been since you quit?

- [ ]

IF YOU HAVE QUIT SMOKING CIGARETTES, please skip to the section entitled "Alcohol."

IF YOU CURRENTLY SMOKE CIGARETTES, please go to the next question.

4. During the PAST 6 MONTHS, have you stopped smoking for one day or longer because you were trying to quit smoking?

- Yes
- No

7. Alcohol

These next questions are about drinking alcoholic beverages. Included are liquor such as whiskey or gin, beer, wine, wine coolers, and any other type of alcoholic beverage. One drink is equivalent to a 12-ounce beer, a 5-ounce glass of wine, or a drink with one shot of liquor. Note: A 40 ounce beer would count as 3 drinks, or a cocktail drink with 2 shots would count as 2 drinks. Please give only one answer for each question.
1. During the PAST 30 DAYS, how many days per week on average did you have at least one drink of any alcohol beverage?
   - 0
   - 1-2
   - 3-4
   - 5-7

2. During the PAST 30 DAYS, on the days when you drank, about how many drinks did you drink on the average?
   Number of drinks

3. Considering all types of alcoholic beverages, how many times during the PAST 30 DAYS did you have 5 (if you’re a man), 4 (if you're a woman) or more drinks on an occasion?
   Number of times

4. During the PAST 30 DAYS, what is the largest number of drinks you had on any occasion?
   Number of drinks

5. Have you ever felt you ought to cut down on your drinking?
   - Yes
   - No

6. Have people annoyed you by criticizing your drinking?
   - Yes
   - No

7. Have you ever felt bad or guilty about your drinking?
   - Yes
   - No

8. Have you ever had a drink first thing in the morning to steady your nerves or get rid of a hangover (Eye-opener)?
   - Yes
   - No
9. What % of your total alcohol consumption occurs in fire service related activities? For example, if half of the alcohol you drink occurs during fire service related activities, your answer would be 50%.

10. Do you have an interest in reducing the amount (ounces and days per week) of alcohol that you drink?

   - Yes
   - No

### 8. Health Status 1

These next questions are about your health and certain medical conditions. Please check one answer for each item.

1. In the PAST 6 MONTHS, have you been told for the first time by a doctor or other health professional that you had the following medical conditions? Check one answer per item.

<table>
<thead>
<tr>
<th>Medical Condition</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension, also called high blood pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coronary artery disease or angina</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any other form of heart disease (e.g. congestive heart failure, heart valve disease)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High cholesterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Myocardial infarction, also called heart attack</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sleep apnea</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety disorder (including acute stress disorder, anxiety, generalized anxiety disorder, obsessive-compulsive disorder, panic disorder, phobia, posttraumatic stress disorder, or social anxiety disorder)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive disorder (including depression, major depression, dysthymia, or minor depression)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Are you CURRENTLY taking any prescribed medication for the following medical conditions. Check one answer per item.

<table>
<thead>
<tr>
<th>Condition</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hypertension, also called high blood pressure</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coronary artery disease or angina</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Any other form of heart disease (e.g. congestive heart failure, heart valve disease)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Diabetes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>High cholesterol</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Weight problem (obese or overweight)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asthma</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Arthritis</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anxiety disorder</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depressive disorder</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. Do you regularly take aspirin, fish oil and/or another blood thinner to prevent a future heart attack or stroke?

☐ Yes
☐ No

4. If you have been diagnosed with sleep apnea, do you regularly use a CPAP (Continuous Positive Airway Pressure) machine?

☐ Yes
☐ No
☐ I have not been diagnosed with sleep apnea

9. Health Status 2

Here are some more questions about your health. Please give one answer for each question unless otherwise specified.

1. On average, how many hours per week do you sit in front of a screen (e.g. television, computer, handheld device, video games)

   Inside the fire station?
   
   Outside the fire station?

2. In general, would you say your health is: (Check one)

☐ Excellent
☐ Very Good
☐ Good
☐ Fair
☐ Poor
3. In THE PAST 4 MONTHS, while performing firefighter duties, did you sustain an injury that resulted in medical treatment, lost time from work, or was captured in an incident report?

☐ No  ☐ Yes

IF "YES," PLEASE GO TO THE NEXT QUESTION.
IF "NO," PLEASE SKIP TO QUESTION #7.

4. If yes, what was the nature of the injury? Check all that apply.

☐ Burns and heat-related  ☐ Sprains and strains

☐ Contusions, abrasions, and wounds  ☐ Other injuries (list) __________________________

☐ Fractures and dislocations

5. What body part was injured? Check all that apply.

☐ Lower extremity  ☐ Back

☐ Upper extremity  ☐ Head or neck

☐ Abdominal/thoracic  ☐ Other (list) __________________________

6. Briefly explain how you were injured.


7. The following two questions are about activities you might do during a typical day. Does your health now limit you in these activities? If so, how much? Check one answer for each.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf:</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Climbing several flights of stairs:</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

8. During the PAST 4 WEEKS, have you had any of the following problems with your work or other regular daily activities as a result of your physical health?

<table>
<thead>
<tr>
<th>Problem</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Accomplished less than you would like:</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Were limited in the kind of work or other activities:</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
9. During the PAST 4 WEEKS, have you had any of the following problems with your work or other regular daily activities as a result of any emotional problems (such as feeling depressed or anxious)?

<table>
<thead>
<tr>
<th>Accomplished less than you would like:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did work or other activities less carefully than usual:</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. During the PAST 4 WEEKS, how much did pain interfere with your normal work (including both work outside the home and housework)?

- Not at all
- A little bit
- Moderately
- Quite a bit
- Extremely

11. The next three questions are about how you feel and how things have been with you during the past 4 weeks. For each question, please give the one answer that comes closest to the way you have been feeling.

**How much of the time during the PAST 4 WEEKS...**

<table>
<thead>
<tr>
<th>Have you felt calm and peaceful?</th>
<th>All of the time</th>
<th>Most of the time</th>
<th>A good bit of the time</th>
<th>Some of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>Did you have a lot of energy?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Have you felt downhearted and blue?</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

12. During the PAST 4 WEEKS, how much of the time has your physical health or emotional problems interfered with your social activities (like visiting friends, relatives, etc.)? (Check one)

- All of the time
- Most of the time
- Some of the time
- A little of the time
- None of the time
13. The following questions ask about how you felt or behaved in the past week. Please answer YES or NO if you felt or behaved this way in the LAST 7 DAYS.

<table>
<thead>
<tr>
<th>Feeling</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>I felt depressed.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt everything I did was an effort.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>My sleep was restless.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I was happy.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt lonely.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>People were unfriendly.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I enjoyed life.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt sad.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I felt that people disliked me.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>I could not get &quot;going&quot;.</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. Knowledge

These next questions about diet and nutrition will help us determine what you know in these areas. Please give only one answer for each question unless otherwise specified.

1. To the best of your knowledge, what is the recommended daily number of calories for a moderately active MAN? Moderate physical activity includes exercises such as brisk walking, bicycling, or gardening for about 30 minutes each day.

2. To the best of your knowledge, what is the recommended daily number of calories for a moderately active WOMAN? Moderate physical activity includes exercises such as brisk walking, bicycling, or gardening for about 30 minutes each day.

3. How many calories do you think you need to consume on average each day to stay at your current weight?

4. Do you feel that you know enough about your daily caloric requirements to make lower calorie choices when you purchase food or eat, or do you feel that you don't know enough?

- Yes, I know enough
- No, I do not know enough
- I don't know
5. What are the current dietary guidelines regarding total fat intake?

- minimize as much as possible
- 10-15% of total caloric intake
- 20-35% of total caloric intake
- 40-50% of total caloric intake

6. Which of the following contributes to a diet that is high in fiber and low in added sugars?

- Orange juice
- Fruit cocktail canned in heavy syrup
- Sweetened dried cranberries
- Fresh fruit salad
- All options are equally healthy

7. Which of the following is the biggest source of sodium in the American diet?

- Salt added while cooking
- Salt added at the table
- Salt added in processed and restaurant foods
- Salt occurring naturally in foods

8. Which of the following is the best source of healthy fat?

- Baked goods, like cookies and cakes
- Nuts, like almonds and walnuts
- Whole milk dairy products
- Butter and margarine
- All fats are unhealthy and should be avoided
9. Which of the following are good sources of lean protein (check all that apply)?
   - Fried chicken
   - Grilled ribeye steak
   - Roasted chicken breast
   - Whole wheat bread
   - Baked fish filet
   - Skim milk

10. Which of the following are good sources of healthy carbohydrates (check all that apply)?
   - Baked goods, like cookies and cakes
   - Fruit and vegetables
   - Sweetened drinks, like soda and fruit punch
   - Nuts, like almonds and walnuts
   - Refined grains, like white bread and pasta
   - Whole grains, like 100% whole wheat bread and brown rice

11. Which of the following is NOT a form of added sugar?
   - Sucrose
   - Corn syrup
   - Maltose
   - Guar gum
   - Molasses

12. Which of the following is the healthiest dietary strategy for losing weight?
   - Eat smaller portions at meals
   - Eliminate all carbs from your diet
   - Skip one meal each day
   - Eliminate all fat from your diet
13. Indicate whether the following methods for cooking chicken reduce, maintain or add fat: (check one answer for each)

<table>
<thead>
<tr>
<th>Method</th>
<th>Reduces fat</th>
<th>Maintains fat</th>
<th>Adds fat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grilling outdoors</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Grilling indoors (e.g., using a Foreman grill)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sauté with oil</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Sauté with cooking spray</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Deep-fry</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Bake</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

14. As a general rule of thumb, one way to eat a balanced and healthy diet is to fill your plate using which of the following proportions?

- 33% grains, 33% high-protein foods, 33% vegetables
- 50% grains, 25% high-protein foods, 25% vegetables
- 25% grains, 25% high-protein foods, 50% vegetables
- 60% grains, 10% high-protein foods, 30% vegetables
- 30% grains, 60% high-protein foods, 10% vegetables

15. Indicate whether the following people would be considered overweight, obese or healthy by current medical guidelines (check one answer for each)

<table>
<thead>
<tr>
<th>Age, Height, Weight (Body Mass Index)</th>
<th>Healthy</th>
<th>Overweight</th>
<th>Obese</th>
</tr>
</thead>
<tbody>
<tr>
<td>45-year-old man, 6'0&quot;, 200 pounds (Body Mass Index = 27)</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>27-year-old woman, 5'6&quot;, 190 pounds (Body Mass Index = 31):</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>72-year-old woman, 5'3&quot;, 140 pounds (Body Mass Index = 25):</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>18-year-old man, 6'2&quot;, 180 pounds (Body Mass Index = 23):</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

16. Name one medical condition associated with a diet that is high in sodium (salt).

17. Diets high in which of the following types of fat are associated with elevated LDL cholesterol (bad cholesterol) and heart disease (check all that apply)?

- Trans fat
- Saturated fat
- Monounsaturated fat
- Polyunsaturated fat
18. Obesity is associated with which of the following medical conditions (check all that apply)?

- Heart disease
- Colon cancer
- Lung cancer
- Arthritis
- Diabetes

11. Label questions

Use this nutrition facts label from a pint of ice cream to answer questions 1-8. Please give only one answer for each question.

**Nutrition Facts**

Serving Size 1/2 cup (83g)
Servings Per Container 4

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>Calories 220</th>
<th>Calories from Fat 120</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% Daily Values**</td>
<td></td>
</tr>
<tr>
<td><strong>Total Fat</strong></td>
<td>13g</td>
<td>20%</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>7g</td>
<td>35%</td>
</tr>
<tr>
<td>Trans Fat</td>
<td>0g</td>
<td></td>
</tr>
<tr>
<td><strong>Cholesterol</strong></td>
<td>35mg</td>
<td>12%</td>
</tr>
<tr>
<td><strong>Sodium</strong></td>
<td>110mg</td>
<td>5%</td>
</tr>
<tr>
<td><strong>Potassium</strong></td>
<td>140mg</td>
<td>4%</td>
</tr>
<tr>
<td><strong>Total Carbohydrate</strong></td>
<td>23g</td>
<td>8%</td>
</tr>
<tr>
<td>Dietary Fiber Less than 1g</td>
<td>4%</td>
<td></td>
</tr>
<tr>
<td>Sugars</td>
<td>21g</td>
<td></td>
</tr>
<tr>
<td><strong>Protein</strong></td>
<td>4g</td>
<td>8%</td>
</tr>
<tr>
<td>Vitamin A</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Vitamin C</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Calcium</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td>Iron</td>
<td>0%</td>
<td></td>
</tr>
</tbody>
</table>

*Contains less than 2% of these values
**Percent Daily Values are based on a 2,000 calorie diet.
Your daily values may be higher or lower depending on your calorie needs:

<table>
<thead>
<tr>
<th>Calories: 2,000</th>
<th>2,500</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Fat</td>
<td>Less than 65g</td>
</tr>
<tr>
<td>Saturated Fat</td>
<td>Less than 20g</td>
</tr>
<tr>
<td>Cholesterol</td>
<td>Less than 300mg</td>
</tr>
<tr>
<td>Sodium</td>
<td>Less than 2,400mg</td>
</tr>
<tr>
<td>Potassium</td>
<td>3,500mg</td>
</tr>
<tr>
<td>Total Carbohydrate</td>
<td>300g</td>
</tr>
<tr>
<td>Dietary Fiber</td>
<td>25g</td>
</tr>
<tr>
<td>Protein</td>
<td>50g</td>
</tr>
</tbody>
</table>
1. How many servings are in the pint of ice cream?

2. How many calories are in each serving?

3. How many total grams of fat are in each serving?

4. How many grams of sugar are in each serving?

5. What percent daily value of calcium is in each serving?

6. How many calories are in the entire pint?

7. How many grams of saturated fat are in the entire pint?

8. How many grams of saturated fat should a person on a 2,000 calorie diet consume each day?

12. Intervention 1

These next questions will help us learn which of our study activities were and were not helpful to you in improving your health. Please give one answer to each question unless otherwise specified.

1. Before you started this study, were your eating habits and/or the types of food you would usually eat a concern for you?

   □ No, I rarely thought about what I was eating or my eating habits.
   □ No, I wasn’t concerned about my eating habits or the types of food I ate, but was interested in learning how to improve my health.
   □ Yes, I thought about changing what I eat and/or my eating habits.
   □ Yes, I was trying to make healthy choices for myself.

2. In the PAST 6 MONTHS have you been involved in any programs/activities OUTSIDE OF THIS STUDY to help you lose weight and/or become healthier? For example: Weight Watchers, Biggest Loser contest at job outside fire station, hiring a personal trainer etc.

   □ Yes
   □ No

3. If yes, please list them here.


4. If you were involved in other programs/activities, was your being involved in this study one reason you sought out these other programs/activities?

☐ Yes  ☐ No  ☐ Not sure

5. Did your fire station have Peer Advocates for Nutrition? (A Peer Advocate for Nutrition is someone who went through a nutrition training at Johns Hopkins to be able to help and motivate firefighters in their station to eat healthier and set health goals).

☐ Yes  ☐ No  ☐ Don’t know

IF "YES", GO TO THE NEXT QUESTION
IF "NO" OR "DON’T KNOW", SKIP TO QUESTION #10

6. Were any of your Peer Advocates helpful to you?

☐ No  ☐ Yes

7. If yes, how were they helpful?

☐ Not at all important  ☐ A little important  ☐ Somewhat important  ☐ Very important

8. How important was having a Peer Advocate(s) to help you set goals for health and nutrition and find ways to try to accomplish those goals?

☐ Not at all important  ☐ A little important  ☐ Somewhat important  ☐ Very important

9. If there was a Peer Advocate that was particularly helpful to you and you would like to recognize them, please write their name here.


FFIRE Study 6 Month Survey PILOT (yes 2m)

10. Which, if any, of the following study activities helped motivate you to eat healthier? (Check all that apply)

- [ ] Something I heard in an education session
- [ ] Something I read from a handout given at an education session
- [ ] Knowing I was going to have my measures taken by the study team
- [ ] Something I read on a poster and/or from the library of books/internet resources we were given
- [ ] Something I read in “Men’s Health” or “Women’s Health” magazine
- [ ] Cooking demonstration(s) during an education session(s)
- [ ] Being told by study doctor (Dr. Cheskin) of my health risks
- [ ] Being told by study team member how to change my eating behavior
- [ ] Being given discounts on healthy items at local restaurants
- [ ] Biggest loser competition between fire stations
- [ ] Other (please specify): ______________________
- [ ] No study activities motivated me to eat healthier

11. Which, if any, of the following motivated you to eat healthier? Check all that apply.

- [ ] Wanting to be a role model for other firefighters.
- [ ] Wanting to prevent heart disease/heart attack, cancer and/or other medical conditions.
- [ ] Wanting to go off medication for blood pressure and/or cholesterol.
- [ ] Wanting to be able to do my job better.
- [ ] Wanting to physically feel better.
- [ ] Wanting to mentally/emotionally feel better.
- [ ] Other (please specify): ______________________
- [ ] Nothing has motivated me to eat healthier.

IF YOU NEEDED TO LOSE WEIGHT AND DID IN FACT LOSE WEIGHT SINCE THE START OF THE STUDY, PLEASE GO TO THE NEXT QUESTION.

IF YOU DID NOT NEED TO LOSE WEIGHT, OR NEEDED TO BUT DIDN’T LOSE WEIGHT, PLEASE SKIP TO QUESTION #14.

12. What do you believe led to your weight loss? (Check all that apply)

- [ ] Increased physical activity
- [ ] Increased healthy food/beverage intake
- [ ] Decreased unhealthy food/beverage intake
- [ ] Decreased my portion sizes
- [ ] Switched to a more balanced diet (appropriate amount of fat, carbohydrates, protein)
- [ ] Other (please specify): ______________________

13. Since your weight loss, which of the following best describes you:

- [ ] I do not perform my firefighter duties any better now than I did before my weight loss.
- [ ] I perform my firefighter duties the same now as I did before my weight loss.
- [ ] I perform my firefighter duties better now than I did before my weight loss.
14. Do you believe your health has improved since the start of this study?

☐ No
☐ Yes

15. Do you think you'll keep any changes you made to improve your health?

☐ No
☐ Yes
☐ I did not make any changes to improve my health

16. Please indicate how helpful the following study activities were to you in improving your health over the past 6 months.

<table>
<thead>
<tr>
<th>Activity</th>
<th>Not at all helpful</th>
<th>A little helpful</th>
<th>Somewhat helpful</th>
<th>Very helpful</th>
<th>Didn't know about</th>
</tr>
</thead>
<tbody>
<tr>
<td>Learning my physical measures (weight, % body fat, etc.)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Biggest Loser competition between fire stations</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Education sessions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cooking demonstrations</td>
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<td>Library at fire station</td>
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<tr>
<td>Resources given to fire stations (bowls, Foreman grill, scale, posters)</td>
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<tr>
<td>Handouts given at education sessions</td>
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<td>Discounts/coupons on healthy items at restaurants</td>
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<td>Magazine subscriptions to &quot;Men's Health&quot; and &quot;Women's Health&quot;</td>
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<td>Other (please specify):</td>
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</table>

17. Did you learn something about your health status that you otherwise would not have known if you were not in this study?

☐ Yes
☐ No

18. If yes, what new thing(s) did you learn about your health?

________________________________________________________________________
19. Do you feel like the food environment AT YOUR FIRE STATION is different now than it was 6 months ago?  
(For example, are firefighters cooking more/less than before; are the types of food available in the station different; are portion sizes smaller/larger?)

☐ No
☐ Yes

20. If yes, what is different?

☐

21. Do you think the food environment AT YOUR HOME is different now than it was 6 months ago?  
(For example, are people cooking more/less than before; are the types of food available in your home different; are portion sizes smaller/larger?)

☐ No
☐ Yes

22. If yes, what is different?

☐

23. What is the greatest challenge for you to eat healthfully?

☐

13. Intervention 2

These last questions are about the monthly presentations, cooking demos and other resources we provided to your station. Please answer them even if you did not attend any or all of the monthly sessions. Please give one answer to each question unless otherwise specified.

1. Did you look over the handouts from the December presentation (see packet)?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
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<tr>
<td>Balancing Your Plate</td>
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<tr>
<td>Eat More, Weigh Less</td>
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</tbody>
</table>
2. Did you attend the January FFIRE presentation (on fruits & veggies and fats) and cooking demo (spaghetti squash)?

- [ ] Yes
- [ ] No
- [ ] Don't remember

3. If you did not attend the January presentation, did you read the email summary?

- [ ] Yes
- [ ] No
- [ ] Don't remember

4. Did you look over the handouts from the January presentation (see packet)?

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
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<tr>
<td>What are the Types of Fat?</td>
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</tbody>
</table>

5. Did you attend the February FFIRE presentation (on behavioral techniques for healthy eating. We brought Chipotle burritos)?

