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Awareness, Perception, and Self-Reported Purchasing Behaviors of College Students
Regarding Front-of-Package Nutrition Labeling Systems and Symbols

A thesis
presented to
the faculty of the Department of Allied Health Sciences
East Tennessee State University

In partial fulfillment
of the requirements for the degree
Master of Science in Clinical Nutrition

by
Audrey L. Kessler
August 2016

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Keywords: Front-of-Package, Nutrition Systems and Symbols, Nutrition Label, Nutrition
Rating, College Student, Emerging Adulthood

ABSTRACT

Awareness, Perception, and Self-Reported Purchasing Behaviors of College Students

Regarding Front-of-Package Nutrition Labeling Systems and Symbols

by

Audrey L. Kessler

Traditional students enroll in post-secondary institutions during emerging adulthood. College enrollment is increasing and adult weight gain occurs most rapidly during the college-age years, with poor food decisions as a potential contributing factor. The present study examined the awareness, perception, and self-reported purchasing behaviors of college students regarding four front-of-package (FOP) nutrition labeling systems and symbols. Students were sent a 24-question web-based survey, with 908 completed surveys that met the research criteria. There were 888 (98.3%) respondents who recognized at least one of the four presented FOP nutrition labels. There were no significant differences between the groups that recognized one to four of the FOP nutrition labels in their stated likelihood to purchase foods with the specified labels. Students' awareness of four commercial FOP nutrition labeling systems and symbols on product packaging did not have an impact on their food purchasing behaviors.

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CHAPTER 1

INTRODUCTION

High rates of overweight and obesity pose serious public health challenges in the United States (U.S.). One-third of children are overweight or obese, 90% of whom are predicted to remain so as they enter adulthood.^{1,2,3} In the transition from an overweight child to an overweight adult lies another life stage: the overweight adolescent maturing into an overweight young adult. About 14% of the U.S. population consists of adolescents (10-19 years of age) and young adults (20-24 years of age).⁴

Referred to as “young invincibles” by some, youthful Americans are not immune to the ramifications of excess weight gain.⁵ Adolescent and young adult obesity have many consequences for the individual and society, both immediately and in the long-term. Implications include increased susceptibility to chronic health disorders, such as insulin resistance leading to type 2 diabetes, cardiovascular diseases, osteoarthritis, several types of cancer, as well as psychological disorders and premature death.^{6,7} This equals billions of dollars in direct and indirect healthcare costs annually.^{8,9} With 27% of 17 to 24-year-olds unfit to join the military due to their weight, adolescent and young adult weight issues also threaten the strength of our national security.¹⁰

Adolescents and young adults ages 18 to 25 are embarking on a period of life that may be referred to as “emerging adulthood,” a unique developmental time characterized by much “change and exploration.”¹¹ It is within this age range that traditional aged students often enroll in college or university. The percentage of traditional college-age students (18-24 year olds) enrolled in college increased from 35.5% in 2000 to 39.9% in 2013.¹²

Leaving home for college demands increasing independence and autonomy, requiring greater responsibility for one's daily activities. Unfortunately, as a result, poor eating habits are among the unhealthful behaviors college students frequently develop throughout their college careers, and these may continue into adulthood.^{13,14,15} This may help to explain the roughly 30 to 40% of college students in the U.S. self-reported as overweight or obese.¹⁶

Given the negative health impacts that excess weight in this segment of the population can have and the scarcity of research conducted on this age group, these emerging adulthood years may be a critical time to hone in on diet-related behavior patterns.¹⁷ Studies have illustrated that college students make poor food decisions.^{18,19} In a survey of college students at 140 institutions, 93.5% of students reported consuming four or fewer servings of vegetables and fruits every day.¹⁶ On the other hand, other researchers have found college students with increased familiarity with the Dietary Guidelines for Americans (DGAs) made more healthful food choices, which translated into an increased likelihood of meeting these recommendations.¹⁹

Researchers assessed behaviors and attitudes of undergraduate students toward Nutrition Facts Panels (NFPs), and found that a large percentage of students viewed food labels to be useful and used them when purchasing a product for the first time.^{20,21} Also, study authors focused on displaying point-of-purchase (POP) nutrition information in on-campus college dining halls and convenience shops found that labels in the form of shelf display tags, posters, and/or flyers providing nutrient information and promotional messages successfully encouraged students to opt for healthier products and increased purchases of labeled foods.^{22,23,24}

Front-of-package (FOP) labeling is another tool to promote nutritious food choices. To complement the more detailed NFP, voluntary FOP labels have been designed to provide at-a-glance guidance. These nutrition labeling systems and symbols are intended to help consumers identify nutritional characteristics of food products and simplify the ability to choose healthier foods and beverages suitable for their daily energy needs.²⁵ Usually found on the main/front display panel, FOP labels may be found on the back, top, or side panels of a food product, or may also be on shelf tags.²⁶ Initially developed by governmental agencies and non-profit organizations as early as 1987, retailers, food industry, and non-food industry experts today are creating their own FOP labels.²⁷

Upon request from Congress, the Institute of Medicine (IOM) undertook a study in 2010 examining FOP nutrition rating systems and symbols, identifying 20 systems in the marketplace.²⁸ Despite being inconsistent in format, content, and criteria, the IOM grouped them all into three broad categories based on general characteristics: (1) nutrient-specific systems, (2) summary indicator systems, and (3) food group information systems. Currently, there is no research that has studied the impact of these FOP nutrition rating systems and symbols on U.S. college student food purchases and eating patterns.

Behaviors during emerging adulthood may have acute and chronic effects on disease risk. This unique period of time, the late teens to the mid-20s, may be a critical, malleable life stage for establishing long-term behavioral routines that promote health and lessen long-term disease risk by reducing the prevalence of overweight and obesity into adulthood.^{29,30} Given that a substantial percentage of traditional students are

enrolled in postsecondary institutions, the college population represents a prime audience for health promotion interventions.

Poor dietary intake is a primary modifiable behavior contributing to morbidity.³¹ FOP nutrition labeling systems and symbols have been designed to be simple and easy to understand, attempting to encourage healthier food purchases. Therefore, the purpose of this research is to investigate whether students are familiar with and have developed opinions about four distinct FOP nutrition labeling systems and symbols frequently displayed on U.S.-sold food products, and if so, whether these FOP nutrition labeling systems and symbols influence students' food purchases. The four FOP nutrition labeling systems and symbols include the: (1) Facts Up Front (FUF) Icons, (2) Heart-Check Food Certification Mark, (3) Whole Grain Stamp, and (4) Fruits & Veggies —More Matters® seal.

CHAPTER 2

LITERATURE REVIEW

Epidemic of Overweight and Obesity

Overweight and Obesity: Prevalence

Overweight and obesity are an increasing public health problem. A measurement of a person's weight adjusted for his or her height, or body mass index (BMI), is a means of determining a person's weight status.³² Normal or healthy weight is defined as a BMI of 18.5 to 24.9 kg/m², overweight is defined as a BMI from 25.0 kg/m² up to 29.9 kg/m², and obesity is defined as a BMI of 30.0 kg/m² or higher.³³ In 2014, worldwide, over 1.9 billion adults (39%) 18 or older were overweight. Of these, more than 600 million (13%) of the world's adult population were obese.³⁴

The U.S. possesses one of the highest incidence rates of overweight among adults globally. From 2009-2012, 68.7% of adults age 20 or over in the U.S. were overweight, with 35.3% of them classified as obese.^{35,36} From 2011-2014, 38.3% of adult women were obese versus 34.3% of adult men.³⁷ It is estimated that up to 47.5% of the U.S. adult population will be obese by the year 2018.³⁸

One-third of U.S. children are overweight or obese, 90% of whom are predicted to remain so into adulthood, resulting in a dramatic increase in the prevalence of adolescents with weight problems.^{1,2,3} Over the course of the last three decades, obesity rates among adolescents have quadrupled, while adult and childhood obesity rates have doubled and tripled respectively.^{39,40,41}