- [ ] Yes
- [ ] No
- [ ] Don't remember

6. If you did not attend the February presentation, did you read the email summary?

- [ ] Yes
- [ ] No
- [ ] Don't remember

7. Did you look over the handouts from the February presentation (see packet)?

<table>
<thead>
<tr>
<th>Topic</th>
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<tbody>
<tr>
<td>Hunger and Fullness/Hunger vs Cravings</td>
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<tr>
<td>Setting SMART Goals/Handling Slips and Lapses</td>
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<tr>
<td>Tips to Avoid Mindless Eating</td>
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</tbody>
</table>
FFIRE Study 6 Month Survey PILOT (yes 2m)

8. Did you attend the March FFIRE presentation (on whole grains and added sugars) and cooking demo (pasta with turkey and spinach sauce)?
   - Yes
   - No
   - Don't remember

9. If you did not attend the March presentation, did you read the email summary?
   - Yes
   - No
   - Don't remember

10. Did you look over the handouts from the March presentation (see packet)?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Yes and Shared with Others</th>
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<tbody>
<tr>
<td>The Whole Truth about Whole Grains</td>
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<tr>
<td>Different Names for Added Sugars/Artificial Sweeteners</td>
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<tr>
<td>Rethink Your Drink</td>
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</tbody>
</table>

11. Did you attend the April FFIRE presentation (on protein, sodium, and prepared foods) and cooking demo (turkey burgers)?
   - Yes
   - No
   - Don't remember

12. If you did not attend the April presentation, did you read the email summary?
   - Yes
   - No
   - Don't remember

13. Did you look over the handouts from the April presentation (see packet)?

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Yes and Shared with Others</th>
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<tr>
<td>Protein/Salt and Sodium</td>
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<tr>
<td>Restaurant Tips</td>
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<tr>
<td>Healthier Grocery Store Prepared Options</td>
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<tr>
<td>Healthier Fast Food/Carryout Options</td>
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</tbody>
</table>
14. Did you attend the May FFIRE presentation (on portion size and food labels) and cooking demo (salad bar)?

- Yes
- No
- Don't remember

15. If you did not attend the May presentation, did you read the email summary?

- Yes
- No
- Don't remember

16. Did you look over the handouts from the May presentation (see packet)?

<table>
<thead>
<tr>
<th>Topic</th>
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<th>Yes and Shared with Others</th>
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<tbody>
<tr>
<td>Be Wise About Portion Size</td>
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<tr>
<td>How to Avoid Portion Size Pitfalls</td>
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<tr>
<td>Using the Nutrition Facts Label/Nutrient Label Claims</td>
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17. Did you look over any of the following materials in the nutrition library at the station?

<table>
<thead>
<tr>
<th>Material</th>
<th>Yes</th>
<th>No</th>
<th>Don't Remember</th>
<th>Didn't Know About</th>
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<tbody>
<tr>
<td>Men's Health magazine (any issue(s))</td>
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<td>Women's Health magazine (any issue(s))</td>
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<td>Eat This, Not That!</td>
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<tr>
<td>The CalorieKing Calorie, Fat &amp; Carbohydrate Counter 2010</td>
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<td>Mindless Eating (by Brian Wansink)</td>
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<tr>
<td>The End of Overeating (David Kessler)</td>
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<td>Food Rules (Michael Pollan)</td>
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<td>NVFC's Heart Healthy Firefighter Cookbook</td>
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<td>Hopkins Weight Management Center White Papers</td>
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<tr>
<td>Changing Your Habits: Steps to Better Health</td>
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</table>

18. Did you look over any of the following posters (see packet)?

<table>
<thead>
<tr>
<th>Poster</th>
<th>Yes</th>
<th>No</th>
<th>Don't Remember</th>
<th>Didn't See Posted</th>
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<tbody>
<tr>
<td>All Foods Can Fit</td>
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<tr>
<td>Eat Frequently to Lose Weight</td>
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</table>
19. Did you visit any of the websites recommended on the FFIRE Free Online Nutritional Resources list?
   
   [ ] Yes
   [ ] No

20. If yes, please specify website(s) if you remember:

21. Did you try any new foods or food preparation methods discussed during the monthly presentations, including but not limited to the recipes prepared during the cooking demonstrations (or variations thereof)?

   [ ] At Station
   [ ] At Home
   [ ] Both
   [ ] Neither

22. If yes, please specify:

23. Did you use the George Foreman grill that was given to the station in April?

   [ ] Yes
   [ ] No

24. Did you use any of the discounts on healthier menu items at local restaurants obtained through the FFIRE program?

   [ ] Yes
   [ ] No

25. If yes, please specify restaurant(s):

14. Additional Comments

If there is anything else you want to tell us, please write it here. Thank you!!
The following are detailed presentation notes for each of the six education sessions. The notes from each month were also emailed to participants who missed that month’s presentation. Development of the educational intervention included choosing session topics based on the results of formative research. Specific notes were compiled in part from numerous online resources, referenced at the end of each month’s outline. The notes are comprehensive and were not always presented in their entirety; sections were highlighted based on the needs of participants at each station.

Education Session #1:
Introduction: Energy Balance, Discretionary Calories and Balanced Proportions

Education Session #2
Fruits & Vegetables and Healthy Fats

Education Session #3
Behavioral Strategies for Healthier Eating

Education Session #4
Whole Grains, Added Sugars and Healthy Beverages

Education Session #5
Protein, Sodium, and Healthier Prepared Foods

Education Session #6
Portion Size and the Nutrition Facts Label
Education Session #1

Introduction: Energy Balance, Discretionary Calories and Balanced Proportions

Energy balance:

Energy in = Energy out \rightarrow \text{Weight maintenance}

Energy in > Energy out \rightarrow \text{Weight gain}

Energy in < Energy out \rightarrow \text{Weight loss}

- To lose weight, can target either side of the equation – decrease energy intake or increase energy expenditure.
- In terms of weight, number of calories matters more than the source – you can gain weight by eating too many healthy foods.

Macronutrients:

Nutrients are substances needed for growth, metabolism, and for other body functions. Since “macro” means large, macronutrients are nutrients needed in large amounts. Macronutrients are nutrients that provide calories (energy):

- Fat, protein, carbs (and alcohol)
  - Need all (except alcohol) in the diet
- Often equate grains with carbs, but fruits and veggies are also primarily carbs
- Most foods contain a combination of all three macronutrients – e.g., pasta with meat sauce – but proportions are not always appropriate

Energy allowance / discretionary calories:

You need a certain number of calories to keep your body functioning and provide energy for physical activities – this is your calorie budget. This budget can be divided into “essentials” and “extras” just like in a financial budget

- In financial budget, essentials are items like rent and food and the extras are things like movies and vacations.
- In a calorie budget, the “essentials” are the calories in the foods that you need to eat to get enough of the essential nutrients. Extras are non-essential foods that you can eat on their own, such as dessert or soda, or as additions to essential foods, for instance, adding butter to vegetables.

Each person has a limited number of extras, or a small discretionary budget. For many people, this budget is only 100 to 300 calories, especially for those who are not physically active.
• If you add butter to your vegetables, or choose to eat a fatty cut of meat, then you
don’t have enough discretionary calories left for a bag of chips, a piece of cake, a
beer, or other non-essential foods.
• If instead you select the lowest fat and no-sugar-added forms of your essential
foods, or in other words make the best nutrient “buys”, then you may have enough
calories left over to eat some extras.
• For example, assume your calorie budget is 2,000 calories per day:
  o Let’s say you need to spend at least 1,735 calories for essential nutrients,
    if you choose foods without added fat and sugar.
  o Then you have 265 discretionary calories left.
    ▪ You may use these on “luxury” versions of the foods in each
      group, such as higher fat meat or sweetened cereal.
    ▪ Or you can spend them on sweets, sauces, or beverages.
• If you eat your essential nutrients but overspend your discretionary calorie
allowance, choosing more added fats, sugars, and alcohol than your budget
allows, then you will be consuming too many calories, and you will gain weight.
• However, even people who are at a healthy weight can still be overspending their
discretionary calorie budget. If a given person is at a healthy weight, then their
total calories are appropriate. But they could still be eating too many
discretionary calories and making up for it by not eating their essential calories.
  o For instance, somebody who gets most of their calories from foods with
    little nutritional value, such as soda and chips, but doesn’t eat vegetables,
    fruits and other healthy foods, can be at an appropriate weight but might
    not be getting the nutrients s/he needs to actually be healthy.
  o This can still lead to problems such as high cholesterol and high blood
    pressure, which may cause heart attacks or strokes.

Calorie/energy density vs nutrient density:

So we want to choose foods that have a lot of nutrients, but not a lot of calories.

• These foods are called nutrient-dense foods, in contrast to foods with many
  calories but few nutrients, called calorie-dense or energy-dense foods.
• High protein, high fiber, lower energy density foods are more satiating
  physiologically

(pass out and review CDC Eat More, Weigh Less brochure)

Plate method:

Use picture on Eat More, Weigh Less brochure cover as example

• Fill half of plate with vegetables, one-quarter with protein, one-quarter with
  grains/starch
• Don’t fry and limit butter, cheese, etc – e.g., can include larger piece of chicken on bottom plate since it’s not fried

(pass out *Balancing Your Plate* handout and go over examples of three plate sections)

Modified in part from [http://www.mypyramid.gov/pyramid/discretionary_calories.html](http://www.mypyramid.gov/pyramid/discretionary_calories.html)
Fruits and Vegetables

Why eat fruits and vegetables?
- Contain essential vitamins, minerals, and fiber; for example:
  - Fiber helps maintain regularity and is linked with a decreased risk of coronary artery disease.
  - Vitamin A keeps eyes and skin healthy and helps to protect against infections.
  - Vitamin C helps heal cuts and wounds and keeps teeth and gums healthy.
- People who eat plenty of fruits and vegetables as part of a healthy diet are likely to have reduced risk of chronic diseases
  - Fruits and veggies can help ward off heart disease and stroke, control blood pressure, prevent some types of cancer, avoid painful intestinal ailments, and guard against cataract and macular degeneration, two common causes of vision loss.
- Fiber and water found in fruits and vegetables help you feel full faster and longer

How many fruits and vegetables should I eat each day?
- The latest dietary guidelines call for 5 to 13 servings of fruits and vegetables a day, depending on your caloric needs
  - For a person who needs 2,000 calories a day to maintain weight and health, this translates into 9 servings (5 from vegetables and 4 from fruit)
  - One servings is roughly one half cup

Does it matter which fruits and vegetables I eat?
- Variety is as important as quantity. No single fruit or vegetable provides all of the nutrients you need to be healthy.
  - To get a healthy variety, think color. Eating fruits and vegetables of different colors (e.g., green spinach, orange carrots, red bell peppers, purple plums) gives your body a wide range of valuable nutrients, like fiber, folate, potassium, and vitamins A and C

Are frozen, canned and dried fruits and vegetables healthy? What about juices?
- Frozen and canned fruits and vegetables are as nutritious as fresh, and are often more economical and convenient. But choose wisely – many varieties include excess fat and sodium.
  - For vegetables, choose frozen varities with no added sauces or seasonings. If you really love a seasoned variety, mix together half seasoned and half plain vegetables to improve the nutritional content. Choose canned varieties with no salt added, or rinse the contents of the can to remove much of the sodium.
For fruit, choose unsweetened frozen varieties, and those canned in juice (not syrup).

- Dried fruit is healthy, but has significantly more calories per ounce and is less filling
  - Without the water found in fresh fruit, dried fruit is less filling and more caloric
    - 1 cup of grapes has the same number of calories as ¼ cup of raisins
  - If eating dried fruit, choose unsweetened varieties

- Juice is a good option, but is not as healthy as fresh, frozen or canned
  - Whole fruit has more fiber and is more filling than juice (since the skin and flesh are removed from the juice)
  - Limit the amount you drink – one 8 oz glass of orange juice has 110 calories (and no fiber), whereas a large navel orange has 85 (plus 15% of your daily fiber)
  - Always choose 100% juice – juice “cocktails” tend to have less than 20% juice (the rest is flavored sugar water)

Can’t I get my nutrients from a multivitamin or fortified foods?

- Naturally occurring nutrients from whole foods are best
  - In nature, vitamins and minerals are packaged with other healthy substances that help protect you from chronic disease; these aren’t captured in multivitamins
- Be aware of claims on food labels
  - Just because a food has 100% of your vitamin C per serving doesn’t make it healthy! Many sugary drinks and snacks are fortified with vitamins to make them appear healthier, but it’s just a marketing trick!
  - Foods with “more” of a particular nutrient usually have more calories as well

How can I increase my consumption of fruits and vegetables?

- Keep fruit out where you can see it
  - Keep it out on the counter or in the front of the fridge so you’ll be more likely to eat it.
- Get some at every meal, every day
  - Don’t wait until dinner to eat your veggies! Try filling half of your plate with vegetables or fruit at each meal. Add veggies to your omelet or fruit to your cereal in the morning; eat a salad or stir-fry at lunch; or munch on fruits and veggies at snack time.
- Keep ready-to-eat fruits and veggies handy
  - These make convenient, fast and healthy snacks. Think baby carrots, grape tomatoes, apples and bananas.
- Explore the produce aisle and choose something new
  - Variety is the key to a healthy diet, so get out of a rut and try some new fruits and vegetables.
- Bag the potatoes
o Remember, though they’re healthy, potatoes are actually a starch and
don’t count towards your vegetable servings.

- Eat soup
  o Choose broth based soups with lots of veggies
- Use the microwave to make steaming veggies easy, quick and convenient
  o No special steaming bags needed
  o When microwaving whole vegetables (e.g., spaghetti squash), pierce holes
to keep it from exploding, then heat for about 10 minutes
  o When microwaving cut vegetables, add 1-2 tablespoons of water to the
bowl, then cover and heat for about 4 to 5 minutes

**Healthy vs Unhealthy Fats**

**Is fat a necessary part of a healthy diet?**
- Yes! The body needs fat for many important functions, so including some fat is an
important part of a healthy eating pattern.
- Adults should consume about 20 to 30% of their calories from fat.
- However, all fats are not alike. While some types of fats are essential for good
health, others can raise blood cholesterol levels or have other negative effects on
cardiovascular health.
- And keep in mind that fat is very calorie-dense, so eating too much of even the
healthy fats can add excess calories and lead to weight gain.

**Which fats are healthy?**
- The healthiest choices are unsaturated fats, including both polyunsaturated and
monounsaturated fats
  o Found in plant foods or in fish that eat microscopic plants. This includes
liquid vegetable oils (e.g., canola, olive), nuts and seeds, and fatty fish
such as salmon, sardines and shellfish.
- Omega 3’s and 6’s are types of polyunsaturated fats. Both provide essential fatty
acids that our bodies need, but can't make. In addition, omega-3 fatty acids,
particularly from fish sources, may have additional health benefits such as
reducing the risk of sudden cardiac death, helping to keep blood vessels flexible
and reducing excess blood clotting.
- Other polyunsaturated fats and monounsaturated fats will lower LDL (“bad”)
cholesterol when used in place of saturated fat.

**Which fats are unhealthy?**
- Fats with negative health effects are saturated fats and trans fats; these fats should
be avoided or eaten sparingly.
  o Saturated fats are found primarily in animal products, including high-fat
meats, poultry skin, and full-fat dairy products. They are also found in
tropical oils such as coconut and palm oil (these aren’t used in most
kitchens, but they’re found in many packaged goods like snack cakes and
pies).
Trans fats are rarely found naturally, and are instead created during food processing when liquid oils are converted into semi-solid fats (a process called hydrogenation). The resulting partially-hydrogenated oils are found in fried foods, stick margarines, crackers, microwave popcorn, baked goods, and other processed foods.

- Studies have shown that both saturated fats and trans fats can raise LDL (“bad”) cholesterol. They can also make the lining of blood vessels (the endothelium) less flexible.
- In addition, trans fats may depress the “good” blood cholesterol (HDL cholesterol) when eaten in large quantities, making it particularly unhealthy. But remember, just because a food is trans fat free doesn’t mean it’s healthy!

What about cholesterol?

- Cholesterol is not a fat. It is a waxy substance found only in foods of animal origin.
- Humans do not need to consume any cholesterol because our cells can produce all of the cholesterol our bodies need for use in cell membranes and hormones.
- High intakes of dietary cholesterol can raise LDL cholesterol and can increase heart disease risk in other ways. However, saturated fat and trans fat in food have a more significant effect on elevating blood cholesterol than dietary cholesterol.
- When you follow the tips to reduce your saturated fat intake, in most cases, you will be reducing your dietary cholesterol intake at the same time.
- If you have high cholesterol, you should also limit consumption of egg yolks (but still eat the whites) and organ meats (e.g., liver, kidneys).

How can I lower my saturated and trans fat intake?

- Replace solid fats (e.g., butter, shortening) used in cooking with liquid oils.
- Choose leaner cuts of meat that do not have a marbled appearance (where the fat appears embedded in the meat). Leaner cuts include round cuts and sirloin cuts. Trim all visible fat off meats before eating.
- Remove the skin from chicken, turkey, and other poultry before cooking.
- Drink low-fat (1%) or fat-free (skim) milk rather than whole or 2% milk. Buy low-fat or non-fat versions of your favorite cheeses and other milk or dairy products.
- When re-heating soups or stews, skim the solid fats from the top before heating.
- Use low-fat spreads instead of butter, but make sure the spread is low in saturated fat and doesn't contain trans fats.
- Check the nutrition facts label before purchasing packaged goods. Many foods that appear to be healthy (e.g., sandwich crackers) actually contain lots of saturated and trans fats. Choose fresh foods (e.g., fruit) whenever possible.

How can I increase my unsaturated fat intake?

- Have an ounce of raw or dry-roasted nuts with breakfast or as a snack.
- Eat guacamole or peanut butter with fruit or veggies as a snack.
- Add nuts or olive oil to your salad.
• But remember, any type of fat is high in calories. To avoid additional calories, substitute unsaturated fats for saturated and trans fats rather than adding these fats to your diet. And limit your portions.

Education Session #3

Behavioral Strategies for Healthier Eating

Food brings us lots of pleasure, so we often eat for reasons other than filling up. In these instances, even if the food happens to be “healthy”, the excess calories still have negative effects.

Hunger

Before eating, you should ask yourself if you’re really hungry

- You might find that you’re actually eating because you’re bored, others are eating, the food looks tempting, etc.

Hunger can be thought of as a scale

- 1 corresponds to feelings of extreme hunger while 10 corresponds to feelings of extreme fullness.
  - Want to avoid eating too much, leading you to feel overfull, as in numbers 8-10
  - Also want to avoid going too long without eating so that you feel very hungry, as in numbers 1-2
- Best to stay between 3 and 7 on the scale
  - Eat when you’re at 3 or 4 on the scale – hungry but not overly so
  - Stop eating periodically during the meal to ask yourself if you are still hungry.
    - Takes the brain 20 minutes to receive the message that it’s full, so eating too quickly will lead you to eat too much. Slowing the rate of eating can allow satiety (fullness) signals to begin to develop by the end of the meal. For instance, try putting your fork down between every bite.
    - Eat until you no longer feel hungry, rather than eating until you feel full.

<table>
<thead>
<tr>
<th>Number</th>
<th>Description</th>
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<tbody>
<tr>
<td>10</td>
<td>Uncomfortably full or “sick” – “Thanksgiving full”</td>
</tr>
<tr>
<td>9</td>
<td>Stuffed and uncomfortable</td>
</tr>
<tr>
<td>8</td>
<td>Too full, somewhat uncomfortable</td>
</tr>
<tr>
<td>7</td>
<td>Full, but not yet uncomfortable – hunger is gone</td>
</tr>
<tr>
<td>6</td>
<td>Filling up, but still comfortable – could definitely eat more</td>
</tr>
<tr>
<td>5</td>
<td>Neutral – neither hungry nor full</td>
</tr>
<tr>
<td>4</td>
<td>Slightly hungry, faint signals that your body needs food, but you can still wait to eat</td>
</tr>
<tr>
<td>3</td>
<td>Hungry, not yet uncomfortable, clear signals that your body needs food</td>
</tr>
<tr>
<td>2</td>
<td>Very hungry, irritable or anxious – you want to eat everything in sight</td>
</tr>
<tr>
<td>1</td>
<td>Starving, feeling weak, lightheaded, dizzy, or other extremely uncomfortable symptoms of hunger</td>
</tr>
</tbody>
</table>
Sometimes when you think you’re hungry, you might actually just be craving a particular food.

- **Hunger**
  - Builds over time
  - Is physical
  - Is a biological function of the body’s real need for food
  - Occurs when you haven’t eaten for hours
  - Is non-specific – if you’re hungry, you’ll eat whatever is available

- **Cravings**
  - Come on suddenly
  - Are psychological
  - Are specific
  - May lead you to *feel* hungry because of something you see or hear
  - Can be related to hormone levels

To manage hunger (i.e., to stay between 3 and 7 on the hunger scale):

- Eat 5 or 6 small meals each day at regular intervals
  - Numerous studies have suggested that eating small meals throughout the day helps prevent weight gain when compared to eating three larger meals. Aim to eat between 300 and 400 calories during each, or about half of what you would consume at a normal meal. Eating larger amounts of food 5 or 6 times each day will lead to weight gain.
- Between planned meals and snacks, consume high volume/low calorie foods, such as salads, cucumbers, and celery
- Drink lots of water – thirst is often mistaken for hunger
- Remember that hunger is not an emergency. It’s best to eat when you feel hungry, but waiting an extra half hour until you have access to healthier choices isn’t a problem.

To manage cravings:

- Cravings will pass, so just keep yourself from giving in until the craving subsides. Gratifying an urge can make it stronger and more frequent.
- Avoidance – keep tempting foods out of the house
- Distraction – engage in activities incompatible with eating (e.g., go outside for a walk, take a hot bath)
- Planned Indulgence - plan to indulge in a portion-controlled amount of the craved food at another time, when you will be in control (not some trigger)
- Substitution - find healthy stand-ins for the foods you crave

**Mindless Eating**

Sometimes we eat without making a conscious decision to do so (e.g., you may open a large bag of chips and later realize you just ate the entire bag, or you may reflexively grab a piece of candy from the candy bowl without thinking). Mindless eating can lead us to
consume hundreds of extra calories each day. Pay attention to everything that you put in your mouth, and use these tips to keep your portions appropriate:

- Be aware of the size and shape of containers. It’s the amount of food that counts, not what it looks like.
- Serve food on smaller plates and bowls so that moderate portions do not appear meager. This way you can still eat a plateful without consuming too much.
- Pour only the amount that you want to eat, then put the extra away immediately so you’re not tempted to take more.
  - Also applies when eating out, e.g., cut your Chipotle burrito in half before starting to keep from eating the entire thing.
- Use nutrition labels, paying attention to the serving size listed. Consider the facts; don’t guess at how many calories you’re eating.
- Keep visual reminders of how much you’re eating. Keep wrappers, empty containers, bones and other reminders of how much you’ve eaten nearby.
- Identify and manage triggers
  - Stimulus (cue) control involves learning what social or environmental cues seem to encourage undesired eating, and then changing those cues.
  - If you tend to overeat while watching television, try to sever the association of eating with the cue (watching tv). If you’re actually hungry, pour an appropriate amount onto a plate.
  - If you’re tempted by junk in the station kitchen, try to avoid or eliminate the cue (avoid the kitchen, or leave immediately after getting what you came to get).
  - If you tend to eat more when around a certain friend, change the circumstances surrounding the cue (plan to meet the friend in non-food settings).
  - In general, visible and accessible food items are often cues for unplanned eating.

**SMART goals and rewards**

The following tips can help you make behavioral changes:

- Don’t try to adopt too many changes at once; start small and focus on making a few changes at a time.
- Make new routines – this makes it easier to establish healthier habits.
- Set specific goals to help you make changes
  - Provide a clear idea of what you’re trying to achieve.
  - Help develop a plan of action.
  - Allow progress to be measured.
- Select two or three goals at a time
  - Most people trying to lose weight focus on just that one goal: weight loss. However, the most productive areas to focus on are the dietary and exercise changes that will lead to long-term weight change.
  - Consecutive goals that move you ahead in small steps are the best way to reach a distant point.
The most effective goals are SMART - Specific, Measurable, Action-oriented, Realistic and Timed

- **Specific**: the goal should indicate what specific action or event will take place. The more specific, the easier it is to plan your routines to reach your goal. For example, the goal “eat more fruits and vegetables every day” is too general. A more specific goal is to “eat five servings (1/2 cup each) of fruits and vegetables every day.”
- **Measureable**: Your goal should be easy to measure so you can chart your progress. Taking the example from above, you can record the number of servings you eat each day and track your progress.
- **Action-oriented**: State exactly what actions you must do to achieve your goal. For example, "Today I will eat fruit as a snack instead of chips."
- **Realistic**: Be realistic in your expectations of yourself and what you hope to accomplish; unrealistic goals set you up for failure. Take large or long-term goals and break them into smaller, more manageable goals. For example, each month you might increase your daily goal by one serving to get to your ultimate goal of eating nine servings of fruits and vegetables each day.
- **Timed**: Goals should be grounded within a time frame. Give yourself enough time to achieve the goal, but not too much time. Using the above example, you could give yourself one month to reach each goal, and can then start working on the next goal.

Make sure you reward yourself periodically for meeting your goals to help keep you on track:

- Make sure the reward is not food!
- Can be tangible (e.g., a CD or DVD or a payment toward buying a more costly item) or intangible (e.g., an afternoon off from work or an hour of quiet time away from family)
- Numerous small rewards, delivered for meeting smaller goals, are more effective than bigger rewards, requiring a long, difficult effort.
- Change the reward system: You are probably used to rewarding yourself and being rewarded by others for losing pounds, rather than for altering your behavior

**Rebounding from Slip-Ups**

The tips above should help you achieve your desired behavior changes. But making lifestyle changes can be challenging and it takes time and regular reinforcement for your new healthy behaviors to become habits. In the meantime, you may occasionally lapse back into old patterns of unhealthy eating.

- It’s best to have a plan in place to recover when slip-ups occur. The acronym “SLIPS” can help you remember how to respond to a slip or lapse.
  - Stop! Then calmly examine the situation. What is going on? Why is the slip or lapse occurring?
  - Learn from the event. How could you do things differently the next time to have a better outcome?
• Immediately take control and turn the situation around. Throw the rest of the food away, turn the car around, do whatever you need to do. Don’t wait for the next day.
• Pat yourself on the back for the things you’ve done well. Forgive yourself for this slip or lapse.
• Seek support! Ask friends, family, or coworkers for help.

Summary Tips

• Be realistic about the changes you’re making, and if applicable, about how much weight you will lose
• Make small, manageable changes to increase the likelihood that they will become habit
• Give yourself (non-food) rewards for every several days that you accomplish your goals
• Plan healthy meals ahead of time so you’re not tempted to pick up something unhealthy
• Shift your focus from feelings of deprivation to feelings of pride for having made a healthy decision
• Don’t expect to be perfect!
• Don’t think of healthy eating as an all-or-nothing pursuit. Being healthy doesn’t mean every choice has to be healthy, but just that the majority of your choices are healthy.
  o E.g., if you find yourself ordering a Big Mac at McDonalds, say no to the fries and milkshake to minimize the damage
• For additional strategies for change and solutions to common barriers, read the “Changing Your Habits: Steps to Better Health” brochure in the nutrition library at your station

Modified in part from
http://www.move.va.gov/download/NewHandouts/Nutrition/N04_HungerAndFullness.pdf,
Education Session #4
Whole Grains, Added Sugars and Healthy Beverages

Whole grains

- Definition
  - Any food made from wheat, rice, oats, cornmeal, barley or another cereal grain is a grain product.
    - Bread, pasta, oatmeal, breakfast cereals, tortillas, and grits are examples
  - Grains are divided into 2 subgroups, whole grains and refined grains.
    - The term whole grain means the entire kernel (including the bran, endosperm, and germ) is left intact during processing.
    - Unlike whole grains, refined grains are missing parts of the kernel, often to give grains a finer texture, and consequently are missing many of the nutrients and health benefits of whole grains.
      - Often enriched with certain vitamins and minerals, but still less nutrient-rich than whole grains.

- Health benefits
  - Whole grains are excellent sources of vitamins (particularly B vitamins, e.g., thiamin, riboflavin, niacin and folate), minerals (e.g., iron, magnesium), fiber, antioxidants and phytocompounds (e.g., lignin, phytic acid and phytosterols),
    - Antioxidants protect cells from damage (like rust-proofing for the body)
    - Phytochemicals are small but powerful disease fighters found in plants
  - Many health benefits associated with these nutrients
    - Decreased risk of heart disease
    - Lower cholesterol levels
    - Protection against many types of cancer
    - Assistance with weight management

- Daily recommendations
  - At least ½ of all grains eaten should be whole grains.
• Most Americans are not eating enough whole grains, and 1/3 never eat any!
• 85-90% of grain products found in supermarkets are made from refined grains, but more whole grain products are appearing on the market (English muffins to pasta to pizza dough)
  o Replace, don’t add - It’s important to substitute the whole-grain product for the refined one, rather than adding the whole-grain product.
  o Aim to get a variety of whole grains in your diet to get the different nutrients your body needs
• Identifying whole grains
  o Look for the word “whole” in front of a grain. For example “whole wheat flour” is a whole grain, but “wheat flour” is not.
  o A whole grain should be the first ingredient listed
    ▪ In example 2 below, whole wheat flour is the third ingredient, after wheat flour and water, so it is not a whole grain product

<table>
<thead>
<tr>
<th>Ingredients of two different breads:</th>
</tr>
</thead>
<tbody>
<tr>
<td>This one <em>is</em> whole wheat</td>
</tr>
<tr>
<td>This one <em>is not</em> whole wheat</td>
</tr>
</tbody>
</table>

• Types of whole grain
  o Whole wheat: whole wheat bread, whole wheat pasta, whole wheat tortillas
  o Whole grain barley
  o Whole oats / oatmeal (including Cheerios)
  o Whole grain corn (including all popcorn)
  o Brown or wild rice
  o Bulgur
  o Buckwheat
  o Quinoa

• Many key words suggestive of whole grain products may be misleading
  o Enriched wheat flour is just white / refined flour!!
  o 100% wheat does not necessarily mean 100% whole wheat
  o Multigrain products include different types of grains, but these are not necessarily whole grains
    ▪ Many times the first ingredient is still enriched wheat flour even if there are whole grains further down the list
  o Pumpernickel and rye breads were traditionally made with primarily whole grain, but modern varieties often start with white flour
o Stone ground refers to processing and is not indicative of what is being ground
  • Choose stone ground whole wheat, not stone ground wheat

o Wheat germ and bran are the parts of the grain that are usually removed in refined grains. But either of these on their own are still refined (still only one part of the three).

o Color is not an indication of a whole grain. Bread can be brown because of molasses or other added ingredients.

• “Made with whole grain” doesn’t mean much – check the label!
  o These foods may contain negligible amounts of whole grain (as indicated by several other ingredients listed before whole grain on the ingredients list).

• High fiber does not equal whole grain
  o Many high-fiber foods do not provide whole grain
    • It is rare to find a whole grain food with more than 4 grams of fiber
      • It usually means an isolated fiber, such as bran, has been added.
    • Many “high fiber” and “light” bread products use refined wheat flour with added fiber – this does not provide the health benefits of whole grains
  o A serving of whole grain is not always a good source of fiber.
    • Depending on the proportions of bran, germ and endosperm naturally occurring in the grain kernel, the fiber content will vary.
    • Whole grain foods without much fiber still provide the important health-promoting benefits of whole grain.

• Ways to increase whole grain consumption:
  o Remember to substitute a whole-grain product for a refined product – such as eating whole-wheat bread instead of white bread or brown rice instead of white rice.
  o Use whole-grain bread or cracker crumbs in meatloaf.
  o Try brown rice stuffing in baked peppers or tomatoes, or brown rice in fried rice dishes.
  o Make a hearty soup or stew using barley in place of pasta or rice.
  o Use bulgur wheat in casseroles or stir-fries.
  o Try rolled oats or a crushed, unsweetened whole grain cereal as breading for baked chicken, fish, veal cutlets, or eggplant parmesan.
  o Create a whole grain pilaf with a mixture of barley, wild rice, brown rice, broth and spices. For a special touch, stir in toasted nuts or chopped dried fruit.
  o Try an unsweetened, whole grain ready-to-eat cereal as croutons in salad or in place of crackers with soup.
  o Experiment by substituting whole wheat or oat flour for up to half of the flour in pancake, waffle, muffin or other flour-based recipes. They may need a bit more leavening.
  o Freeze leftover cooked brown rice, bulgur, or barley. Heat and serve it later as a quick side dish.
**Added sugars**

- **Definition**
  - Added sugars are sugars and syrups that are added to foods or beverages during processing or preparation. This does not include naturally occurring sugars such as those that occur in milk and fruits.

- **Average American consumes almost 100 pounds of added sweeteners a year, or almost a quarter-pound of sugar and other calorie-rich sweeteners a day!**

- **Health concerns**
  - No health advantage to consuming any amount of added sugar.
  - Not harmful in small amounts, but all consumption comes out of discretionary calorie budget.
  - Too much added sugar, and in some cases naturally occurring sugar, can lead to such health problems as:
    - Tooth decay – all forms of sugar promote tooth decay by allowing bacteria to grow.
    - Poor nutrition – if you fill up on foods laden with added sugar, you may skimp on nutritious foods, which means you could miss out on important nutrients.
    - Weight gain – there’s usually no single cause for being overweight or obese. But added sugar likely contributes significantly to the problem.
    - Energy dense, i.e., a small amount of food or drink with added sugar usually has a large amount of calories.
    - Increased triglycerides – some evidence suggests that eating an excessive amount of added sugar can increase triglyceride levels, boosting your risk of heart disease.
    - Many studies have looked specifically at the negative health effects of sugary drinks – those results are reported in the “Drinks” section below.

- In general, the American Heart Association says that most American women should consume no more than 100 calories a day from added sugar (equal to 6 teaspoons), and that most American men should consume no more than 150 calories a day (equal to 9 teaspoons) from added sugar — and that even less is better.
  - A single can of soda has approximately 150 calories!
  - Most Americans get more than 22 teaspoons of added sugar a day (or 355 calories), far exceeding the guidelines!

- **Added sugar is found in almost all foods, not just those that taste sweet**
  - Serves many functions in food manufacturing:
    - Boosts flavor
    - Gives baked goods texture and color
    - Helps preserve foods such as jams and jellies
    - Fuels fermentation, which produces alcohol and enables bread to rise
    - Serves as a bulking agent in baked goods and ice cream
    - Balances the acidity of foods containing vinegar and tomatoes
  - Even without soda and sweets, sugar consumption can still add up quickly
• Distinction from natural sugars
  o Fruits, vegetables and milk have naturally-occurring sugars, which are part of a healthy diet
  o “No sugar added” means the product contains only naturally-occurring sugars
    ▪ It does not mean the product is necessarily sugar free, just that the only sugar is found naturally in the fruit/vegetable/dairy products used as ingredients
  o But natural sugars can be used as added sugars, e.g., when fruit juice is used to sweeten another product
    ▪ So “all natural” doesn’t mean no sugar added!

• Common sugars
  o Go by many different names, depending on source and how it is made.
  o Ingredients ending in “ose” are usually a type of sugar (chemical name for sugar)
    ▪ E.g., glucose, fructose, lactose (sugar in milk), sucrose (table sugar)
  o Most traditional sugar (i.e., table sugar) is processed from sugar cane and sugar beets, but many other sources have been popular for centuries
    ▪ E.g., Honey, agave
  o Sweeteners like honey are less processed than certain other sweeteners (e.g., corn syrup), but all types of added sugars provide unnecessary calories and should be minimized
  o High fructose corn syrup has gained a reputation as being the worst of the bunch!
    ▪ Studies are unclear on whether this is true - some indicate yes, while others suggest that the same outcomes would be seen after consuming a comparable amount of other sugars
    ▪ Rebranding as “corn sugar”
  o Read the “Added Sugars” handout for a list of other key words to look for on ingredient labels to identify added sugars

Drinks

• Sodas and other sweetened beverages contain most of the added sugars in American diets
  o According to figures from the beverage industry, soft drink makers produce a staggering 10.4 billion gallons of soda pop each year.
• Average can of sugar-sweetened soda or fruit punch provides about 150 calories from sugar, usually high-fructose corn syrup.
  o Equivalent to 10 teaspoons of sugar
  o If you were to drink just one can of a sugar-sweetened soft drink every day, and not cut back on calories elsewhere, you could gain up to 15 pounds in a year.
    ▪ Conversely, if you cut just one can of soda a day, you could lose up to 15 pounds
• Studies consistently show that increased consumption of soft drinks is associated with increased caloric intake
  o People tend to compensate for a bigger than usual meal or for a snack by taking in fewer calories later. That's how weight stays stable. This compensation doesn't seem to happen with soft drinks. No one knows for sure why this happens, but there are several possibilities.
  o Fluids may not be as satiating as solid foods. That means they don't provide the same feeling of fullness or satisfaction that solid foods do, which might prompt you to keep eating.
  o The body doesn't seem to "register" fluid calories as carefully as it does those from solid food. This would mean they are added on top of calories from the rest of the diet.
  o High fructose corn syrup may be particularly problematic – some studies have shown that fructose does not trigger the same satiety signals as other forms of sugar
  o It is possible that sweet-tasting soft drinks—regardless of whether they are sweetened with sugar or a calorie-free sugar substitute—might stimulate the appetite for other sweet, high-carbohydrate foods.

• Numerous other health concerns
  o One study with 9000 participants found that individuals who had one or more servings a day of a sugar-sweetened soft drink or fruit punch were twice as likely to have developed type 2 diabetes during the study than those who rarely had these beverages.
  o Participants who drank more than two servings of sugary beverage each day had a 40 percent higher risk of heart attacks or death from heart disease than those who rarely drank sugary beverages.
  o Researchers accounted for differences in diet quality, energy intake, and weight among the study volunteers. They found that having an otherwise healthy diet, or being at a healthy weight, only slightly diminished the risk associated with drinking sugary beverages.
    ▪ Adverse effects of the high glycemic load from these beverages on blood glucose, cholesterol fractions, and inflammatory factors probably contribute to the higher risk of heart disease (in addition to excess calories).

• Read the CDC “Rethink Your Drink” brochure for more information on the calories in popular drinks and tips to reduce consumption of liquid calories

Artificial Sweeteners and Sugar Alcohols

• Artificial sweeteners
  o Synthetic sugar substitutes
  o To date, the FDA has approved the use of five artificial sweeteners:
    ▪ aspartame (Equal®, NutraSweet®, others), 180 times sweeter than sugar
    ▪ acesulfame-K (Sunett®, Sweet One®), 200 times sweeter than sugar
• saccharin (Sweet'N Low®, Necta Sweet®, others), 300 times sweeter than sugar
• sucrrose (Splenda®), 600 times sweeter than sugar
• neotame (no brand names), 7,000 to 13,000 times sweeter than sugar
  o All are calorie-free
  o But heavy consumption still linked with weight gain
    ▪ Researchers have shown that rats eating food sweetened with saccharin took in more calories and gained more weight than rats fed sugar-sweetened food.
    ▪ A long-term study of nearly 3,700 residents of San Antonio, Texas, showed that those who averaged three or more artificially-sweetened beverages a day were more likely to have gained weight over an eight-year period than those who didn't drink artificially-sweetened beverages.
    ▪ One proposed mechanism is that artificial sweeteners may throw off the body's ability to accurately gauge how many calories are being taken in.
  o Should therefore be consumed in moderation
• Sugar alcohols
  o Carbohydrates that occur naturally in certain fruits and vegetables; can also be manufactured
  o Lower in calories than regular sugar (but not calorie-free)
  o Can have a laxative effect, causing bloating, intestinal gas and diarrhea
  o Again, consume only in moderation

Education Session #5
Protein, Sodium, and Healthier Prepared Foods

Protein
Definition:

- Proteins are part of every cell, tissue, and organ in our bodies. These body proteins are constantly being broken down and replaced.
- Proteins are made up of amino acids, which are like building blocks. There are 20 different amino acids that join together to make all types of protein.
  - Some of these amino acids can't be made by our bodies; these are known as essential amino acids since it's essential that our diet provide these.

Types of protein:

- In the diet, protein sources are labeled according to how many of the essential amino acids they provide.
- A complete protein source is one that provides all of the essential amino acids. You may also hear these sources called high quality proteins.
- An incomplete protein source is one that is low in one or more of the essential amino acids.
  - Complementary proteins are two or more incomplete protein sources that together provide adequate amounts of all essential amino acids.
  - For example, rice contains low amounts of certain essential amino acids, but high amounts of others; meanwhile, beans contain high amounts of the essential amino acids not found in rice, and low amounts of the ones that are found in rice. Together, these two foods can provide adequate amounts of all of the essential amino acids the body needs.
  - Complementary proteins must be eaten the same day for the body to be able to combine the amino acids from the different foods.

Protein sources:

- Most animal products are complete protein sources
  - meats, poultry, and fish
  - eggs
  - milk, yogurt and cheese
- Many plant products have some protein, but they are incomplete protein sources and the quantity and quality of the protein differs
  - tofu
  - legumes (dry beans and peas)
  - nuts and seeds
  - grains, some vegetables, and some fruits - provide only small amounts of protein relative to other sources
Protein recommendations:

- As a general rule of thumb, the average American adult should strive for 0.36 grams of good quality protein per pound of (ideal) body weight every day (equals 0.8 g protein / kg body weight).
  - Adult men need at least 56 grams of protein, while adult women need at least 46 grams
- Because proteins have 4 calories/gram, this accounts for approximately 10-20% of total caloric intake. Higher protein intake, up to 35% of calories, is okay, but this is considered the upper limit to leave room in the diet for healthy fats and carbohydrates (the other macronutrients).
- Most adults in the United States get enough protein to meet their needs. It's rare for someone who is healthy and eating a varied diet to not get enough protein.
  - Vegetarians can get enough protein in their diet, but they must plan carefully (e.g., by eating complementary proteins on the same day)
  - Many people think they need more protein in their diet in order to build muscle; in most cases, this is not necessary and protein supplements can lead to excess calories
- However, increasing the protein content of your meals can be beneficial
  - Physiologically, protein is more satiating than carbohydrates and fat per calorie
    - E.g., 150 calories of protein will keep you full longer than 150 calories of bread
  - Thus replacing some carbohydrates and fats in your diet with protein may help you consume fewer calories
  - But keep in mind that increasing protein intake without decreasing fat and carbohydrate intake will lead to excess caloric consumption, and thus weight gain.