Overweight and Obesity: College Students

Although discrepancies exist in defining adolescence and early adulthood, this general timeframe (18-25 years of age) encompasses the age range that traditional students enroll in college or university.⁴² The percentage of traditional college-age students (18-24 year olds) enrolled in college increased from 35.5% in 2000 to 39.9% in 2013.⁴³ College enrollment is expected to set new records by increasing by 15 percent from fall 2015 through fall 2023.⁴⁴

It is during the college-age years that adults gain weight most rapidly.⁴⁵ The average weight gain in adults is calculated to be roughly two pounds per year.⁴⁶ However, in the first year of college, the average weight gain for freshmen can range from five to fifteen pounds.^{47,48,49} In four-year university students, weight gain is statistically significant, and the most rapidly gained during freshman year.^{50,51,52} This weight gain may result in excess body fat contributing to a BMI above normal, meaning overweight or obesity weight status.⁵³

Nelson et al. assessed disparities in overweight and obesity among four-year U.S. college students and concluded the following: male students were more likely to be overweight than females, higher rates were noted among African American students, lower rates were found among Asian students, lower socioeconomic position was associated with higher rates of weight gain, and higher rates of overweight and obesity occurred among upperclassmen.⁵¹

According to the American College Health Association (ACHA), roughly 30 to 40% of college students in the U.S. have self-reported to be overweight or obese.⁵⁴ Results from the National Longitudinal Study of Adolescent Health and the National

Health and Nutrition Examination Survey show that a substantial number of youths become obese and stay that way from adolescence to young adulthood (18-24 years old).⁴² Additionally, as obesity is not easily reversed, those who are obese or become obese during young adulthood are at an escalated risk of remaining so throughout the rest of their lives.⁵⁵

Overweight and Obesity: Implications

As compared to people of a normal weight, those who are obese are at an increased risk for several conditions, including heart disease, type 2 diabetes, osteoarthritis, and certain cancers.⁵⁶ These health conditions increase the risk of a low quality of life.⁵⁷ A BMI of 35 or greater (grade 2 obesity and above) is associated with increased risk of death.⁵⁸ However, obesity-related morbidity may increase with longer duration of obesity.⁵⁹ Development of a chronic illness at a younger age, as well as increased all-cause mortality, has been demonstrated with early onset of obesity.⁶⁰ Cohort studies from the US, Japan, and the United Kingdom (UK) indicate that premature death is more probable among young adults with a BMI of 25 kg/m² or greater.^{61,62,63}

In addition to a personal health burden, the cost of health care increases among individuals who weigh more. Obese patients in the U.S. incur billions of dollars in direct and indirect costs annually.^{64,65} Researchers who conducted a study of health insurance claims from 2001 to 2011 found that annual medical and pharmacy costs more than doubled for people with a BMI of 45 kg/mg² (\$4,880) in comparison to those with a BMI of 19 kg/mg² (\$2,386).⁶⁶

Implications of obesity may also impact national security. Twenty-seven percent of 17 to 24-year-old Americans (roughly 9 million potential recruits) who were eligible for military service exceeded the Army's enlistment standards for weight and body fat.^{67,68} Overweight has been reported to be the leading medical reason for failing to serve in the U.S. Armed Forces.⁶⁹

As stated by the Centers for Disease Control and Prevention (CDC), a 1% reduction in diet-related chronic diseases such as overweight, elevated cholesterol, glucose, and blood pressure, would save \$83 to \$103 per person in annual medical costs.⁷⁰ Researchers have also estimated medical savings of \$169 billion could be realized with the elimination of problems derived from overweight and obesity in the U.S., even a minor caloric debt (negative 100 calories daily) across the populace could save up to \$58 billion in medical-related costs.⁷¹ Additionally, a reversal of the obesity epidemic and promotion of healthy weights among children and adults may give “our future recruits and military communities—a fair shot at good health, and our nation the benefit of their dedication.”⁷²

Overweight and Obesity: Prevention

Diet, physical inactivity, health conditions, genetics, and environmental factors, among other influences, contribute to overweight and obesity.⁷³ According to the U.S. Surgeon General, approximately 112,000 preventable deaths occur each year that are the result of obesity due in part to poor nutrition and sedentary behaviors.⁷⁴ Therefore, disease prevention and health promotion that includes healthy eating and active living can help reduce the occurrence of major illnesses, preventable death, and the economic burden of disease, while improving productivity and quality of life.⁷⁵