Examples of protein in certain foods:

- 3 ounces of meat has about 19 grams of protein (complete)
- 1 cup of milk has about 8 grams of protein (complete)
- 1 cup of plain yogurt has about 11 grams of protein (complete)
- 1 large egg has about 6 grams (complete); one large egg white has 4 grams
- ½ cup of canned beans has about 7 grams of protein (incomplete)

Tips for choosing healthy proteins:

- Choose grilled, baked, broiled or steamed preparations
- Choose lean cuts of meat
- Lean beef does not have a marbled appearance e.g., round and sirloin cuts.
- White meat (i.e., breast meat) is the leanest poultry
- Most varieties of fish and seafood are lean (when prepared in a healthy manner)
- Trim all visible fat off meats before eating
- Remove the skin from chicken, turkey and other poultry before cooking.
- Choose low-fat or fat-free dairy products, including milk, yogurt, and cheese
Whole eggs can be a part of a healthy diet, but if you eat eggs often, consider using only egg whites, or make omelets with two egg whites for every one whole egg.

**Sodium**

Definition and importance:
- Sodium is a mineral found in the fluid surrounding the cells in your body.
- Sodium has an important role in maintaining the water balance within cells and in the function of both nerve impulses and muscles.
- Sodium is found naturally in many foods, but 90% of our sodium intake is from salt:
  - Salt is added to foods to boost flavor and as a preservative.
  - Table salt (sodium chloride) is 40% salt and 60% chloride.
  - MSG (monosodium glutamate) is another form of sodium commonly added to foods.

Excess sodium / hypertension:
- Consuming excess sodium may lead to water retention. Water retention increases circulatory volume, or the load the blood vessels have to handle. Extra load means increased pressure, putting an unhealthy strain on our hearts and blood vessels and causing high blood pressure, or hypertension.
- Furthermore, as a reaction to this increased pressure, blood vessel walls thicken and narrow, leaving less room for the blood to flow. This causes the heart to work harder, increasing the pressure with which it is pumping blood.
- Hypertension tends to develop as people age. A high intake of sodium early in life might weaken genetic defenses against developing high blood pressure. Experts recommend not to wait and see if you develop hypertension, but to reduce sodium intake while blood pressure is still normal. This may decrease your risk of developing hypertension.
  - Other important considerations are healthful eating, maintaining ideal body weight, physical exercise, and stress management.
- Women who consume excess sodium may be at higher risk for developing osteoporosis even if calcium intake is adequate. Evidence suggests that for each teaspoon of salt (2,000 mg of sodium) consumed, considerable calcium is excreted in the urine.

Dietary recommendations:
- Minimum sodium requirement is about 500 milligrams (mg) per day.
  - USDA recommends 1500 mg as being more feasible when meeting general caloric requirements.
- Maximum recommended level of sodium intake is 2,300 mg per day (about 1 tsp):
  - On average, American men consume between 3,100 and 4,700 mg of sodium per day, while women consume between 2,300 and 3,100 mg (due to their lower caloric intake).
Nearly 80% (77%) of sodium in the diet comes from prepared foods
  o 5% added during cooking, 6% added at the table, and 12% naturally occurring

What foods are high in sodium:
  • Sodium is found in many foods, and particularly prepared foods. Some foods with the highest sodium content include:
    o Deli meats (lunch meats), hot dogs, sausage and bacon
    o Canned soups, bouillon, dried soup mixes
    o Condiments (ketchup, soy sauce, salad dressings)
    o Frozen and boxed pre-seasoned mixes for potatoes, rice, and pasta
    o Snack foods (pretzels, popcorn, peanuts, chips)
    o Pickled or marinated food
  • But remember, most processed foods contain significant amounts of sodium, even things that don’t taste salty (e.g., breads, cereals, sauces, etc)

Tips to reduce sodium intake:
  • Avoid eating out whenever possible
  • Use fresh foods as snacks and in meal preparation (i.e., not canned, boxed or frozen) whenever possible
  • When buying packaged foods, choose “low salt” or “reduced sodium” varieties
  • Buy packaged goods with no added seasonings (e.g., plain frozen veggies, plain brown rice)

**Healthier Prepared Foods**

It’s best to choose home-cooked meals, but at times when that is not possible, the guidelines below can help you choose healthier prepared items:

  • Choose restaurants you know will have healthy options. Many restaurants have websites, so you can check out menus in advance.
  • You don’t have to eat it all – ask for part of your meal to be packaged to go.
  • Food preparation
    o Don’t be afraid to ask how items are prepared.
    o Ask for low-fat cooking spray or little or no butter / oil to be used.
    o Look for choices that are roasted, poached, steamed, baked, or grilled rather than sautéed, deep fried, or pan fried. If it is sautéed, ask for wine or lemon juice to be used.
    o Ask for sauces on the side.
  • Appetizers – Choose Soup or Salad
    o Soup:
      ▪ Choose clear broth or tomato-based soups.
      ▪ Avoid cream-based choices such as a bisque, chowder or cheese soup.
    o Salad:
- Avoid salads that contain fried foods. Ask for poultry, meat, or seafood to be grilled.
- Ask for fat free or lowfat dressing. Always ask for the dressing to be put on the side, not tossed in the salad. Try vinegar or lemon juice on your salad.
- Leave off extras like croutons, cheese, nuts, fried noodle strips, etc.

- **Entrée**
  - Select skinless poultry, preferably white meat, fish, or lean cuts of beef and pork such as tenderloin, London broil or filet mignon. Avoid ribs, prime rib, and other marbled meats.
  - When choosing vegetarian choices, avoid cheese, cream, etc.

- **Sides**
  - Choose colorful vegetables, but skip the creamed vegetables or those that have cheese.
  - Choose fresh fruit or a tossed salad over potato salad, coleslaw, macaroni salad, etc.

- **Beverages**
  - Drink plenty of water with your meal.
  - Low calorie, sugar-free beverages and low-fat or skim milk are the next best options.

- **Dessert**
  - Order fresh fruit.
  - Choose a small bowl of low-fat ice cream, sorbet, sherbet or gelatin or a piece of angel food cake.
  - Order one dessert for the table to share.

- **Bread**
  - Limit bread to 1-2 slices per meal. Choose baked bread, rolls, and saltine crackers instead of croissants, biscuits, and cornbread.
  - If bread is too tempting for you, ask your server not to bring the basket to your table, or ask for only a limited amount (e.g., one roll per person).
  - Leave off butter or margarine. For toast, ask for it ‘dry’.

- Eat slowly. Take plenty of time to savor the food’s flavor. Enjoy yourself!

Remember that choosing a prepared meal from the grocery store can be just as fast as heading to a fast-food restaurant. Use the recommendations below to compile a healthier meal:

- **Frozen Meals:** Choose those with <400 calories and <700mg sodium per serving.
  - Lean Cuisine
  - Weight Watchers’ Smart Ones
  - Gordon’s Grilled Salmon or Shrimp
  - Healthy Choice
  - Amy’s Organic

- **Deli:** Choose low-sodium lean meats and low-fat cheese.
  - Pre-made turkey, roast beef, or lean ham sandwiches on whole grain bread
Fat-free beef or turkey hot dogs with ketchup and mustard
Canned chunk light tuna or salmon (in water, NOT oil) with low-fat/fat free mayonnaise
Rotisserie chicken (remove skin)
Broth-based soups with vegetables and lean meat

• Dairy Case: Choose low-fat or nonfat versions.
  Nonfat Greek yogurt or plain yogurt (pair with fresh fruit)
  Low-fat cottage cheese, no salt added if available (pair with fresh fruit)
  Light or low-fat string cheese

• Salad Bar: Go easy on cheese, full fat salad dressings, and croutons.
  Choose a variety of vegetables and lettuce with hard boiled eggs, chicken, and/or beans, and balsamic vinegar or low-fat dressing.

• Cereal Aisle: Choose low-sugar, high-fiber options (and pair with a healthy protein to stay full longer)
  Instant oatmeal, unflavored, or lower sugar / weight control varieties
  Whole grain cereal (e.g., Cheerios, Whole Grain Total, Wheat Chex)

• Beverages:
  Bottled water
  Skim or 1% milk or light soymilk (for cereal / oatmeal, or to drink with meals)
  Seltzer, any flavor with zero calories

• Fruits and Veggies:
  Any fresh fruits or ready-to-eat veggies (e.g., baby carrots, grape tomatoes, cucumbers)
  Fruit cups in fruit juice with no sugar added
  Frozen vegetables, preferably with no sauces or seasonings

Education Session #6

Portion Size and the Nutrition Facts Label

Portion Size

When eating at many restaurants, it's hard to miss that portion sizes have gotten larger in the past few years. The trend has also spilled over into the grocery store and vending machines. Why is this a problem?

- Research shows that people unintentionally consume more calories when faced with larger portions. This can mean significant excess caloric intake, especially when eating high-calorie foods.
- Most of us tend to underestimate the amount of food we eat and tend to overestimate the recommended serving sizes for many foods. Almost everyone underestimates the amount of calories they consume, and people who weigh more do so to a greater degree.
  - Portion: A “portion” is how much food you choose to eat at one time (breakfast, lunch, dinner, or snack), whether in a restaurant, from a package, or in your own kitchen. Portions can be bigger or smaller than the recommended food servings. There is no standard portion size and no single right or wrong portion size.
  - Serving: A “serving” size is the amount of food listed on a product’s Nutrition Facts label or the amount of food recommended in the Food Guide Pyramid and the Dietary Guidelines for Americans. A serving is a standard amount used to help give advice about how much to eat, or to identify how many calories and nutrients are in a food.
  - Sometimes, the portion size and serving size match; sometimes they do not.

Common household objects can be used to approximate serving sizes. The “Be Wise About Portion Size” card in the nutrition library includes several guides to estimating reasonable portions. For example:

- 1 ounce of cheese = 4 dice (smaller than you might have guessed!)
- 2 cups of salad greens = 2 baseballs (larger than you might have guessed!)

The portion size guide can help you consume an appropriate amount. Visualize the objects mentioned on the guide when eating out, planning a meal, or grabbing a snack.

Here are additional tips to help you avoid common portion-size pitfalls:

- **Portion control when eating out.** Many restaurants serve more food than one person needs at one meal. Take control of the amount of food that ends up on your plate by splitting an entrée with a friend. Or, ask the wait person for a "to-go" box and wrap up half your meal as soon as it's brought to the table.
- **Portion control when eating in.** To minimize the temptation of second and third helpings when eating at home, serve the food on individual plates, instead of
putting the serving dishes on the table. Keeping the excess food out of reach may discourage overeating.

- **Portion control in front of the TV.** When eating or snacking in front of the TV, put the amount that you plan to eat into a bowl or container instead of eating straight from the package. It's easy to overeat when your attention is focused on something else.

- **Go ahead, spoil your dinner.** We learned as children not to snack before a meal for fear of “spoiling our dinner.” Well, it's time to forget that old rule. If you feel hungry between meals, eat a healthy snack, like a piece of fruit or small salad, to avoid overeating during your next meal.

- **Be aware of large packages.** For some reason, the larger the package, the more people consume from it without realizing it. To minimize this effect:
  - Divide up the contents of one large package into several smaller containers to help avoid over-consumption.
  - Don't eat straight from the package. Instead, serve the food in a small bowl or container.

- **Out of sight, out of mind.** People tend to consume more when they have easy access to food. Make your home a "portion friendly zone."
  - Replace the candy dish with a fruit bowl.
  - Store especially tempting foods, like cookies, chips, or ice cream, out of immediate eyesight, like on a high shelf or at the back of the freezer. Move the healthier food to the front at eye level.
  - When buying in bulk, store the excess in a place that's not convenient to get to, such as a high cabinet or at the back of the pantry.

**Nutrition Facts Label**

The Nutrition Facts Label helps you determine the amount of calories and nutrients (fats, carbohydrates, protein, vitamins and minerals) in one serving of food. This information helps you know whether you’re eating a healthy, balanced diet.

- A healthy person should consume a certain amount of fat, carbohydrates (especially fiber), protein, vitamins and minerals each day. The nutrition facts label can help you make sure you get enough of these nutrients.

- Certain other nutrients, such as saturated fats, trans fats, cholesterol and sodium, are considered unhealthy and should only be eaten in very small amounts. The nutrition facts label can help you make sure you limit your consumption of these nutrients.

Nutrient values are provided as raw numbers (i.e., g or mg) and also, for many nutrients, as a % Daily Value.

- % Daily Values compare how much of a particular nutrient one serving of food contains to how much of that nutrient you should consume daily. These percents are often easier to interpret than the raw numbers.

- The % Daily Value is based on a 2000 calorie/day diet (which is how much the average American requires), but the percents can be helpful even if your total
caloric needs are different. For example, the % Daily Values can help you determine whether a food is high or low in a particular nutrient.

- Generally, 5% or less of a particular nutrient is considered low, while 20% or more of a nutrient is considered high.

- If you are on a 2000 calorie/day diet, you want to reach no more than 100% of certain nutrients (e.g., saturated fat, carbohydrate and sodium), and at least 100% of other nutrients (e.g., dietary fiber, Vitamin A, Vitamin D and calcium). If you require 1500 calories/day, then you want to total 75% instead of 100%. Meanwhile, if you require 2500 calories/day, then you want to total 125%.

*Serving size* and *servings per container* is the first piece of information listed on the label because the *nutritional information on the rest of the label applies to one serving.*

- Serving sizes are standardized to make it easier to compare similar foods; they are provided in familiar units, such as cups or pieces (e.g., one cup of cereal), followed by the metric amount, (e.g., the number of grams).

- In surveys conducted by the International Food Information Council Foundation, many more people say they look at the calorie number than at the serving size on which it is based. But the size of the serving on the food package influences the number of calories and all the nutrient amounts listed.

- It’s important to compare the serving size listed on the container to the amount of that food that you normally eat. For example, the label may list a serving size as 7 potato chips. If you usually eat twice that amount, you are also eating twice the amount of calories and nutrients, and also need to double the % Daily Values.

- Be sure to look at the number of servings in the package. Small packages may appear to be one serving, but they often contain more. In the sample label for macaroni and cheese below, the package contains two servings. If you ate the whole box, you would be eating two servings, so you would need to double all of the nutrient values.

*Calories* are listed next. They provide a measure of how much energy you get from one serving.

- Many Americans consume more calories than they need without meeting recommended intakes for a number of nutrients. The calorie section of the label can help you manage your weight (i.e., gain, lose, or maintain.)

- Remember: the number of servings you consume determines the number of calories you actually eat (your portion amount).

- Compare the number for Calories from Fat to Total Calories. You want your total fat calories to be no more than 1/3 of your total calories for the day.

- In the example, there are 250 calories in one serving of this macaroni and cheese. 110 calories are from fat, which means almost half of the calories in a single serving come from fat. If you eat the whole package, then you would consume two servings, or 500 calories, and 220 would come from fat.
The information for fat is broken into a few categories.

- **Total fat** includes both good fat and bad fat. It is recommended that you aim for 65g fat/day on a 2000 cal/day diet, but this should come primarily from good (unsaturated) fat.

- **Saturated fat** intake should not exceed 20g/day if you are on a 2000 cal/day diet. Choose items low in saturated fat, and make sure the number of grams (g) of saturated fat isn’t close to the number given for total fat (which would mean that most of the fat in the product is saturated).

- **Trans fat** should be limited as much as possible. Look for choices with 0g of Trans Fat.
- Sometimes unsaturated fat is also listed on the food label. Unsaturated fat is an essential part of a healthy diet, but you should still watch your fat intake to make sure you don’t consume too many calories.
  - If unsaturated fat is not listed on the label, you can calculate the amount by subtracting the amount of saturated and trans fats from the total fat. For example, on the sample label, the macaroni and cheese has 12 g of total fat, 3g of which are saturated and 3g of which are trans fat. That means 12 - (3+3) = 6 g of fat are unsaturated.

The next two nutrients, cholesterol and sodium, are straightforward. Try to limit your intake of these nutrients, and make sure you do not exceed 100% of the DV.

On the other hand, most people need to increase their potassium consumption. Make sure you reach at least 100%.

Carbohydrates are like fat in that they are an essential part of a healthy diet, but you need to choose wisely.
- Dietary fiber, one type of carbohydrate, plays many important roles in the body. Make sure you reach at least 100% of the DV.
- Sugar is tricky. The amount listed on the nutrition facts label does not distinguish naturally-occurring sugar from added sugars.
  - Many healthy foods, like fruits, vegetables, and dairy products, have naturally-occurring sugar. This sugar is part of a healthy diet.
  - But these foods and most other foods can also have lots of added sugars (sugar that is added during manufacturing). Added sugars should be minimized.
  - In order to determine whether the sugar in a product is naturally-occurring or added, read the ingredients list.
    - The product's ingredients must be listed in order of quantity, so the major ones come first.
    - Look for products that don’t have added sugars (for instance, sucrose, corn syrup, high fructose corn syrup or glucose) listed as one of the first ingredients.

Protein does not always have a % DV listed because the amount of your daily recommended intake met by the protein in a product depends on whether the protein is complete or incomplete. Aim to consume 0.36g of protein per pound of body weight from either complete protein sources (e.g., lean chicken, turkey, beef, pork, seafood, eggs, and dairy) or from complementary incomplete protein sources (e.g., rice and beans).

The nutrients listed after the bold bar (including vitamin A, vitamin C, calcium and iron) are vitamins and minerals. These are essential parts of a healthy diet; make sure you get enough of these nutrients.

Sometimes the nutrition facts label also includes a footnote. The footnote is the chart on the bottom of the label.
• Small packages do not have to include the footnote, but when it appears, it will always be the same. It doesn't change from product to product because it is not about the specific food product. It instead contains dietary advice for the general population.
• It includes recommended intakes of total fat, saturated fat, cholesterol, sodium, total carbohydrate and dietary fiber for individuals on a 2000 cal/day diet and also for those on a 2500 cal/day diet.
  o Note how the DVs for some nutrients change, while for others (i.e., cholesterol and sodium) they remain the same for both calorie amounts.
• To read the chart, find the column that is of interest to you (2000 cal/day or 2500 cal/day) and read down the list to see how much of each of the aforementioned nutrients you should consume.
• Some nutrients, including total fat, saturated fat, cholesterol and sodium, are listed as upper limits (e.g., less than 65 g of total fat and less than 20 g of saturated fat on a 2000 cal/day diet). This means it is recommended that you stay below the amount listed.
• Other nutrients, including total carbohydrate and dietary fiber, are listed as recommended intakes.

Benefits of nutrition facts labels:
• The information on nutrition facts labels can help you make sure you consume enough of the nutrients your body needs while limiting the nutrients your body does not need.
• Nutrition facts labels allow you to compare one product or brand to a similar product to determine which is healthier. Just make sure the serving sizes are similar, especially the weight (e.g. gram, milligram, ounces) of each product.
• Nutrition facts labels can help you make dietary trade-offs with other foods throughout the day. You don't have to give up a favorite food to eat a healthy diet. When a food you like is high in fat, balance it with foods that are low in fat at other times of the day. Also, pay attention to how much you eat so that the total amount of fat for the day stays below 100% DV.
• But keep in mind that the nutrition facts label does not clearly say whether a food is a healthy choice. It is not that easy or simple. Everyone must read the label to decide if a food meets his or her own individual needs for a healthy diet. It is a tool or guide for nutrition information.
  o Make your calories count. Look at the calories on the label and compare them with the nutrients you are getting to decide whether the food is worth eating.

Nutrient Label Claims

There are lots of terms on food packages. The Nutrient Label Claims handout explains what some of them mean. For example:
• Low fat means the food contains 3 grams of fat or less per serving
• Good source means the food contains 10-19% of the Daily Value of a particular nutrient (like iron), while high means the food contains at least 20% of the Daily Value.

But keep in mind that most of these claims are in regard to a single nutrient, so even if something is, for instance, “low fat” it can still be high in calories, sodium, and sugar!

• The macaroni and cheese from the sample label can be marketed as “high” in calcium, without any mention of all of the unhealthy nutrients the food also provides.

• Be sure to look at the complete nutrition facts label and the ingredients list before making your final decision.

APPENDIX C: FFIRE STUDY HANDOUTS

Handouts were used to emphasize main points from the monthly education sessions. Existing handouts were used when appropriate; otherwise, new handouts were designed.

Session 1: Energy Balance, Discretionary Calories and Balanced Proportions
- Balancing Your Plate
- Eat More, Weigh Less

Session 2: Fruits & Vegetables and Healthy Fats
- Fruits and Vegetables
- What Are the Types of Fat?

Session 3: Behavioral Strategies for Healthier Eating
- Hunger and Fullness
- Hunger vs. Cravings
- Setting S.M.A.R.T. Goals
- Handling Slips and Lapses
- Tips to Avoid Mindless Eating

Session 4: Whole Grains, Added Sugars and Healthy Beverages
- The Whole Truth about Whole Grains
- Different Names for Added Sugars
- Artificial Sweeteners and Sugar Alcohols
- Rethink your Drink

Session 5: Protein, Sodium, and Healthier Prepared Foods
- Protein
- Salt and Sodium: 10 Tips to Cut Back
- Restaurant Tips
- Healthier Grocery Store Prepared Options
- Healthier Fast Food/CARRYOUT Options

Session 6: Portion Size and the Nutrition Facts Label
- How to Avoid Portion Size Pitfalls
- Understanding the Nutrition Facts Label
- Nutrient Label Claims

Additional Handouts
- FFIRE Online Nutritional Resources
- Maintaining Healthy Habits
- Healthier Vending Machine Options (for station chiefs)
Balancing Your Plate

1/4 plate protein

3 oz or size of deck of cards
- Fresh or frozen fish
- Tuna packed in water
- Skin-less chicken or turkey
- Shellfish (clams, shrimp, crab)
- Low-fat/non-fat cheese
- Lean beef (round, flank, chuck, rump)

Recommended
- Artichoke
- Asparagus
- Bean sprouts
- Beans (green)
- Beets
- Broccoli
- Brussel sprouts
- Cabbage
- Carrots
- Cauliflower
- Celery
- Cucumber
- Eggplant
- Greens (collard, kale)
- Leeks
- Mushrooms
- Onions
- Peppers (red, green, yellow)
- Salad greens (romaine, bibb, red, endive)
- Spinach
- Tomatoes
- Turnips
- Water chestnuts

1/4 plate starch

- 1/2 c. beans (pinto, kidney, black)
- 1/2 c. lentils
- 1/3 c. baked beans
- 1 c. mixed corn and peas
- 1/2 c. plantains
- 1 c. winter squash (butternut)
- 1/2 c. sweet potatoes
- 1/2 c. whole-wheat pasta
- 1/2 c. brown rice
- 1/2 c. oatmeal
- 1/2 c. bulgur or quinoa

1/2 plate vegetables

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Eat More, Weigh Less?

How to manage your weight without being hungry

607 calories

293 calories
Can you weigh less without eating less?

Have you tried to lose weight by cutting down the amount of food you eat? Do you end up feeling hungry and not satisfied? Or have you avoided trying to lose weight because you're afraid of feeling hungry all the time? If so, you are not alone. Many people throw in the towel on weight loss because they feel deprived and hungry when they eat less. But there is another way. Aim for a slow, steady weight loss by decreasing calorie intake while maintaining an adequate nutrient intake and increasing physical activity. You can cut calories without eating less nutritious food. The key is to eat foods that will fill you up without eating a large amount of calories.

If I cut calories, won't I be hungry?

Research shows that people get full by the amount of food they eat, not the number of calories they take in. You can cut calories in your favorite foods by lowering the amount of fat and/or increasing the amount of fiber-rich ingredients, such as vegetables or fruit.

Let's take macaroni and cheese as an example. The original recipe uses whole milk, butter, and full-fat cheese. This recipe has about 540 calories in one serving (1 cup).
Here’s how to remake this recipe:

- Use 2 cups non-fat milk instead of 2 cups whole milk.
- Use 8 ounces light cream cheese instead of 2 1/4 cups full-fat cheddar cheese.
- Use 1 tablespoon butter instead of 2 or use 2 tablespoons of soft trans-fat free margarine.
- Add about 2 cups of fresh spinach and 1 cup diced tomatoes (or any other veggie you like).

Your redesigned mac and cheese now has 315 calories in one serving (1 cup). You can eat the same amount of mac and cheese with 225 fewer calories.
What foods will fill me up?

In order to be able to cut calories without eating less and feeling hungry, you need to replace some higher calorie foods with foods that are lower in calories and fat and will fill you up. In general, this means foods with lots of water and fiber in them. The chart below will help you make smart food choices that are part of a healthy eating plan.

**These foods will fill you up with less calories. Choose them more often...**

| Fruits and vegetables  
(prepared without added fat) |
<table>
<thead>
<tr>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Spinach, broccoli, tomato, carrots, watermelon, berries, apples</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Low-fat and fat-free milk products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low- or fat-free milk, low or fat-free yogurt, low- or fat-free cottage cheese</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Broth-based soup</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vegetable-based soups, soups with chicken or beef broth, tomato soups (without cream)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Whole grains</th>
</tr>
</thead>
<tbody>
<tr>
<td>Brown rice, whole wheat bread, whole wheat pastas, popcorn</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Legumes (beans and peas)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black, red kidney and pinto beans (without added fat), green peas, black-eyed peas</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Lean meat, poultry and fish</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grilled salmon, chicken breast without skin, ground beef (lean or extra lean)</td>
</tr>
</tbody>
</table>

**Technically speaking...**

The number of calories in a particular amount or weight of food is called “calorie density” or “energy density.” Low calorie dense foods are ones that don’t pack a lot of calories into each bite.
A healthy eating plan is one that:

- Emphasizes fruits, vegetables, whole grains, and fat free or low fat milk and milk products.
- Includes lean meats, poultry, fish, beans, eggs, and nuts.
- Is low in saturated fats, trans fats, cholesterol, salt (sodium), and added sugars.
- Stays within your calorie needs

These foods can pack more calories into each bite. Choose them less often...

### Fried foods
- Eggs fried in butter, fried vegetables, French fries

### Fatty cuts of meat
- Bacon, brisket, ground beef (regular)

### Full-fat milk products
- Full-fat cheese, full-fat ice cream, whole and 2% milk

### Dry snack foods
- Crackers or pretzels, cookies, chips, dried fruits

### Higher-fat and higher-sugar foods
- Croissants, margarine, shortening and butter, doughnuts, candy bars, cakes and pastries

Foods that have a lot of water or fiber and little fat are usually low in calorie density. They will help you feel full without an unnecessary amount of calories.
Here are some more ideas for cutting back on calories without eating less and being hungry:

**Make substitutions**

<table>
<thead>
<tr>
<th>Instead of...</th>
<th>Try...</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fried chicken sandwich</td>
<td>Grilled chicken salad with low-fat dressing</td>
</tr>
<tr>
<td>with 1 tbsp. mayonnaise</td>
<td>2 cups lettuce, 2 oz. grilled chicken breast, 2 tbsp. light balsamic vinaigrette dressing</td>
</tr>
<tr>
<td>= 599 calorie</td>
<td>= 178 calories</td>
</tr>
<tr>
<td>Cream-based soup</td>
<td>Broth-based soup</td>
</tr>
<tr>
<td>1 cup mushroom bisque</td>
<td>1 cup minestrone</td>
</tr>
<tr>
<td>= 400 cals</td>
<td>= 112 calories</td>
</tr>
<tr>
<td>Chips or pretzels</td>
<td>Baby carrots with hummus</td>
</tr>
<tr>
<td>1.5 oz. pretzels</td>
<td>16 baby carrots with 1 tbsp. hummus</td>
</tr>
<tr>
<td>= 162 calories</td>
<td>= 75 calories</td>
</tr>
</tbody>
</table>
Good things can come in big packages

People eat more than they realize when faced with large portion sizes. This usually means eating too many calories. But, not all large portions are created equal. Larger portions of water- and fiber-rich foods, like fruits, vegetables, and broth-based soups, can fill you up with less calories.

Start with an appetizer

Research shows that if you eat a low-calorie appetizer before a meal, you will eat fewer total calories during the meal. Start your meals with a broth-based soup or a green salad without a large amount of cheese, or croutons.

Fruits and veggies: Keep it simple

Most fruits and veggies are low-calorie and will fill you up, but the way you prepare them can change that. Breading and frying, and using high-fat creams or butter with vegetables and fruit will add extra calories. Try steaming vegetables and using spices and low-fat sauces for flavor. And enjoy the natural sweetness of raw fruit.

What about beverages?

While drinking beverages is important to good health, they don’t help you feel full and satisfied the way food does. Choose drinks without calories, like water, sparkling water, or unsweetened iced tea. Drink fat-free or low-fat milk instead of 2% or whole milk.
On the front cover:

Chicken, 1/2 breast, meat and skin fried with flour, bone removed: 218 calories, 9g fat, 0g fiber

Macaroni and cheese made with whole milk, butter, and full-fat cheese, 1/2 cup: 270 calories, 14g fat, 1.5g fiber

Baked beans with pork and tomato sauce, 1/2 cup: 119 calories, 1g fat, 5g fiber

Total for meal: 607 calories, 24g fat, 6.5g fiber

Chicken, 1/2 breast, bone and skin removed, roasted: 142 calories, 3g fat, 0g fiber

Sweet potato, half of one large, baked 81 calories, 0g fat, 3g fiber

Broccoli, 1 large stalk, cut up (about 1 cup) 55 calories, 1g fat, 5g fiber

Tomatoes, 3 slices of a large tomato 15 calories, 0g fat, 0g fiber

Total for meal: 293 calories, 4g fat, 8g fiber
How to use fruits and vegetables to help manage your weight.
Fruits and vegetables are part of a well-balanced and healthy eating plan.

There are many different ways to lose or maintain a healthy weight. Using more fruits and vegetables along with whole grains and lean meats, nuts, and beans is a safe and healthy one. Helping control your weight is not the only benefit of eating more fruits and vegetables. Diets rich in fruits and vegetables may reduce the risk of some types of cancer and other chronic diseases. Fruits and vegetables also provide essential vitamins and minerals, fiber, and other substances that are important for good health.

To lose weight, you must eat fewer calories than your body uses.

This doesn’t necessarily mean that you have to eat less food. You can create lower-calorie versions of some of your favorite dishes by substituting low-calorie fruits and vegetables in place of higher-calorie ingredients. The water and fiber in fruits and vegetables will add volume to your dishes, so you can eat the same amount of food with fewer calories. Most fruits and vegetables are naturally low in fat and calories and are filling.

As people become less active, their bodies need fewer calories. Even if you do not need to lose weight, you may still need to reduce calories simply to maintain your current weight.

Here are some simple ways to cut calories and eat fruits and vegetables throughout your day:

Breakfast: Start the Day Right.

- Substitute some spinach, onions, or mushrooms for one of the eggs or half of the cheese in your morning omelet. The vegetables will add volume and flavor to the dish with fewer calories than the egg or cheese.
- Cut back on the amount of cereal in your bowl to make room for some cut-up bananas, peaches, or strawberries. You can still eat a full bowl, but with fewer calories.

Lighten Up Your Lunch.

- Substitute vegetables such as lettuce, tomatoes, cucumbers, or onions for 2 ounces of the cheese and 2 ounces of the meat in your sandwich, wrap, or burrito.

The new version will fill you up with fewer calories than the original.

- Add a cup of chopped vegetables, such as broccoli, carrots, beans, or red peppers, in place of 2 ounces of the meat or 1 cup of noodles in your favorite broth-based soup. The vegetables will help fill you up, so you won’t miss those extra calories.
Dinner

• Add in 1 cup of chopped vegetables such as broccoli, tomatoes, squash, onions, or peppers, while removing 1 cup of the rice or pasta in your favorite dish. The dish with the vegetables will be just as satisfying but have fewer calories than the same amount of the original version.

• Take a good look at your dinner plate. Vegetables, fruit, and whole grains should take up the largest portion of your plate. If they do not, replace some of the meat, cheese, white pasta, or rice with legumes, steamed broccoli, asparagus, greens, or another favorite vegetable. This will reduce the total calories in your meal without reducing the amount of food you eat. BUT remember to use a normal- or small-size plate—not a platter. The total number of calories that you eat counts, even if a good proportion of them come from fruits and vegetables.

Smart Snacks

Most healthy eating plans allow for one or two small snacks a day. Choosing most fruits and vegetables will allow you to eat a snack with only 100 calories.

About 100 Calories or Less

• a medium-size apple (72 calories)
• a medium-size banana (105 calories)
• 1 cup steamed green beans (44 calories)
• 1 cup blueberries (83 calories)
• 1 cup grapes (100 calories)
• 1 cup carrots (45 calories), broccoli (30 calories), or bell peppers (30 calories) with 2 tbsp. hummus (46 calories)

The fruits and vegetables in the box above all have about 100 or fewer calories. Instead of a high-calorie snack from a vending machine, bring some cut-up vegetables or fruit from home. One snack-sized bag of corn chips (1 ounce) has the same number of calories as a small apple, 1 cup of whole strawberries, AND 1 cup of carrots with 1/4 cup of low-calorie dip. Substitute one or two of these options for the chips, and you will have a satisfying snack with fewer calories.
**Remember: Substitution is the key.**

It’s true that fruits and vegetables are lower in calories than many other foods, but they do contain some calories. If you start eating fruits and vegetables in addition to what you usually eat, you are adding calories and may gain weight. **The key is substitution.** Eat fruits and vegetables instead of some other higher-calorie food.

**Fruits and Vegetables for Weight Control**

**Eat fruits and vegetables the way nature provided—or with fat-free or low-fat cooking techniques.**

Try steaming your vegetables, using low-calorie or low-fat dressings, and using herbs and spices to add flavor. Some cooking techniques, such as breading and frying, or using high-fat dressings or sauces will greatly increase the calories and fat in the dish. And eat your fruit raw to enjoy its natural sweetness.

**Canned or frozen fruits and vegetables are good options when fresh produce is not available.**

However, be careful to choose those without added sugar, syrup, cream sauces, or other ingredients that will add calories.

**Choose whole fruit over fruit drinks and juices.**

Fruit juices have lost fiber from the fruit. It is better to eat the whole fruit because it contains the added fiber that helps you feel full. One 6-ounce serving of orange juice has 85 calories, compared to just 65 calories in a medium orange.

**Whole fruit gives you a bigger size snack than the same fruit dried—for the same number of calories.**

A small box of raisins (¼ cup) is about 100 calories. For the same number of calories, you can eat 1 cup of grapes.

---

**Want More Information?**

Check out these Web sites for more information about how fruits and vegetables can help you manage your weight:

- Centers for Disease Control and Prevention: [www.cdc.gov/5aday](http://www.cdc.gov/5aday)
- US Department of Agriculture, Center for Nutrition Policy and Practice: [www.usda.gov/cnpp](http://www.usda.gov/cnpp)
- National Cancer Institute: [www.5aday.gov](http://www.5aday.gov)
- Produce for Better Health Foundation: [www.5aday.org](http://www.5aday.org)
- [www.healthierus.gov/dietaryguidelines](http://www.healthierus.gov/dietaryguidelines)
This brochure is available at
www.cdc.gov/nccdphp/dnpa
What Are The Types Of Fat?

Limiting your fat intake is key to losing weight. Healthy eating includes small amounts of fats, but some fats are much healthier than others. Eating monounsaturated or polyunsaturated fats instead of saturated or trans fats may help improve your blood cholesterol.

**Good Fats**

**Monounsaturated:**

- Canola, olive, nut and peanut oils (use these fats for cooking); peanuts; nuts; avocado; olives

**Polyunsaturated:**

- Most vegetable oils (corn, cottonseed, flaxseed, safflower, sesame, soybean, sunflower), nuts, seeds, peanuts, fish

**Bad Fats**

**Saturated:**

- Animal sources such as meat, poultry, butter, lard, whole and reduced fat dairy products; tropical oils – coconut, palm and palm kernel
- Saturated fats are solid at room temperature

**Hydrogenated:**

- Many fats used in processed foods, snack foods, stick margarine, vegetable shortening; Read the ingredients list for shortening, “partially hydrogenated vegetable oil” (A liquid vegetable oil is changed to a solid fat by a chemical process.) *May be labeled as trans fat

MOV!
Hunger and Fullness

Are you really hungry? Sometimes, we eat because we think we should, the clock says a certain time, or because others are eating. We need to eat when we are truly hungry.

When should you stop eating? You should only eat until you feel satisfied or almost full.

In order to manage how much you eat and your weight, you need to listen to your body. Use the scale below to help determine how hungry you are. Stop eating 2 or 3 times during each meal to ask yourself if you are still hungry or starting to feel satisfied. Feelings of satisfaction or fullness do not happen right away so eating slowly can help. After you finish eating, check again to see how full you are. You never want to be too hungry or too full. It is best to stay between 3 and 7 on the fullness scale.

<table>
<thead>
<tr>
<th>Rating</th>
<th>Hunger / Fullness Feelings</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>Uncomfortably full or “sick” – “Thanksgiving full”</td>
</tr>
<tr>
<td>9</td>
<td>Stuffed and uncomfortable</td>
</tr>
<tr>
<td>8</td>
<td>Too full, somewhat uncomfortable</td>
</tr>
<tr>
<td>7</td>
<td>Full, but not yet uncomfortable – hunger is gone</td>
</tr>
<tr>
<td>6</td>
<td>Filling up, but still comfortable – could definitely eat more</td>
</tr>
<tr>
<td>5</td>
<td>Neutral – neither hungry nor full</td>
</tr>
<tr>
<td>4</td>
<td>Slightly hungry, faint signals that your body needs food, but you can still wait to eat</td>
</tr>
<tr>
<td>3</td>
<td>Hungry, not yet uncomfortable, clear signals that your body needs food</td>
</tr>
<tr>
<td>2</td>
<td>Very hungry, irritable or anxious – you want to eat everything in sight</td>
</tr>
<tr>
<td>1</td>
<td>Starving, feeling weak, lightheaded, dizzy, or other extremely uncomfortable symptoms of hunger</td>
</tr>
</tbody>
</table>
Hunger vs. Cravings:
How to Tell the Difference and How to Manage Both

<table>
<thead>
<tr>
<th>How to Recognize</th>
<th>How to Manage</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Hunger</strong></td>
<td></td>
</tr>
<tr>
<td>• Builds over time</td>
<td>Eat 5 or 6 small meals each day at regular intervals</td>
</tr>
<tr>
<td>• Physical</td>
<td>Between planned meals and snacks, consume high volume/low calorie foods, such as salads, cucumbers, and celery</td>
</tr>
<tr>
<td>• Biological function of the body's real need for food</td>
<td>Drink lots of water – thirst is often mistaken for hunger</td>
</tr>
<tr>
<td>• Occurs when you haven’t eaten for hours</td>
<td>Try the mantra, “Hunger is not an emergency”</td>
</tr>
<tr>
<td>• Nonspecific – if you’re hungry, you’ll eat whatever is available</td>
<td></td>
</tr>
<tr>
<td><strong>Craving</strong></td>
<td></td>
</tr>
<tr>
<td>• Comes on suddenly</td>
<td>Avoidance – keep tempting foods out of the house</td>
</tr>
<tr>
<td>• Psychological</td>
<td>Distraction – engage in activities incompatible with eating (e.g., go outside for a walk, take a hot bath)</td>
</tr>
<tr>
<td>• Specific</td>
<td>Confrontation – just say NO to cravings. Say, “I don’t need this food right now.” Know that gratifying an urge by eating can make it stronger and more frequent.</td>
</tr>
<tr>
<td>• <em>Feeling</em> hungry because of something you see or hear</td>
<td>Visualization – view cravings as waves that build, crest, break, and then gradually fade away.</td>
</tr>
<tr>
<td>• Can be related to hormone levels, including the stress hormone cortisol</td>
<td>Substitution - find healthy stand-ins for the foods you crave.</td>
</tr>
<tr>
<td></td>
<td>Planned Indulgence - plan to indulge in a portion-controlled amount of the craved food at another time, when YOU will be in control (not some trigger).</td>
</tr>
</tbody>
</table>
Setting S.M.A.R.T. Goals

Goal setting is a powerful motivational tool. Goals provide us with a clear idea of what we’re trying to achieve. They help us develop a plan of action and allow us to measure our progress. The most effective goals are SMART - Specific, Measurable, Action-oriented, Realistic and Timed. Here is a brief description of each SMART element:

S – Specific:
The goal should indicate what specific action or event will take place. The more specific, the easier it is to plan your routines to reach your goal. For example, the goal “eat more fruits and vegetables every day” is too general. A more specific goal is to “eat five servings (1/2 cup each) of fruits and vegetables every day.”

M – Measurable:
Your goal should be easy to measure so you can chart your progress. Taking the example from above, you can record the number of servings you eat each day and track your progress.

A – Action-oriented:
State exactly what actions you must do to achieve your goal. For example, "Today I will eat fruit as a snack instead of chips."

R – Realistic:
Be realistic in your expectations of yourself and what you hope to accomplish. It is important to identify and change unrealistic weight-loss objectives you may have set for yourself because they set you up for failure. Take large or long-term goals and break them into smaller, more manageable goals. For example, each month you might increase your daily goal by one serving to get to your ultimate goal of eating nine servings of fruits and vegetables per day.

T – Timed:
Goals should be grounded within a time frame. Give yourself enough time to achieve the goal, but not too much time. Using the above example, you could give yourself one month to reach each goal, and can then start working on the next goal.

“Without goals, and plans to reach them, you are like a ship that has set sail with no destination.” - Fitzhugh Dodson
Handing Slips and Lapses

Making lifestyle changes can be challenging and it's not unusual to occasionally lapse back into old patterns of unhealthy eating and minimal exercise. Life is unpredictable and you are human; you should expect mistakes to happen and have a plan in place to recover when slip-ups occur. It takes time and regular reinforcement for your new healthy behaviors to become habits.