With obesity on the rise, additional public health initiatives have turned their focus towards the development and implementation of obesity prevention programs among both the general public and college students. Healthy People (HP) is a science-based, 10-year national health promotion and disease prevention agenda addressing a variety of determinants for improving the health of Americans, including nutrition and weight status.⁷⁶ The Healthy People 2020 (HP2020) goal is to “promote health and reduce chronic disease risk through the consumption of healthful diets and achievement and maintenance of healthy body weights.” One objective is to prevent excessive weight gain in children and adults.⁷⁷

Healthy Campus 2020 is a sister document to HP, communicating relevant HP2020 objectives to the unique physical and social environments offered on college and university campuses.⁷⁸ Goals of the program, targeting an estimated 20 million college and university students, include increasing the number of students who attain a healthy weight by a 10% target improvement, at the same time decreasing the number of students who are obese by a 10% target improvement.⁷⁸

Overweight and Obesity: Intervention During Emerging Adulthood

Over the past 50 years in industrialized nations, 18- to 25-year-olds have delayed marriage and parenthood.¹⁷ As a result, this population has delayed assuming normative adult roles and responsibilities, and instead engaged in adolescent-like experimentation.¹¹ Though the age range (18-25) covers both traditional adolescence and young adulthood, this stage of “emerging adulthood” is distinctly different from both adolescence and young adulthood.

The shift to adulthood is also a critical time when long-term health habits may be established.¹⁷ Declines in overall-diet quality accompanied by unfavorable shifts in activity patterns may occur during this transitional period.¹⁷ As per VanKim and Laska, “...emerging adulthood is marked as a period of weight gain, decreased physical activity levels and diet quality...”⁷⁹ Therefore, the emerging adult years may be a key point in time to focus on weight- and nutrition-related behavior patterns, especially given the prevalent and swift increases in obesity among this age group, as well as the long-term negative impacts that excessive weight in early adulthood can have.^{42,80,81}

Overweight and Obesity: Contributing Factors Among College Students

Behavioral, environmental, and occupational alterations can all contribute to weight gain in college students.^{48,82} Among those just starting college, planning and self-monitoring skills to maintain healthful behaviors throughout one’s college career are often inadequate.⁸³ Researchers have found a negative association between excessive weight gain and the challenges faced by incoming freshmen students, such as new surroundings and greater lifestyle freedoms.⁵³ In college, alcoholic beverage intake increases, which is associated with increased consumption of unhealthy foods and directly contributes to an increase in overall caloric intake.⁸³ Additionally, college students may experience the stress of changes in family support and increased academic pressures, which may, in turn, result in weight gain.^{52,84}

Poor nutritional intake and/or unfavorable shifts in activity patterns among college students play major roles in negative health outcomes such as weight gain and consequential chronic diseases.^{85,86} Racette et al. found that student weight gain during the first two of years of college was primarily due to inactivity and unhealthy dietary

behaviors.⁸⁷ The majority of freshman women surveyed by Smith-Jackson et al. perceived changes in eating habits as the contributory factor in their weight gain.⁸⁸ However, Jung et al. found that the resulting weight gain from the transition to college was solely due to a decline in physical activity.⁸⁹

Still, the challenges to healthy eating posed by the transition to college can be significant.⁹⁰ Researchers have found college students have low intakes of fruits and vegetables with a preference for processed snacks over fresh produce.^{83,91,92} The average college student appears to consume roughly 1 serving of fruit, 1.5 servings of vegetables, 0.5 serving of low-fat dairy, and 1.4 servings of whole grains daily.⁸³ Subjects in the longitudinal Bogalusa Heart Study consumed fewer fruits, less milk, and more salty snacks, sugar-sweetened beverages, and beef as young adults (19–28 years) than when they were children (10 years and older).⁹³ In a survey conducted by the ACHA, only 8.5% of the students reported consuming five or more servings of vegetables and fruit every day.⁹⁴ This might help to explain why the diets of college students have been found to be low in fiber, calcium, iron, folate, and vitamins A, C, and E.⁹⁵