Slips are signs that you are struggling. Maybe you are craving a high fat food or starting to exercise less but you haven’t stopped all together. Lapses occur when you fall back into former unhealthy habits.

The acronym “SLIPS” can help you remember how to respond to a slip or lapse.

S — Stop! Then calmly examine the situation. What is going on? Why is the slip or lapse occurring?

L — Learn from the event. How could you do things differently the next time to have a better outcome?

I — Immediately take control and turn the situation around. Throw the rest of the food away, turn the car around, do whatever you need to do. Don’t wait for the next day.

P — Pat yourself on the back for the things you’ve done well. Forgive yourself for this slip or lapse.

S — Seek support! Ask friends, family, or coworkers for help.

And remember to make small, manageable changes to increase the likelihood that they will become habit, and reward yourself (but not with food!) for your successes. This will help you to avoid slips and lapses in the first place.
Tips to Avoid Mindless Eating

Mindless eating can lead us to consume hundreds of extra calories each day, without even realizing it. “Hidden persuaders” lead you to eat more than you think you’re eating, so a keen awareness of these persuaders is an important step in controlling the amount and quality of food you eat.

■ **Be aware of the size and shape of containers.** It’s the amount of food that counts, not what it looks like.

■ **Serve food on smaller plates and bowls.** Empty plates and bowls cue some people to stop eating.

■ **Use nutrition labels, paying attention to the serving size listed.** Consider the facts; don’t guess at how many calories you’re eating.

■ **Look past the packaging.** A food’s package or the language on a menu can lead you to actually like a food better, increasing your chance of overeating.

■ **Keep visual reminders of how much you’re eating.** Keep wrappers, empty containers, bones and other reminders of how much you’ve eaten nearby.

■ **Think about eating a healthier meal.** Don’t just focus on separate parts of the meal.

■ **Control your purchases.** Don’t let signs lead you to buy more than you need.

From NIH News in Health, July 2005
The Whole Truth about Whole Grains: Your Guide to Good Health

What is a whole grain?

- The term *whole grain* means that the entire kernel (including the bran, endosperm, and germ) is left intact during processing (see diagram).

- Unlike whole grains, *refined grains* are missing parts of the kernel, and consequently are missing many of the nutrients and health benefits of whole grains. Although about half of your grain intake should come from whole grains, about 85-90% of grain products found in supermarkets are made from refined grains.

Health Benefits of Whole Grains

Whole grains are excellent sources of antioxidants, fiber, phytonutrients and vitamins, all of which contribute to good health:

- Decreased risk of heart disease
  - Lower cholesterol levels
  - Protection against many types of cancer
  - Assistance with weight management

What are phytonutrients?

Small but powerful disease fighters found naturally in plant and plant-based foods. Whole grains contain significant amounts of the phytonutrients lignan, phytic acid, and phytosterols. Aim to get a variety of whole grains in your diet—that way you’re more likely to get all of the phytonutrients your body needs!
How can you tell if a food is whole grain?

- **Look at the package and label.** Look for the words, “whole grain.”
- **Separate marketing from truth.** Read the ingredients labels even if the package says “Made with whole grain.” These foods may contain negligible amounts of whole grain.
- **Check the ingredient list.** The first ingredient listed is present in the highest quantity by weight. If the food is high in a whole grain, it will be listed first.
- **Look for the word “whole” in front of a grain.** For example “whole wheat flour” is a whole grain, but “wheat flour” is not.
  - Multigrain, 100% wheat, stone ground, and pumpernickel are not necessarily whole grain. Many of these products have grains and flour, but they do not have whole grains or whole grain flour.

<table>
<thead>
<tr>
<th>Ingredients of two different breads:</th>
</tr>
</thead>
<tbody>
<tr>
<td>This one is whole wheat</td>
</tr>
<tr>
<td>This one is not whole wheat</td>
</tr>
</tbody>
</table>

Even though Example 2 contains whole wheat flour, it is not considered a whole grain product because it is not the first ingredient listed.

**Important reminders:**

- On labels, wheat flour is another name for white flour.
- “Enriched” means that iron and B-vitamins have been added back. But most of the fiber, zinc, and other vitamins and minerals are gone.
- Whole wheat means that all parts of the wheat kernel are included—bran, germ and endosperm.
- Other parts of bread wrappers can be misleading. Ignore pictures and big print that might give the false impression of being “whole wheat”—look at the ingredient list instead.

**Whole Grain**

<table>
<thead>
<tr>
<th>Whole-grain [name of grain]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stone-ground whole [grain]</td>
</tr>
<tr>
<td>Whole-wheat</td>
</tr>
<tr>
<td>Brown Rice</td>
</tr>
<tr>
<td>Rye</td>
</tr>
</tbody>
</table>

**Refined Grain**

<table>
<thead>
<tr>
<th>Refined grain</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wheat</td>
</tr>
<tr>
<td>Made with whole-wheat</td>
</tr>
<tr>
<td>Stone-ground</td>
</tr>
<tr>
<td>Enriched flour</td>
</tr>
<tr>
<td>Wheat germ</td>
</tr>
<tr>
<td>Bran</td>
</tr>
<tr>
<td>Cracked wheat</td>
</tr>
<tr>
<td>Multi-grain</td>
</tr>
<tr>
<td>Wheatberries</td>
</tr>
</tbody>
</table>

Adapted from [http://www.montana.edu/wellness/UMforms/Whole_grains.pdf](http://www.montana.edu/wellness/UMforms/Whole_grains.pdf) and [http://www.extension.iastate.edu/efnep/web/wholegrain.pdf](http://www.extension.iastate.edu/efnep/web/wholegrain.pdf)
Different names for added sugar

Sugar goes by many different names, depending on its source and how it was made. This can make it confusing to identify added sugar, even when you read ingredient lists and food labels. Check for ingredients ending in "ose"; that's the chemical name for many types of sugar, such as fructose. These and other common types of sugar and added sugar are described below:

- **Agave nectar and syrup**: Extracted from the agave plant, usually *Agave tequilana*, commonly used in drinks and as a substitute for honey.
- **Brown sugar**: Granulated white sugar with added molasses for flavor and color, commonly used in baking.
- **Cane juice and cane syrup**: Sugar from processed sugar cane. Further processing produces brown or white solid cane sugar.
- **Confectioners' sugar**: Granulated white sugar that has been ground into a fine powder, sometimes with a small amount of cornstarch. Commonly used in icings and whipped toppings.
- **Corn sweeteners and corn syrup**: Corn sugars and corn syrups made from corn and processed cornstarch.
- **Dextrose**: Another name for glucose.
- **Fructose**: Sugar that occurs naturally in fruits, vegetables and honey.
- **Fruit juice concentrate**: A form of sugar made when water is removed from whole juice to make it more concentrated.
- **Glucose**: A simple sugar that provides your body's main source of energy. Also called blood sugar because it circulates in your blood.
- **Granulated white sugar**: This is table sugar, or pure crystallized sucrose, made by processing raw sugar from sugar cane or sugar beets. It's commonly used in baking or to sweeten tea or coffee.
- **High fructose corn syrup**: The most common sweetener in processed foods and beverages, this is a combination of fructose and glucose made by processing corn syrup.
- **Honey**: A mix of glucose, fructose and sucrose created from nectar made by bees.
- **Invert sugar**: Used as a food additive to preserve freshness and prevent shrinkage, this is a mix of fructose and glucose made by processing sucrose.
- **Lactose**: Sugar that occurs naturally in milk.
- **Maltose**: Starch and malt broken down into simple sugars and used commonly in beer, bread and baby food.
- **Malt syrup**: A grain syrup made from evaporated corn mash and sprouted barley.
- **Molasses**: The thick, dark syrup that's left after sugar beets or sugar cane is processed for table sugar.
- **Sucrose**: The chemical name for granulated white sugar (table sugar).
- **Syrup**: Sugar comes in many forms of syrup, a thick, sweet liquid that can be made from the processing of sugar or from sugar cane, grains such as corn or rice, maple sap, and other sources.
- **White sugar**: Same as granulated white sugar (table sugar).
Artificial Sweeteners and Sugar Alcohols

**Artificial sweeteners** are synthetic sugar substitutes; they are sometimes derived from naturally occurring substances, including herbs or sugar itself. Artificial sweeteners are also known as intense sweeteners because they are many times sweeter than regular sugar. They contain no carbohydrates, fat or protein, and thus no calories.

To date, the FDA has approved the use of five artificial sweeteners:

- aspartame (Equal®, NutraSweet®, others), 180 times sweeter than sugar
- acesulfame-K (Sunett®, Sweet One®), 200 times sweeter than sugar
- saccharin (Sweet'N Low®, Necta Sweet®, others), 300 times sweeter than sugar
- sucralose (Splenda®), 600 times sweeter than sugar
- neotame (no brand names), 7,000 to 13,000 times sweeter than sugar

Eaten in moderation, there are no health concerns associated with consumption of artificial sweeteners. However, there is worrisome evidence that regular use of artificial sweeteners may promote weight gain. One proposed mechanism is that artificial sweeteners may throw off the body's ability to accurately gauge how many calories are being taken in. Bottom line: limit consumption.

**Sugar alcohols** (polyols) are carbohydrates that occur naturally in certain fruits and vegetables, but they also can be manufactured. They're not considered intense sweeteners, because they aren't sweeter than sugar — in fact, some are less sweet than sugar.

Sugar alcohols aren't considered non-caloric sweeteners because they contain calories. But they're lower in calories than regular sugar, making them a common alternative in manufactured products. Despite their name, sugar alcohols aren't alcoholic since they don't contain ethanol, the active ingredient in alcoholic beverages.

Approved sugar alcohols and novel sweeteners include:

- Erythritol
- Hydrogenated starch hydrolysates
- Isomalt
- Lactitol
- Maltitol
- Mannitol
- Sorbitol
- Xylitol
- Stevia preparations that are highly refined (Pure Via, Truvia)

Eaten in moderation, there are no concerns associated with sugar alcohol consumption. When eaten in large amounts, usually more than 50 grams but sometimes as little as 10 grams, sugar alcohols can have a laxative effect, causing bloating, intestinal gas and diarrhea. Same bottom line: limit consumption.

Rethink your drink.
When it comes to weight loss, there’s no lack of diets promising fast results. There are low-carb diets, high-carb diets, low-fat diets, grapefruit diets, cabbage soup diets, and blood type diets, to name a few. But no matter what diet you may try, to lose weight, you must take in fewer calories than your body uses. Most people try to reduce their calorie intake by focusing on food, but another way to cut calories may be to think about what you drink.

What Do You Drink? It Makes More Difference Than You Think!

Calories in drinks are not hidden (they’re listed right on the Nutrition Facts label), but many people don’t realize just how many calories beverages can contribute to their daily intake. As you can see in the example on the next page, calories from drinks can really add up. But there is good news: you have plenty of options for reducing the number of calories in what you drink.
<table>
<thead>
<tr>
<th>Occasion</th>
<th>Instead of...</th>
<th>Calories</th>
<th>Try...</th>
<th>Calories</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morning coffee shop run</td>
<td>Medium café latte (16 ounces) made with whole milk</td>
<td>265</td>
<td>Small café latte (12 ounces) made with fat-free milk</td>
<td>125</td>
</tr>
<tr>
<td>Lunchtime combo meal</td>
<td>20-oz. bottle of nondiet cola with your lunch</td>
<td>227</td>
<td>Bottle of water or diet soda</td>
<td>0</td>
</tr>
<tr>
<td>Afternoon break</td>
<td>Sweetened lemon iced tea from the vending machine (16 ounces)</td>
<td>180</td>
<td>Sparkling water with natural lemon flavor (not sweetened)</td>
<td>0</td>
</tr>
<tr>
<td>Dinnertime</td>
<td>A glass of nondiet ginger ale with your meal (12 ounces)</td>
<td>124</td>
<td>Water with a slice of lemon or lime, or seltzer water</td>
<td>0 calories for the water with fruit slice, or about 30 calories for seltzer water with 2 ounces of 100% orange juice.</td>
</tr>
<tr>
<td>Total beverage calories</td>
<td></td>
<td>796</td>
<td></td>
<td>125-155</td>
</tr>
</tbody>
</table>

(USDA National Nutrient Database for Standard Reference)
Substituting no—or low—calorie drinks for sugar-sweetened beverages cuts about 650 calories in the example on the previous page.

Of course, not everyone drinks the amount of sugar-sweetened beverages shown. Check the list below to estimate how many calories you typically take in from beverages.

<table>
<thead>
<tr>
<th>Type of Beverage</th>
<th>Calories in 12 oz</th>
<th>Calories in 20 oz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fruit punch</td>
<td>192</td>
<td>320</td>
</tr>
<tr>
<td>100% apple juice</td>
<td>180</td>
<td>300</td>
</tr>
<tr>
<td>100% orange juice</td>
<td>168</td>
<td>280</td>
</tr>
<tr>
<td>Lemonade</td>
<td>168</td>
<td>280</td>
</tr>
<tr>
<td>Regular lemon/lime soda</td>
<td>148</td>
<td>247</td>
</tr>
<tr>
<td>Regular cola</td>
<td>136</td>
<td>227</td>
</tr>
<tr>
<td>Sweetened lemon iced tea (bottled, not homemade)</td>
<td>135</td>
<td>225</td>
</tr>
<tr>
<td>Tonic water</td>
<td>124</td>
<td>207</td>
</tr>
<tr>
<td>Regular ginger ale</td>
<td>124</td>
<td>207</td>
</tr>
<tr>
<td>Sports drink</td>
<td>99</td>
<td>165</td>
</tr>
<tr>
<td>Fitness water</td>
<td>18</td>
<td>36</td>
</tr>
<tr>
<td>Unsweetened iced tea</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Diet soda (with aspartame)</td>
<td>0*</td>
<td>0*</td>
</tr>
<tr>
<td>Carbonated water (unsweetened)</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Water</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

*Some diet soft drinks can contain a small number of calories that are not listed on the Nutrition Facts label. (USDA National Nutrient Database for Standard Reference)
Milk contains vitamins and other nutrients that contribute to good health, but it also contains calories. Choosing low-fat or fat-free milk is a good way to reduce your calorie intake and still get the nutrients that milk contains.

<table>
<thead>
<tr>
<th>Type of milk</th>
<th>Calories per cup (8 ounces)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chocolate milk (whole)</td>
<td>208</td>
</tr>
<tr>
<td>Chocolate milk (2% reduced-fat)</td>
<td>190</td>
</tr>
<tr>
<td>Chocolate milk (1% low-fat)</td>
<td>158</td>
</tr>
<tr>
<td>Whole milk (unflavored)</td>
<td>150</td>
</tr>
<tr>
<td>2% reduced-fat milk (unflavored)</td>
<td>120</td>
</tr>
<tr>
<td>1% low-fat milk (unflavored)</td>
<td>105</td>
</tr>
<tr>
<td>Fat-free milk (unflavored)</td>
<td>90</td>
</tr>
</tbody>
</table>

(USDA National Nutrient Database for Standard Reference)

Safe Weight Loss
Experts have defined healthy weight loss as a loss of 1-2 pounds per week. Most people need to cut roughly 500 calories a day to lose one pound per week. You can do this by reducing the number of calories you take in through both food or drink.
Learn To Read Nutrition Facts Carefully

Be aware that the Nutrition Facts label on beverage containers may give the calories for only part of the contents. The example below shows the label on a 20-oz. bottle. As you can see, it lists the number of calories in an 8-oz. serving (100) even though the bottle contains 20 oz. or 2.5 servings. To figure out how many calories are in the whole bottle, you need to multiply the number of calories in one serving by the number of servings in the bottle (100 x 2.5). You can see that the contents of the entire bottle actually contain 250 calories even though what the label calls a “serving” only contains 100. This shows that you need to look closely at the serving size when comparing the calorie content of different beverages.

<table>
<thead>
<tr>
<th>NUTRITION FACTS LABEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serving Size 8 fl. oz.</td>
</tr>
<tr>
<td>Servings Per Container 2.5</td>
</tr>
<tr>
<td>Amount per serving Calories 100</td>
</tr>
</tbody>
</table>

High-Calorie Culprits in Unexpected Places

Coffee drinks and blended fruit smoothies sound innocent enough, but the calories in some of your favorite coffee-shop or smoothie-stand items may surprise you. Check the website or in-store nutrition information of your favorite coffee or smoothie shop to find out how many calories are in different menu items. And when a smoothie or coffee craving kicks in, here are some tips to help minimize the caloric damage:

At the coffee shop:

• Request that your drink be made with fat-free (skim) milk instead of whole milk.

• Order the smallest size available.

• Forgo the extra flavoring—the flavor syrups used in coffee shops, like vanilla or hazelnut, are sugar-sweetened and will add calories to your drink.
• Skip the Whip. The whipped cream on top of coffee drinks adds calories and fat.

• Get back to basics. Order a plain cup of coffee with fat-free milk and artificial sweetener, or drink it black.

At the smoothie stand:

• Order a child’s size if available.

• Ask to see the nutrition information for each type of smoothie and pick the smoothie with the fewest calories.

• Hold the sugar. Many smoothies contain added sugar in addition to the sugar naturally in fruit, juice, or yogurt. Ask that your smoothie be prepared without added sugar: the fruit is naturally sweet.

Sugar by Any Other Name: How To Tell Whether Your Drink Is Sweetened

Sweeteners that add calories to a beverage go by many different names and are not always obvious to anyone looking at the ingredients list. Some common caloric sweeteners are listed below. If these appear in the ingredients list of your favorite beverage, you are drinking a sugar-sweetened beverage.

• High-fructose corn syrup

• Fructose

• Fruit juice concentrates

• Honey

• Sugar

• Syrup

• Corn syrup

• Sucrose

• Dextrose
Now that you know how much difference a drink can make, here are some ways to make smart beverage choices:

• Choose water, diet, or low-calorie beverages instead of sugar-sweetened beverages.

• For a quick, easy, and inexpensive thirst-quencher, carry a water bottle and refill it throughout the day.

• Don’t “stock the fridge” with sugar-sweetened beverages. Instead, keep a jug or bottles of cold water in the fridge.

• Serve water with meals.

• Make water more exciting by adding slices of lemon, lime, cucumber, or watermelon, or drink sparkling water.

• Add a splash of 100% juice to plain sparkling water for a refreshing, low-calorie drink.

• When you do opt for a sugar-sweetened beverage, go for the small size. Some companies are now selling 8-oz. cans and bottles of soda, which contain about 100 calories.

• Be a role model for your friends and family by choosing healthy, low-calorie beverages.
PROTEIN

Why do you need protein?
Proteins are part of every cell, tissue and organ in our bodies. We need a constant supply of proteins to keep our bodies in good working order and to repair body cells as they wear out.

What are the types of protein?
Proteins are made up of amino acids, which can be thought of as building blocks. There are 20 different amino acids that join together to make all types of proteins. Some of these amino acids can’t be made by our bodies, so they must be obtained through our diet; these are called essential amino acids.

Complete proteins provide all of the essential amino acids. These are sometimes called high-quality proteins. Animal-based foods, such as meat, poultry, fish, milk, eggs and cheese are considered complete protein sources.

Incomplete proteins may provide some essential amino acids, but they are low in at least one. Complementary proteins are two or more incomplete proteins sources that together provide adequate amounts of all essential amino acids. For example, rice and beans are each considered incomplete protein sources, but together, they provide adequate amounts of all essential amino acids and thus form a complete protein source.

How much protein do you need?
As a general rule of thumb, the average American adult should strive for 0.36 grams of good quality protein per pound of body weight every day (equals 0.8 g protein / kg body weight). Because proteins have 4 calories/gram, this accounts for approximately 10-20% of total caloric intake. Higher protein intake, up to 35% of calories, is okay, but this is considered the upper limit to leave room in the diet for healthy fats and carbohydrates (the other macronutrients). Remember, increasing protein intake without decreasing fat and carbohydrate intake will lead to excess caloric consumption, and thus weight gain.

Most Americans get enough protein, but not everyone gets enough good quality protein. Look for tips on choosing healthy protein options along the side bar.

____________________ * 0.36 g / lb = ____________ g protein / day
(your weight in pounds) (your protein requirements)

Go lean on protein!
• Choose grilled, baked, or broiled preparations
• Use lean cuts of meat that aren’t marbled, e.g., round and sirloin cuts.
• Trim all visible fat off of meats before eating
• Remove the skin from chicken, turkey and other poultry before cooking.
• Choose low-fat or fat-free dairy products

Dairy Products
• 1 egg white: 4 grams
• 1 whole egg: 6 grams
• ½ cup cottage cheese: 14g
• 1 string cheese: 8g
• 6 oz plain yogurt: 8g
• 6 oz Greek yogurt: 14-22g
• 1 cup skim milk: 8g

Meat & Poultry (cooked wt.)
• 3oz beef (top round): 29g
• 3oz chicken breast: 27g
• 3oz turkey breast: 26g
• 3oz turkey ham: 14g
• 3oz pork tenderloin: 22g

Fish / Seafood
• 4oz ocean caught: 25g-31g
• 4oz shrimp, crab: 23g
• 4oz tuna: 27g
• 4oz scallops: 25g

Beans, Lentils & Grains
• ½ cup beans: 7g
• ½ cup lentils: 9g
• ½ cup quinoa: 6g
• ¾ block tofu: 7g
• 1 veggie burger: 5-20g
Salt is America’s favorite food ingredient. Salt is used both in processed foods and home cooking. Americans consume about 2 to 4 teaspoons of salt a day. According to the 2005 Dietary Guidelines for Americans, healthy adults should have no more than 2,300 mg (or about 1 teaspoon) of sodium a day from all sources. Sodium plays a role in hypertension (or “high blood pressure”) development in many individuals. Cutting back on salt and sodium is a good idea for everybody, even kids.