Sporadic meal patterns and diets lacking nutrient density, including poor consumption of vegetables, fruit, and dairy products, increase nutritional risk and unwanted weight gain.⁹⁶ In fact, Pliner et al., using a 69-question food frequency tool, found that a low intake of vegetables and fruits was the sole dietary predictor of weight gain among college freshman.⁹⁷

College students have also expressed concern about the cost of healthy food, seeing it as a barrier to consuming healthier meals.^{53,90} Additionally, they have reported

limited time, reliance on precooked meals and unhealthful food, along with limited knowledge of how to shop and prepare food, making it difficult for them to maintain a healthful weight.⁵³ Greaney et al. found that some students, however, reported that exercising portion control, eating in moderation, and remaining within a daily calorie limit were choices they could make to maintain a healthy weight.⁵³ Driskell et al. determined from their research that eating (as well as exercise) habits did not appear to vary among lower- and upperclassmen.⁹⁸

Racette et al. found that 50% of students ate fried or fast foods a minimum of three times during the week prior to starting their freshman term.⁸⁷ This was further confirmed more recently with national survey data from 2007-2010 indicating that calories from fast food was highest in adults ages 20 to 39, averaging 15.3% between both sexes.⁹⁹ Also, young adults have the highest consumption of sweetened beverages among adults in the U.S.¹⁰⁰ This is likely due to the fact that the current generation of young adults (18-35 years old) was born into an “obesogenic food environment,” with an increased availability, and therefore consumption of, fairly low cost, highly processed foods, unlike anything previously seen in our culture.⁶⁰

There is conflicting data as to whether a college student’s residence influences his/her dietary patterns.^{96,101,102} Researchers have found students who live on-campus consume a healthier diet due to an increased availability of a variety of nutrient-dense foods, such as vegetables, fruits, and dairy products.⁹⁶ Students who live off-campus may consume less produce and dairy products, potentially increasing their weight-related disease risks indirectly.^{29,96} These students often have to buy and make their

own meals, which they may be ill-prepared to do.^{96,103} Also, the risk for poor dietary intake exists even for those students living with their parents.²⁹

Although college weight gain may be viewed as small, the associated risks can be significant and have a great impact on their later adult lives. It is important to understand the influences that college life has on overweight and obesity trends.⁸⁷ However, the causes of additional unhealthy weight gain in this population are many, and may consist of late night eating, energy drink consumption, insufficient nutrition education and skills, poor sleep habits, and/or other high-risk, adverse health behaviors.^{17,104,105}

Nutrition Labels

Nutrition Facts Panel: Introduction

In 1990, Congress passed the Nutrition Labeling and Education Act (NLEA), giving the U.S. Food and Drug Administration (FDA) authority to require nutrition labeling on the processed food and beverage packages they regulate, including recommended daily values per serving of specified nutrients, and to set standards for approved health claims.¹⁰⁶ The expressed motives of the Nutrition Facts Panel (NFP) were to (1) clear up confusion surrounding nutrition labeling, (2) assist consumers in making healthier food choices, and (3) offer the incentive to food companies to boost the nutritional quality of their products.¹⁰⁷

Nutrition Labels: Use Among Adults

In a country where obesity is pervasive, it is important to identify whether consumers truly find value in the required NFP information provided on food products, and how presenting this nutritional information affects their dietary selections. A large

body of research exists describing consumers' awareness and use of mandatory NFPs, along with other voluntary labeling formats.^{108,109}

Some literature has documented consumers' overall comprehension of the link between food intake and health, and interest in the presentation of nutrition facts on food labels.^{110,111} Previous research has also revealed a positive connection between concerns about nutrition, health, and the responsibility of meal-planning with NFP use.^{112,113,114} As per the 2014 FDA Health and Diet Survey, 77% of U.S. adults reported using the NFP at least sometimes when purchasing products, whereas 79% reported using the label often or sometimes when buying a product for the first time.¹¹⁵ In 2004, only about half of consumers self-reported referring to the NFPs when making food purchases.¹¹⁶ Additionally, consumer use of nutrition labels appeared to have decreased from 1995 to 2006, with the largest decline among young adult consumers (20-29 years of age) and those less educated.¹¹⁷ Nonetheless, attention to food labels may be a valuable way to improve food choices and prevent chronic weight-related illnesses.¹¹⁸ Use of food label nutrition information has been associated with consumption of less sugar, lower fat and cholesterol intake, and diets higher in iron and fiber.^{112,118,119,120}

The major factor for nutrition label effects in real-world shopping situations may be the label's ability to attract consumer attention.¹²¹ Recently, Graham et al. conducted an eye-tracking study and found that participants paired with one of their children (6 to 8 years old) were more likely to view FOP nutrition labels versus NFPs, and that the presence of in-aisle signage further increased their attention to FOP labels.¹²² However, to what extent attention moderates the effect of nutrition labels on choice, and whether this process differs between label formats has not been addressed.^{123,124,125}

Nonetheless, researchers have shown that the more frequently consumers used food labels, the healthier their overall diets.^{118,126}

Nutrition Labels: Use Among College Students

Nine years after the NLEA, Marietta et al. assessed undergraduate college students' behavior and attitudes regarding required food labels.¹²⁷ Researchers found that 95% of participants believed general food labels to be useful, with 70% using the NFP when purchasing a product for the first time. Women most frequently used nutrient information regarding calories, fat, and calories from fat, whereas men were more apt to look at protein content. Nutrients considered the least were fiber, iron, and vitamin A.¹²⁷

A year later, Smith et al. found that female college students were more likely than male students to use nutrition labels by a 4:1 ratio.¹²⁸ Furthermore, students of both genders who reported using labels believed in the value of having nutrition facts listed on products, whereas nonusers saw no value in nutrition facts. Label users were most concerned with information regarding fat and vitamin content.¹²⁸

Further supporting these findings were studies conducted by Byrd-Bredbenner and Huang et al.^{129,130} They found that college-age and adolescent women had a tendency to read food labels the majority of the time (79% and 78%, respectively). Also, they found that college-age men, though less apt to use nutrition labels, were inclined to view macronutrients, oftentimes protein. Conversely, college-age women were more apt to look at total caloric content. The hypotheses that reading food labels equated to healthier food selections were not supported.^{129,130}

More recently, Graham and Laska's findings conflicted with the outcomes of the two aforementioned studies.¹³¹ They found college students who reported reading

nutrition labels frequently--including those who placed little value on healthy meal preparation--were more likely to consume healthier diets. This included eating more vegetables and fruits and less added sugar and fast food. They suggested that use of food labels among students may contribute to healthful eating independently of nutrition-related attitudes.¹³¹

The Dietary Guidelines for Americans (DGAs) are evidence-based nutrition recommendations based upon the most current scientific data.¹³² Limited studies are available on the topic of college students' adherence to dietary guidelines.¹³³ One study involved a survey of 200 first-year college students enrolled in a university meal plan. The researchers' findings revealed that increased knowledge of the 2005 DGAs was positively correlated with more healthful eating behaviors.¹³⁴ Researchers findings from other studies have established that using point-of-purchase (POP) (also known as point-of-selection) methods that provide "benefit-based-messages"--nutrition-related or not--increase attention, purchase, and consumption of healthier food choices in the college/university setting.^{135,136,137}

Front-of-Package Nutrition Labeling Systems and Symbols

Front-of-Package Nutrition Labels: Background

Although the 1990 NLEA legislation requires manufacturers to display an NFP on many food products, communicating nutrition information to consumers using voluntary on-pack labels is common. FOP nutrition labeling systems and symbols have been designed to provide at-a-glance guidance regarding the nutritional content of foods.²⁸ Less detailed than the NFP, these symbolic icons and simple graphics are intended to help consumers identify nutritional characteristics of food products, quickly compare

foods and beverages within product categories, and ultimately make healthier, informed choices suitable for their daily energy needs.^{25,138,139}