1 think fresh
Most of the sodium Americans eat is found in packaged foods. Eat less often highly processed foods—especially salty chips; cured meats, such as bacon, sausage, hot dogs, and luncheon meats; canned entrées, like chili and ravioli; and many soups.

2 enjoy full-flavored, home-prepared foods
Use herbs and spices to flavor foods. Preparing your own foods allows you to control the amount of sodium you eat. Make your own salad dressings with herb mixes instead of buying pre-packed ones.

3 fill up on foods naturally low in sodium
Eat plenty of fruits, vegetables, and cooked dry beans and lentils. Many Americans need to eat 3 cups—and for some people up to a total of 6 cups—of fruits and vegetables each day, depending on the amount of calories needed. Go to MyPyramid.gov to find out the amount of fruits and vegetables YOU need.

4 get enough, but not too much, of some other foods low in sodium
Find out the specific amount of foods YOU need from the Milk Group and the Meat & Beans Group by going to MyPyramid.gov. Choose fresh cuts of beef, pork, poultry, fish, or eggs—and eat just the amount you need. Choose low-sodium cheese. Choose fat-free milk or reduced fat yogurt.

5 learn to enjoy the natural taste of foods
Savor the flavor of simply prepared foods. Try cutting back on salt little by little—and pay attention to the natural tastes and textures of various foods.

6 skip the salt
Table salt (sodium chloride) is approximately 40% sodium. Just skip adding salt when cooking. Keep salt off the kitchen counter and the dinner table.

7 read the label
Use the Nutrition Facts label and the ingredients statement to find foods lower in sodium. Look for foods labeled “low sodium” or “reduced sodium.” Foods with less than 140 mg sodium per serving can be labeled as low-sodium foods.

8 learn the lingo
Besides “salt,” sodium comes in a range of forms. When reading ingredient statements, look for: sodium benzoate, sodium nitrite, sodium ascorbate, etc. Limit sodium and salt in food.

9 ask for low-sodium foods where you eat out or shop
Ask for what you want. The marketplace is changing and supermarkets and food manufacturers want to sell healthier foods. Many restaurants will prepare low-sodium foods at your request and will serve sauces and salad dressings on the side so you can use less. The more you make your low sodium demands known, the greater the chance that food companies will change their recipes.

10 pay attention to the condiments and seasonings you use
Some seasonings are just about as high in sodium as regular table salt. So, instead of onion salt, use onion powder or replace garlic salt with fresh garlic. Limit the amount of brined or pickled foods. Buy low-sodium soy sauce. Use only a sprinkling of flavoring packets instead of the entire packet.
Restaurant Tips

• Choose restaurants you know will have healthy options. Many restaurants have websites. Check out menus in advance.

• You don’t have to eat it all – ask for part of your meal to be packaged to go.

Food preparation

• Don’t be afraid to ask how items are prepared.

• Ask for lowfat cooking spray or little or no butter or oil to be used.

• Look for choices that are roasted, poached, steamed, baked, and grilled rather than sautéed, deep fried, or pan fried. If it is sautéed, ask for wine or lemon juice to be used. If you do eat fried foods, remove any breading and skin.

• Ask for sauces on the side.

Appetizers – Choose Soup or Salad

• Choose clear broth soups or tomato-based soups.

• Avoid cream-based choices such as a bisque, chowder or cheese soup.

• Avoid salads that contain fried foods. Ask for poultry, meat, or seafood to be grilled.

• Ask for fat free or lowfat dressing. Always ask for the dressing to be put on the side, not tossed in the salad. Try vinegar or lemon juice on your salad.

• Leave off extras like croutons, cheese, egg, nuts, fried noodle strips, etc.

Entrée

• When choosing vegetarian choices, avoid cheese, cream, etc.

• Select skinless poultry, preferably white meat, and lean cuts of beef and pork such as tenderloin, London broil or filet mignon. Avoid ribs, prime rib, and other marbled meats.
Sides

- Choose colorful vegetables.
- Skip the creamed vegetables or those that have cheese.
- Be adventurous. Try something new instead of the old stand-by of French fries.
- Choose fresh fruit or a tossed salad over potato salad, coleslaw, macaroni salad, etc.

Beverages

- Drink plenty of water or low calorie sugar-free beverages with your meal.
- Consider lowfat or skim milk.

Dessert

- Order fresh fruit.
- Choose a small bowl of lowfat ice cream, sorbet, sherbet, gelatin or a piece of angel food cake.
- If you order dessert, split it with someone else.

Bread

- If bread is too tempting for you, ask your server not to bring the basket to your table.
- Limit bread to 1-2 slices per meal. Choose baked bread, rolls, and saltine crackers instead of croissants, biscuits, and cornbread.
- Leave off butter or margarine. For toast, ask for it ‘dry’.

**Eat slowly. Take plenty of time to savor the food’s flavor. Enjoy yourself!**
Healthier Grocery Store Prepared Options

Frozen Meals: Choose those with <400 calories and <700mg sodium per serving.
- Lean Cuisine
- Weight Watchers’ Smart Ones
- Gordon’s Grilled Salmon or Shrimp
- Healthy Choice
- Amy’s Organic

Deli: Choose low-sodium lean meats and low-fat cheese.
- Pre-made turkey, roast beef, or lean ham sandwiches on whole grain bread
- Fat-free beef or turkey hot dogs with ketchup and mustard
- Canned chunk light tuna or salmon (in water, NOT oil) with low-fat/fat free mayonnaise
- Rotisserie chicken (remove skin)
- Broth-based soups with vegetables and lean meat

Dairy Case: Choose low fat or nonfat versions.
- Nonfat Greek yogurt or plain yogurt (pair with fresh fruit)
- Cottage cheese, snack size 4-6 oz. (pair with fresh fruit)
- Light or low-fat string cheese

Salad Bar: Go easy on cheese, full fat salad dressings, and croutons.
- Choose a variety of vegetables and lettuce with hard boiled eggs, chicken, and/or beans, and low fat or fat-free dressing. Pair with a small bag of pretzels or baked chips to make a meal.

Breakfast: Choose low sugar, high fiber options
- Instant oatmeal, unflavored, or lower sugar / weight control varieties
- Whole grain cereal (e.g., Cheerios, Whole Grain Total, Wheat Chex, Shredded Wheat)

Beverages:
- Bottled water
- Low fat chocolate milk (good for breakfast or as a snack)
- Skim or 1% milk or light soymilk (for cereal / oatmeal, or to drink with meals)
- Seltzer, any flavor with zero calories

Fruits and Veggies:
- Any fresh fruits or ready-to-eat veggies (e.g., baby carrots, grape tomatoes, cucumbers)
- Fruit cups in fruit juice with no sugar added
- Frozen vegetables, preferably with no sauces or seasonings
Healthier Fast Food / Carryout Options

It’s best to choose home-cooked meals, but at times when that is not possible, the list below can help you choose healthier items at popular eateries. Up the nutritional value by pairing these items with additional vegetables and fruits (French fries and mashed potatoes do not count!).

Fast Food / Burger Restaurants

Wendy’s
- Apple pecan chicken salad
- Chili (w/o cheese)
- Ultimate chicken grill sandwich or grilled chicken go wrap
- Sides: side salad (no croutons) or mandarin orange cup

McDonalds
- Premium grilled chicken sandwich or grilled chicken snack wraps
- Premium salad with grilled chicken and low-fat dressing
- Fruit and maple oatmeal without brown sugar
- Fruit and yogurt parfait

Hardees
- Charbroiled turkey burger (all varieties)
- Charbroiled bbq chicken sandwich

Sub Shops / Bakeries

Subway
- Salad or sandwich from the 6 g of fat or less menu
- Broth-based soup (chicken tortilla, minestrone, roasted chicken noodle, rosemary chicken and dumpling, Spanish style chicken with rice, tomato garden vegetable with rotini, vegetable beef)

Wawa
- Any made-to-order sandwich with turkey, ham, or roast beef (on whole wheat, with ketchup, mustard, or vinegar, any veggies)
- Salad with light dressing

Dunkin Donuts
- DD Smart Menu

Einstein Bros Bagels
- The Lighter Side menu
- Whole wheat bagel thins – plain, w/light whipped cream cheese or as a sandwich with egg whites, smoked salmon, chicken breast, turkey, ham, or tuna salad (avoid creamy and buttery spreads!)
- Chicken noodle soup, turkey chili
- Nonfat latte or cappuccino (skip the extras!)

Panera
- Low-fat soups
• Salads (except steakhouse salad) with light dressing

Fast Food / Mexican Restaurants

Chipotle
• Burrito bowl (any meat)
• Salad (skip the dressing)

California Tortilla
• Burrito bowls (mixed grill or sunset chicken and veggie)
• Chicken / steak / carnitas / veggie tacos with light cheese
• Fajita platter (skip the tortillas)
• Turkey chili

Qdoba
• Naked burrito (chicken, pork, shredded beef or steak; skip the ground beef)
• Naked taco salad
• Tortilla soup

Taco Bell
• Drive-thru Diet menu

Chinese Restaurants

Panda Express
• Any Wok Smart item with mixed veggies

Chinese carry-outs (general guidelines):
• Choose protein that isn’t breaded/fried
• Ask for food to be prepared with minimal oil, and ask for sauce on the side
• Skip rice and opt for a bed of steamed veggies, or get brown rice

Chicken Restaurants

Kentucky Fried Chicken
• Grilled chicken (preferably breast)
• Grilled chicken salad (Caesar or BLT) with light / low-fat dressing (skip the croutons)
• Sides: green beans, corn on the cob

Chicken Out
• ¼ chicken (skinless)
• Freshly roasted turkey breast, grilled chicken filet (skinless), pulled rotisserie chicken breast
• Chicken noodle or vegetable primavera soup
• Sides: cucumber and onion salad, steamed vegetable medley, zucchini and yellow squash, fruit salad, green beans with red peppers and caramelized onions
How to
avoid
portion size
pitfalls
to help manage
your weight.

When eating at many restaurants, it’s hard to miss that portion sizes have gotten larger in the last few years. The trend has also spilled over into the grocery store and vending machines, where a bagel has become a BAGEL and an “individual” bag of chips can easily feed more than one. Research shows that people unintentionally consume more calories when faced with larger portions. This can mean significant excess calorie intake, especially when eating high-calorie foods.

Here are some tips to help you avoid some common portion-size pitfalls:
Go ahead, spoil your dinner.
We learned as children not to snack before a meal for fear of “spoiling our dinner.” Well, it’s time to forget that old rule. If you feel hungry between meals, eat a healthy snack, like a piece of fruit or small salad, to avoid overeating during your next meal.

**Portion control in front of the TV.**
When eating or snacking in front of the TV, put the amount that you plan to eat into a bowl or container instead of eating straight from the package. It’s easy to overeat when your attention is focused on something else.

**Directions**
Do you get caught in portion size pitfalls? Roll the dice and move along the path. (Use dice and players from another board game.) Follow the instructions for each shortcut or pitfall you land on. The turn then moves to the next player. Get on the path to proper portion control!

**Portion control when eating in.**
To minimize the temptation of second and third helpings when eating at home, serve the food on individual plates, instead of putting the serving dishes on the table. Keeping the excess food out of reach may discourage overeating.

**Portion control when eating out.**
Many restaurants serve more food than one person needs at one meal. Take control of the amount of food that ends up on your plate by splitting an entrée with a friend. Or, ask the wait person for a “to-go” box and wrap up half your meal as soon as it’s brought to the table.
Out of sight, out of mind. People tend to consume more when they have easy access to food. Make your home a “portion friendly zone.”

- Replace the candy dish with a fruit bowl.
- Store especially tempting foods, like cookies, chips, or ice cream, out of immediate eyesight, like on a high shelf or at the back of the freezer. Move the healthier food to the front at eye level.
- When buying in bulk, store the excess in a place that’s not convenient to get to, such as a high cabinet or at the back of the pantry.

Be aware of large packages. For some reason, the larger the package, the more people consume from it without realizing it. To minimize this effect:

- Divide up the contents of one large package into several smaller containers to help avoid over-consumption.
- Don’t eat straight from the package. Instead, serve the food in a small bowl or container.
Check out these websites for more portion size tips

• The Portion Distortion Quiz from the National Heart Lung and Blood Institute (NHLBI) (http://hin.nhlbi.nih.gov/portion/) shows how portion sizes of some common foods have changed over the years.

• Food labels can help you understand that portion sizes are often larger than you think. Click the links below to learn how to use the Nutrition Facts Label on food packages:

• Take the NHLBI Visual Reality quiz (http://nhlbisupport.com/chd1/visualreality/visualreality.htm) to test your skills at estimating serving sizes.

• Use this handy Serving Size Wallet card from NHLBI (http://hin.nhlbi.nih.gov/portion/servingcard7.pdf) to help estimate the right amount to eat. Or check out www.MyPyramid.gov for detailed information on how much to eat from each food group without eating more calories than you need.
Using the Nutrition Facts Label

Most packaged foods have a Nutrition Facts label. For a healthier you, use this tool to make smart food choices quickly and easily. Try these tips:

- Keep these low: saturated fats, trans fats, cholesterol, and sodium.
- Get enough of these: potassium, fiber, vitamins A and C, calcium, and iron.
- Use the % Daily Value (DV) column when possible: 5% DV or less is low, 20% DV or more is high.

Check servings and calories. Look at the serving size and how many servings you are actually consuming. If you double the servings you eat, you double the calories and nutrients, including the % DVs.

### Sample Label for Macaroni and Cheese

#### Nutrition Facts

**Serving Size 1 cup (228g)**  
**Servings Per Container 2**  

<table>
<thead>
<tr>
<th>Amount Per Serving</th>
<th>Calories 250</th>
<th>Calories from Fat 110</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>% Daily Value*</td>
<td></td>
</tr>
<tr>
<td>Total Fat</td>
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</tr>
<tr>
<td>Saturated Fat</td>
<td>3g</td>
<td>15%</td>
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<tr>
<td>Trans Fat</td>
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<td></td>
</tr>
<tr>
<td>Cholesterol</td>
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<tr>
<td>Sodium</td>
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<tr>
<td>Potassium</td>
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<tr>
<td>Total Carbohydrate</td>
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<td>0%</td>
</tr>
<tr>
<td>Sugars</td>
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<td></td>
</tr>
<tr>
<td>Protein</td>
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<td></td>
</tr>
<tr>
<td>Vitamin A</td>
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</tr>
<tr>
<td>Vitamin C</td>
<td></td>
<td>2%</td>
</tr>
<tr>
<td>Calcium</td>
<td></td>
<td>20%</td>
</tr>
<tr>
<td>Iron</td>
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<td>4%</td>
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* Percent Daily Values are based on a 2,000 calorie diet. Your Daily Values may be higher or lower depending on your calorie needs.

<table>
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<tr>
<th>Calories</th>
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<tr>
<td>Total Fat</td>
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</tr>
<tr>
<td>Saturated Fat</td>
<td>Less Than</td>
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<tr>
<td>Cholesterol</td>
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<tr>
<td>Total Carbohydrate</td>
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</tr>
<tr>
<td>Dietary Fiber</td>
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</table>

Source: Food and Drug Administration (FDA)

Make your calories count. Look at the calories on the label and compare them with what nutrients you are getting to decide whether the food is worth eating.

Don’t sugar-coat it. Since sugars contribute calories with few, if any nutrients, look for foods and beverages low in added sugars. Read the ingredient list and make sure that added sugars are not one of the first few ingredients. Some names for added sugars (caloric sweeteners) include sucrose, glucose, high-fructose corn syrup, corn syrup, maple syrup, and fructose.

Know your fats. Look for foods low in saturated fats, trans fats, and cholesterol to help reduce the risk of heart disease (5% DV or less is low, 20% DV or more is high). Most of the fats you eat should be polyunsaturated and monounsaturated fats. Keep total fat intake between 20 percent to 35 percent of calories.

Reduce sodium (salt), increase potassium. Research shows that eating less than 2,300 milligrams of sodium (about 1 tsp of salt) per day might reduce the risk of high blood pressure. Most of the sodium people eat comes from processed foods, not from the salt shaker. Also, look for foods high in potassium, which counters some of sodium’s effects on blood pressure.
Nutrient Label Claims

There are lots of terms on food labels. The list below explains what some of them mean. But keep in mind that most of these claims are in regard to a single nutrient, so even if something is, for instance, “low fat” it can still be high in calories, sodium, and sugar! So be sure to look at the complete nutrition facts label and the ingredients list before making your final decision.

**Free:**
Sugar free, fat free, sodium free or calorie free – too small an amount to affect your diet.

**Low :**
Low fat: 3 grams or less of fat per serving
Low in saturated fat: 1 g or less per serving and not more than 15 percent of calories from saturated fat
Low-cholesterol: 20 mg or less and 2 g or less of saturated fat per serving
Low calorie: 40 calories or less per serving
Low-sodium: 140 mg or less per serving

**Reduced :**
Contains 25% less of a nutrient than compared to a similar food. Examples include reduced calorie, reduced fat, reduced cholesterol, or reduced sodium. You will also see “reduced in”, “fewer”, “lower”, “lower in”, or “less”.

**Light:**
⅓ fewer calories, 50% less fat or 50% less sodium than the original.

**High:**
20% of the Daily Value (DV) of a nutrient (example: calcium, vitamin C)
You will also see “excellent source of” or “rich in”.

**Good Source:**
10-19% of the Daily Value of a nutrient (example: folate, iron)
You will also see “contains” or “provides”.

**More:**
10% of the Daily Value of a nutrient (example: fiber)
You will also see “enriched”, “fortified”, or “added”.

**Lean:**
Less than 10 g fat, 4.5 g or less saturated fat, and less than 95 mg cholesterol per serving

**Extra Lean:**
Less than 5 g fat, less than 2 g saturated fat, and less than 95 mg cholesterol per serving
# Free Online Nutritional Resources

## General resources:

<table>
<thead>
<tr>
<th>Website</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://www.fruitsandveggiesmarter.gov/index.html">http://www.fruitsandveggiesmarter.gov/index.html</a> and <a href="http://www.fruitsandveggiesmorematters.org/">http://www.fruitsandveggiesmorematters.org/</a></td>
<td>Comprehensive fruit and vegetable resource sites, including recipes, budget tips, planning and shopping guides, and interactive tools</td>
</tr>
<tr>
<td><a href="http://www.cdc.gov/obesity/index.html">http://www.cdc.gov/obesity/index.html</a> and <a href="http://www.cdc.gov/obesity/resources.html">http://www.cdc.gov/obesity/resources.html</a></td>
<td>More detailed information about overweight and obesity published by the Centers for Disease Control (CDC), as well as a list of resources and publications on achieving a healthy weight</td>
</tr>
</tbody>
</table>

## Tools to track daily food consumption and exercise:

<table>
<thead>
<tr>
<th>Website</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://sparkpeople.com">sparkpeople.com</a></td>
<td>Numerous tools, including calorie counter, fitness programs, motivational systems and feedback reports</td>
</tr>
<tr>
<td><a href="http://fitday.com">fitday.com</a></td>
<td>Online diaries to track daily intake, exercise, weight loss and goals</td>
</tr>
<tr>
<td><a href="http://livestrong.com">livestrong.com</a> and <a href="http://livestrong.com/thedailyplate/">livestrong.com/thedailyplate/</a></td>
<td>Extensive fitness and nutrition tools, including the Daily Plate application to search foods and track daily intake</td>
</tr>
<tr>
<td><a href="http://mypyramid.gov">mypyramid.gov</a></td>
<td>Personalized eating plans and interactive tools (including food and exercise trackers) based on the USDA food pyramid</td>
</tr>
<tr>
<td><a href="http://nutritiondata.com">nutritiondata.com</a></td>
<td>Nutritional information for popular foods, including from fast-food and sit-down restaurants, with a daily intake tracker</td>
</tr>
</tbody>
</table>

## Databases of nutritional information and recipes:

<table>
<thead>
<tr>
<th>Website</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><a href="http://recipefinder.nal.usda.gov">recipefinder.nal.usda.gov</a></td>
<td>Nutritious and affordable recipes with various search functions</td>
</tr>
<tr>
<td><a href="http://hp2010.nhlbihin.net/healthyeating/">hp2010.nhlbihin.net/healthyeating/</a></td>
<td>Healthy recipes and other healthy cooking resources (e.g., information on healthy preparations and ingredients)</td>
</tr>
<tr>
<td><a href="http://healthydiningfinder.com">healthydiningfinder.com</a></td>
<td>Lists of healthy options at popular fast-food and sit-down restaurants</td>
</tr>
<tr>
<td><a href="http://calorieking.com/foods/">calorieking.com/foods/</a></td>
<td>Nutritional information for popular foods, including from fast-food and sit-down restaurants</td>
</tr>
</tbody>
</table>
Maintaining Healthy Habits

Maintaining healthy habits can be difficult even without the extra temptations of the holiday season. Use the tips and reminders below to navigate any belated holiday get-togethers and to help you stay on track throughout the year.