As early as 1987, the AHA developed the Heart Guide symbol, a single logo indicating whether a food was “heart friendly.”²⁹ Three years later, it was revised to adhere to NLEA guidelines, and again in 1995 to reflect the FDA coronary heart disease risk reduction claims. In this final version, it was renamed the Heart-Check program, which is still in use today.²⁸

Since the inception of the AHA Heart-Check mark, FOP nutrition labeling systems and symbols have proliferated worldwide. Usually found on the main/front display panel, FOP labels may be found on the back, top, or side panels of a food product, or may also be on shelf tags.²⁸ Aside from non-profit health organizations (like the AHA), these systems and symbols have been developed by governmental agencies, retailers, food manufacturers, non-industry experts, industry and non-industry consortia.²⁸

In 2002, Wegmans supermarkets developed Wellness Keys.¹⁴⁰ Displayed on store brand products, this series of symbols is based on FDA and U.S. Department of Agriculture (USDA) nutrient content and health claims. Fourteen health attributes, including high fiber, gluten-free, and low fat, are indicated by colorful dots printed on qualifying food item packaging. These easily recognizable, at-a-glance alerts are said to help consumers identify important nutrition information, but also incentivize the purchase of house brand products.^{28,141}

From 2004 to 2007, some of the food and beverage manufacturers, such as PepsiCo, General Mills, Kraft Foods, Unilever, and Kellogg’s launched FOP systems of

their own: Smart Spot, Goodness Corner (which later evolved to Nutrition Highlights), Sensible Solution, Choices, and Nutrition at a Glance, respectively.¹⁴²

Using single logos or a series of color-coded symbols related to specific nutrient attributes, these rating systems were based on a variety of nutritional content requirements. Most defined minimum percentages of beneficial or “targeted” nutrients (i.e., protein, calcium, iron), limitations of less-beneficial nutrients (i.e., saturated and trans fats, cholesterol), specifications by product type (i.e., dairy/cheese, snacks/crackers), and/or identified formulations with benefits specific for health and wellness.¹⁴²

Beginning in 2006, U.S. food retailers joined the bandwagon and rolled out new versions of nutritional rating systems.²⁸ Different than manufacturer-developed labeling systems placed on food packaging, these rating systems oftentimes are displayed on the shelf-edge, on or near the price tag or display cases. Applied to numerous products, these systems permit comparisons within food categories across varying brands, and sometimes between food categories. The Hannaford Brothers supermarket chain initiated this trend with the Guiding Stars® program.¹⁴³ Implemented store-wide, this rating system uses a proprietary algorithm developed by a scientific advisory panel to assign one, two, or three stars to “good,” “better,” and “best” product choices in terms of overall nutrient quality. If a food product does not receive a star, the established minimum nutrition criteria has not been met. Hannaford Brothers reported early in Guiding Stars’ introduction that food products earning stars had outsold those that did not.^{144,145,146}

In the following year (2007), the NuVal® Nutritional Scoring System was introduced to the public. Developed by an independent panel of medical and nutrition

experts, a proprietary algorithm--the Overall Nutritional Quality Index (ONQI®)--bases its 1-100 food rating scale on the Institute of Medicine's (IOMs) Dietary Reference Intakes (DRIs) and the DGAs.^{142,147} This system is marketed as an objective system that allows consumers to compare the overall healthfulness of foods within and across categories. NuVal is a joint venture by TopCo Associates, LLC, a privately held supermarket industry co-op, and Griffin Hospital of Derby, Connecticut.¹⁴⁸ Twenty-six retailers currently license the system in order to print and display NuVal signage in their stores.¹⁴⁹ In 2009, Albertsons® stores debuted NUTRITION IQ®, color-coded shelf tags developed by SUPERVALU, Inc. and Harvard Medical School's Joslin Diabetes Center.¹⁵⁰ That same year, Stop & Shop and Giant Foods rolled out the Healthy Ideas® rating system, developed by health experts affiliated with Harvard Medical School, displayed as a stamp on both products and shelf tags.¹⁵¹