Healthy eating tips for parties and special occasions:

- Don’t skip meals to save calories for the unhealthy food you plan to eat at a party or special meal. Instead, choose healthy, low-calorie foods like a salad or grilled chicken breast at lunch, and snack on raw vegetables or fruit to curb your appetite before leaving for the dinner or party. Skipping meals may cause you to overeat and consume more calories than you would if you had eaten something beforehand.

- Survey party buffets before filling your plate to develop a plan to sample the foods you enjoy without abandoning the good habits you’ve formed.
  - It’s okay to eat some of your favorite treats; just spend your calories wisely, eat small portions, and enjoy the foods you choose.
  - Always remember to fill half of your plate with vegetables and fruits to keep your plate balanced and to help feel full on fewer calories.

- Eat until you are satisfied, not stuffed. Sit down, get comfortable, and take time to enjoy the taste of your meal. Pace yourself and try to be the last person to finish each course. Take small bites and chew slowly. Remember, it takes about 20 minutes for your brain to get the message from your stomach that you are full.

- Stay more than an arm’s length away from the buffet tables and snack bowls.

- Bring your own healthy dish to gatherings. This strategy not only provides you with a good menu option, but your host will greatly appreciate the help.

- Be careful with beverages; alcoholic and non-alcoholic drinks are often full of calories and sugar. Alcohol can also lessen inhibitions and induce overeating. Instead, drink lots of water, or make a cocktail with seltzer (not tonic!) and fresh lime juice.

- Concentrate on socializing, making new acquaintances, and having fun. Think about what you are celebrating, not just about how great the food is! When talking, set down your plate and give the conversation your full attention.

- Chew gum once you finish eating to keep from nibbling on additional food.

Remember the energy balance equation!

To maintain weight, “energy in” (calories consumed) should equal “energy out” (calories burned). So in addition to watching what you eat, make sure to plan time for exercise. Not only can a moderate and daily increase in exercise help prevent weight gain, exercise also helps relieve stress. Start with 10- or 15-minute brisk walks two times a day if you are not currently active.

Healthy party foods (also good everyday snacks!):

- crudités (raw sliced veggies)
- steamed asparagus or other steamed veggies
- grapes and other fresh fruit
- lean deli meats – turkey, chicken, roast beef
- chicken kabobs
- steamed shrimp and other seafood
- salsa (instead of chips, eat with veggies, chicken, or on its own)
- sparkling water

Ingredient substitutions and other tips to improve the nutrition of your favorite recipes:

- Use non-fat plain yogurt (or Greek yogurt) in place of sour cream
- Use evaporated skim milk in place of heavy cream or half and half
- Use two egg whites or ¼ cup egg substitute in place of one egg
- Use additional spices and herbs in place of (at least half of the) salt
- Use rolled oats or crushed whole grain cereal in place of breadcrumbs
- Use quinoa in place of white rice (both require the same amount of time and water to cook)
- Double or triple the vegetables called for in the recipe while keeping the grain (e.g., pasta) and meat quantities the same
- In baked goods, use applesauce in place of oil/butter, and top with meringue or fresh fruit instead of frosting
- Use cooking spray instead of oil/butter to coat pots and pans
- In general, choose the low-fat or non-fat options whenever possible (e.g., low-fat mayo in place of regular mayo, skim milk instead of whole milk)
- If sticking with unhealthy ingredients, cut the quantity in half (e.g., use half of the sugar called for in the recipe)

Keep in mind your calorie allowance!

In a calorie budget, the “essentials” are the calories in the foods that you need to eat to get enough of the essential nutrients. Extras are non-essential foods like dessert, soda, or butter added to vegetables. Each person has a limited number of extras, or a small discretionary budget, sometimes only 100 to 300 calories.

Don't blow your discretionary calories on foods you don’t enjoy. There are so many delicious treats to enjoy that there’s no reason to mindlessly raid the vending machine or the candy jar. Try to save your discretionary calories for your favorite treats, but remember to watch your portion size. And always fill up on healthy foods to make your discretionary budget go further.

Take the focus off of food.

Plan activities with friends and family that don’t revolve around food, such as a board game night, a sports game (e.g., flag football), or volunteering in the community.
Healthier Vending Machine Options

Vending machines are notoriously packed with empty calories. It’s hard to stock truly healthy items in (non-refrigerated) machines, but the suggestions below can help with choosing healthier options that can curb hunger or satisfy a craving without causing much damage. The main thing to watch out for is bag size; many vending machine staples are sold in bags that are too large. For instance, many "single-serving" bags of nuts include several ounces, which is much more than is recommended for one sitting.

Below are some guidelines to help you find appropriate options, and some specific suggestions for each:

- **Nuts and peanuts:** 100-calorie packs (usually 0.5-0.7 ounces) or 1 ounce bags, raw or roasted
  - Planters 1 oz peanuts: [http://www.planters.com/varieties/onthego.aspx](http://www.planters.com/varieties/onthego.aspx)
- **Sunflower seeds:** 0.9 to 1.75 ounce bags, with shells
- **Baked chips:** 1 to 1.25 ounce bags
  - [http://www.amazon.com/Lays-Potato-Crisps-1-125-Ounce-Single/dp/B000R7QU8W/ref=sr_1_4?ie=UTF8&qid=1297444104&sr=8-4](http://www.amazon.com/Lays-Potato-Crisps-1-125-Ounce-Single/dp/B000R7QU8W/ref=sr_1_4?ie=UTF8&qid=1297444104&sr=8-4)
- **Microwaveable popcorn:** low-fat mini bags
  - Jolly Time 100 calorie mini bags: [http://www.amazon.com/Jolly-Time-Healthy-Microwave-10-Count/dp/B000MAK3UA/ref=pd_bxgy_gro_img_b](http://www.amazon.com/Jolly-Time-Healthy-Microwave-10-Count/dp/B000MAK3UA/ref=pd_bxgy_gro_img_b)
- **Dried or baked fruit, no sugar added:**
  - Raisins: 0.5 to 1.5 ounce boxes (e.g., Champion 100-calorie pack raisins: [http://www.amazon.com/Champion-Calorie-Raisins-Count-Ounce/dp/B00196WXA4/ref=sr_1_18?ie=UTF8&qid=1297962044&sr=8-18](http://www.amazon.com/Champion-Calorie-Raisins-Count-Ounce/dp/B00196WXA4/ref=sr_1_18?ie=UTF8&qid=1297962044&sr=8-18))
  - Baked apple chips (avoid fried): [http://www.amazon.com/Bare-Fruit-Organic-Bake-Dried-Cinnamon/dp/B0017I753O/ref=sr_1_1?ie=UTF8&qid=1297961967&sr=8-1](http://www.amazon.com/Bare-Fruit-Organic-Bake-Dried-Cinnamon/dp/B0017I753O/ref=sr_1_1?ie=UTF8&qid=1297961967&sr=8-1)
- **Granola / snack bars with 10 grams or less of sugar:**
- **Energy bars made entirely of dried fruits and nuts:** varieties with 200 calories or less
  - "Clif C" bar (other varieties of Clif bars have high amounts of added sugar): [http://www.amazon.com/gp/product/B00336EXQ0/ref=pd_lpo_k2_dp_sr_1?ie=UTF8&pf_rd_p=486539851&pf_rd_s=lop-top-stripe-1&pf_rd_t=201&pf_rd_i=B003COG3L6&pf_rd_m=ATVPDKIKX0DER&pf_rd_r=17Q0AMN1MV7JH2V4KEV8](http://www.amazon.com/gp/product/B00336EXQ0/ref=pd_lpo_k2_dp_sr_1?ie=UTF8&pf_rd_p=486539851&pf_rd_s=lop-top-stripe-1&pf_rd_t=201&pf_rd_i=B003COG3L6&pf_rd_m=ATVPDKIKX0DER&pf_rd_r=17Q0AMN1MV7JH2V4KEV8)
  - Jerky (beef or turkey): 100-calorie packs

- Tuna: plain or with light mayo, addition of crackers is okay

- Canned soup: broth-based reduced sodium varieties
- Oatmeal packets: low sugar if possible, full-sugar is also fine

- And remember, when purchasing less healthy items for vending machines, it’s even more important to stick with smaller packages (e.g., 1 oz bags of chips / Cheetos, regular size rather than king size candy bars, etc) to encourage portion control and decrease total caloric consumption.
APPENDIX D: FFIRE STUDY RECIPES

The included recipes were prepared during cooking demonstrations at monthly education sessions.

- Microwaved spaghetti squash
- Spinach and meat sauce
- Turkey burgers
- Creamy coleslaw
Microwaved Spaghetti Squash

**Ingredients:**

1 medium spaghetti squash (look for a firm, mild to bright yellow squash)

Black pepper (½ tsp or to taste)
Garlic powder (½ tsp or to taste)
Dried oregano (1 tsp or to taste)
Salt (optional; to taste)

¼ cup Italian blend shredded cheese

**Directions:**

Pierce squash several times with knife or fork to allow steam to escape (be sure to pierce through the outer rind). This step is very important – otherwise, the squash will explode in the microwave!

Microwave on high power for 10 minutes (smaller squashes will need less time (start with 7 or 8 minutes); larger squashes will need more (start with 12 to 15 minutes))

Check for doneness – squash should be soft to the touch and will probably look collapsed. Microwave for additional time as needed

Cut squash in half (careful – it will be very hot!) and scoop out the seeds (these can be discarded or roasted as you would pumpkin seeds)

Scoop out the spaghetti-like strands of squash into a large bowl

Add seasonings and toss to coat

Add cheese and toss again

Enjoy!

* This is only one recommendation for seasoning spaghetti squash. Use other seasonings, incorporate fresh herbs, skip the cheese, or serve with pasta sauce – the beauty of spaghetti squash is that it works well with many flavors!
Spinach and Meat Sauce

Ingredients:

3 cloves garlic, minced (or 2 teaspoons bottled garlic packed in water)
1 large onion, thinly sliced

1 package 93% lean ground turkey (19.2 – 20.8 ounces)

½ tsp salt, optional
1 tsp pepper, optional
1 tsp cumin, optional
1 tsp paprika, optional
½ tsp garlic powder, optional

16 oz bag frozen chopped spinach (can substitute other greens, fresh or frozen)
1 tsp low-sodium soy sauce
2 tsp balsamic vinegar

4-5 cups bottled pasta sauce of choice (equals 1 ½ 24-ounce bottles)
2 tsp dried oregano (can substitute other herb, fresh or dried)

Directions:

Spray bottom of large pot with cooking spray

Sauté garlic until fragrant, approximately 2 minutes

Add onion; cook until softened, approximately 5 minutes

Add ground turkey and spice to taste (if using, add salt, pepper, cumin, paprika and garlic powder at this time); cook until browned (approximately 7 – 10 minutes)

Drain liquid from pan

Add spinach, soy sauce and balsamic vinegar; cook until spinach is thawed, approximately 3 minutes

Add pasta sauce and oregano, mix well, allow to heat thoroughly

Serve over whole grain pasta, spaghetti squash, or on its own

Enjoy!
Turkey Burger and Coleslaw Recipes

Turkey Burgers:

- 1 package 93% lean ground turkey (19.2 – 20.8 ounces)
- 4 teaspoons Worcestershire sauce
- ½ teaspoon salt
- ½ teaspoon pepper
- 1 teaspoon garlic
- ½ teaspoon paprika

Mix together all ingredients. Form 5 (approximately 4-ounce) patties. Grill until cooked through, about 10 minutes, flipping once halfway through if using an outdoor grill. Serve with whole grain hamburger buns, ketchup/mustard, and lettuce/onion/tomato. If adding mayonnaise or cheese, be sure to choose low-fat varieties.

Creamy Coleslaw:

- 1 cup plain non-fat or low-fat yogurt
- 2 tablespoons Dijon mustard
- 3 tablespoons non-fat or low-fat mayonnaise
- 1 tablespoon fresh lemon juice
- 4 – 5 cups coleslaw veggie mix (thinly sliced cabbage and shredded carrots)
- 1 cup thinly sliced red onion (about 1 large) (optional)
- 1/2 teaspoon dill seeds (optional)
- Salt and pepper to taste

Blend together the first four ingredients until smooth to make dressing. Pour over veggies and mix until evenly distributed. Add salt and pepper to taste (and dill seed if desired).
The FFIRE study evaluation forms were completed at each station following monthly sessions.

- FFIRE Study Education Session Evaluation (*distributed to all attendees including non-participants*)
- FFIRE Interventionist Evaluation
FFIRE Study Education Session Evaluation

We would like your opinion on today’s education session to help us improve it. Please answer the following questions:

Are you enrolled in the FFIRE study (circle one)?    YES    NO

What was the most important thing you learned from today’s presentation?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

What questions do you have after the presentation?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

What did you like about the presentation?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

What would you like to see changed for the next session?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

What do you wish you had gotten out of this session that you didn’t?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Please provide any additional comments on the back, then return this evaluation. THANK YOU!!
FFIRE Interventionist Evaluation

Fire Station: ________________________________________________________________

Date / Session #: __________________________________________________________

# attendees: _______________ (# participants: ___________, # non-participants: ___________)

What topics were covered? Was there a cooking demonstration? What food was provided?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

How involved were the participants? Did they appear to understand the content?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

Suggested improvements for the next session?
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________
______________________________________________________________________________

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CURRICULUM VITAE

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EDUCATION

2017
PhD candidate, Human Nutrition, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD
Dissertation: Fighting Fires and Fat: A Nutrition Intervention to Address Obesity in the Fire Service.

2009
MHS, Human Nutrition, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD
Masters paper: Validation of a quantitative food frequency questionnaire (QFFQ) for Apache communities.

2004
BS, Psychology and BA, Anthropology, Honors and Gemstone Program citations, University of Maryland, College Park, MD

PROFESSIONAL EXPERIENCE

2010-
Graduate Research Assistant, Maryland Firefighter Food Intervention, Research and Evaluation (FFIRE) Study, Center for Injury Research and Policy, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD

Responsibilities: Developed and implemented educational and environmental components of a novel firefighter nutrition intervention to decrease obesity and risk of heart attack. Led monthly presentations and cooking demonstrations at participating stations, coordinated changes to food environment, and contributed to questionnaire development and data collection. Analyzed nutritional data using longitudinal models. Manuscript preparation is ongoing.

2014-2015
Community Outreach Coordinator, Center for Chronic Disease Prevention and Control, Maryland Department of Health and Mental Hygiene

Responsibilities: Oversaw implementation of environmental initiatives to promote health and reinforce healthful behaviors, particularly through improved nutrition and increased physical activity. Collaborated closely with the MD State Department of Education to support school- and childcare-based programs.
Developed work plan activities for upcoming grant years, provided guidance to statewide partners, and monitored deliverable completion.

2009-2011 Graduate Research Assistant, Healthy Bodies, Healthy Souls, Center for Human Nutrition, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD

Responsibilities: Assisted in development of church-based diabetes prevention program in Baltimore. Developed and administered study instruments to assess dietary intake and behavior, attitudes, and knowledge of nutrition and physical activity. Trained data collectors on study instruments. Led workshops with church representatives to identify key problems and plan intervention.

2008-2010 Graduate Research Assistant, Apache Healthy Foods and Navajo Healthy Stores, Center for Human Nutrition, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD, San Carlos Apache Reservation, AZ and Navajo Nation, AZ and NM

Responsibilities: Coordinated validation studies for the Apache and Navajo Food Frequency Questionnaires (FFQ). Randomized households, prepared materials, and administered instruments including the FFQ and 24-hour recalls. Completed data entry and analysis using NutriBase software.

2007-2008 Interventionist, Baltimore Healthy Stores, Center for Human Nutrition, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD

Responsibilities: Educated customers in local corner stores on issues of nutrition and worked with store owners to stock healthy foods. Organized in-store taste-tests and cooking demonstrations, discussed healthy food selection and preparation with customers, distributed educational materials, and labeled promoted foods.

2007-2008 Formative Researcher, Baltimore Healthy Eating Zones, Center for Human Nutrition, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD

Responsibilities: Conducted 24-hour dietary recalls and tabulated results to inform the creation of an adolescent obesity-prevention program in Baltimore. Assisted in the development of additional instruments to assess food behavior, attitudes, and knowledge.


Responsibilities: Assisted dietitian and chef with classes on preparing nutritious meals on a budget for low-income adults. Prepared ingredients for in-class demonstrations, assisted students with meal preparation, and answered student questions.

2005-2007 Data Manager, The EMMES Corporation, Rockville, MD
Responsibilities: Assisted in the coordination of over 50 research sites in a pivotal phase III NIH-sponsored vaccine clinical trial. Directed sites in all aspects of protocol compliance, created reports to monitor study progress and safety, evaluated study endpoints and maintained database of decisions, and developed data capture forms for Internet-based systems. Participated in training of new staff members internally and at study sites.

2003-2004 Research Assistant, Child Development Lab, University of Maryland, College Park, MD

Responsibilities: Compiled and administered research tasks and maintained numerous databases for an NIH research trial on amygdala activation in social situations.

2001-2004 Researcher, University of Maryland, College Park, MD and William Wirt Middle School, Riverdale, MD

Responsibilities: Designed and implemented a weekly after-school contemporary issues-based program to increase motivation for learning in low-income middle school students in a four-year team project as part of the Gemstone Program.

2001-2004 Resident Assistant, Department of Resident Life, University of Maryland, College Park, MD

Responsibilities: Helped residents resolve personal and academic issues and planned monthly educational and social programs.

2000-2001 Political Intern, Progressive Maryland, Silver Spring, MD

Responsibilities: Contributed to living wage, affordable housing, and clean money campaigns by organizing protests, lobbying politicians, and recruiting support from constituents.

1999-2000 Research Assistant, Neuropsychology Lab, American University, Washington, DC

Responsibilities: Developed and administered research tasks for a study on ability to interpret emotion in body posture.

HONORS AND AWARDS

Fellowships / Scholarships

2014 Hall/Graham Travel Award
2011 Harry J. Prebluda Fellowship in Nutritional Biochemistry
2010 Elsa Orent Keiles Fellowship in Human Nutrition
2007 Johns Hopkins Center for Global Health Scholarship (full tuition scholarship for first year of graduate study)
2000 University of Maryland Banneker Key Scholarship (full tuition, room and board for four years of undergraduate study)
### 2000
- Maryland Distinguished Scholarship (annual scholarship for four years of undergraduate study)

### Honors
- 2004 Maryland Medallion Society inductee, University of Maryland, College Park
- 2004 Omicron Delta Kappa National Leadership Honor Society inductee
- 2004 Who’s Who Among Students in American Universities and Colleges
- 2003 Psi Chi National Psychology Honor Society inductee
- 2003 Golden Key International Honour Society inductee
- 2003 National Residence Hall Honorary inductee

### PUBLICATIONS

**Journal Articles**


Goheer A, Gittelsohn J, Bailey M, Cheskin L, Yenokyan G, Pollack K. A pilot environmental and educational nutrition intervention improves firefighter diet and advances readiness to change. (In preparation to submit to *Preventing Chronic Disease*)


**Posters and Presentations**


**ACADEMIC SERVICE**

2007-10 Johns Hopkins Bloomberg School of Public Health Student Assembly
Positions held: Vice President of Social and Cultural Affairs, Member-At-Large

2000-04 University of Maryland Student Entertainment Events
Positions held: President, Comedy Director, Cultural Events Director

**TEACHING**

2010-2011 Teaching Assistant, Food Technology and Health, Center for Human Nutrition, The Johns Hopkins University Bloomberg School of Public Health, Baltimore, MD
Responsibilities: Organized class logistics, developed exam questions, coordinated and graded assignments and assisted with student questions.

2004 5th grade teacher, Baltimore City Public School System
Responsibilities: Selected and trained by Teach for America. Diagnosed student needs, developed and taught lesson plans, created and graded assessments, monitored student progress, and established communication with parents.

2001-2002 Section Leader, Introduction to a Liberal Education, University Honors Program, University of Maryland, College Park, MD
Responsibilities: Led introductory class for freshman in the University Honors Program. Developed lesson plans, moderated discussions, and graded assignments.

**SOFTWARE SKILLS**

- SAS statistical package
- NutriBase professional nutrition and fitness software
- Microsoft Office suite – Access, Excel, Word, PowerPoint

**LANGUAGES**

- Urdu / Hindi – oral fluency
ADDITIONAL INFORMATION

Personal Statement of Research

My research interests are centered on interventions to address obesity and related chronic diseases.

Specific interests include:

- Development of worksite obesity and diabetes interventions;
- Integration of educational and environmental components to facilitate behavior change;
- Development of culturally-, socially-, and economically-appropriate interventions.