Standardization of FOP labeling became the goal of some in the retail industry as well as non-industry leaders. They expressed concern that too many systems and symbols were competing for attention by consumers, using varying criteria and logos, and potentially causing confusion. Therefore, the Keystone Food and Nutrition Roundtable, a group of leaders from industry, public health, academia, and the government, was assembled in 2007.¹⁵² Together they developed the voluntary, uniform FOP system known as the Smart Choices Program. Intended to be science-based and transparent, the program was administered as a 501(c) non-profit organization by partnership of the American Society for Nutrition and NSF International, with implementing companies paying participation fees. Some of the largest international food and beverage companies participated in the Smart Choices Program and replaced

their proprietary FOP symbols (i.e., PepsiCo's Smart Spot, Kraft's Sensible Solutions, Unilever's Choices, and General Mill's Nutrition Highlights) with the Smart Choices logo by the end of 2009. However, two months into its launch, the program was suspended due to strong negative public criticism and calls for investigation into its nutritional criteria and source(s) of funding.^{28,142,153}

Front-of-Package Nutrition Labels: Examination

Sixty-seven respondents to an FDA survey reported using FOP symbols "often" (31%) or "sometimes" (36%) when making food purchasing decisions.¹⁵⁴ Using differing criteria and targeting varying customer sub-sets, and in light of the suspension of the Smart Choice Program, an investigation into the abundant existing FOP labels was in order. Mandated by Congress in 2009, the CDC directed the IOM to review and provide recommendations regarding FOP nutrition rating systems and symbols. Shortly after, with the inception of the *Let's Move!* Campaign in February 2010, the White House Childhood Obesity Task Force reinforced this message by highlighting the need to "empower parents and caregivers to make healthy choices" with simple, straightforward nutrition information, including examination and regulation of food marketing efforts, including FOP food labels.^{155,156}

Front-of-Package Nutrition Labels: Categorization

The Committee on Examination of Front-of-Package Nutrition Ratings Systems and Symbols released the first of two consensus reports in October 2010.²⁶ In Phase I, the committee reviewed 20 systems that were representative of systems that had been introduced into the marketplace. They fell into three categories: (1) nutrient-specific systems, (2) summary indicator systems, and (3) food group information systems.²⁸

Nutrient-specific systems provide a snapshot of a food's nutrient content and its contribution to a person's daily diet. Nutrient-specific systems have been created primarily by food retailers and manufacturers. Examples of this type of system include Wegmans Wellness Keys, General Mills' Goodness Corner, and the Facts Up Front (FUF) nutrition labeling program, which will be further discussed in the following section of this paper.^{27,142}

Summary indicator systems use one symbol, score, or icon to summarize information regarding nutrient content of a packaged product.²⁶ With no specified nutrient content provided, these systems are generally based on algorithms or nutrient thresholds.²⁸ Non-profits, food manufacturers, advisory groups, and partnerships among these groups are the primary developers of summary indicator systems. Examples include the AHA's Heart-Check mark, Hannaford Supermarkets' Guiding Stars Program, and the NuVal Nutritional Scoring System.^{27,28}

Food group information systems use symbols based on the product content containing a specific food group or ingredient, notably vegetables, fruits, and whole grains. Developers of this type of system assert that their purpose is to help consumers eat a more balanced diet by making it easier to track specific food groups. Examples of food group information systems include the Whole Grain Stamp developed by Whole Grains Council and the National Cancer Institute's Fruits & Veggies—More Matters logo.¹⁵⁷ Both of these systems will be discussed in detail in the following section of this document.

Front-of-Package Nutrition Labels: Highlighted Programs

Facts Up Front. In September of 2011, two U.S.-based food industry groups, the Grocery Manufacturers Association (GMA) and the Food Marketing Institute (FMI), representing over 80% of packaged food and beverage products, introduced the voluntary FUF FOP label (Figure 1).^{158,159} Earlier that year, however, the program had been unveiled as Nutrition Keys.¹⁶⁰ With a \$50 million campaign investment to “...bring the *Facts Up Front* program alive...,” particularly targeted to moms, Hispanics, and African Americans, product packaging containing FUF labels appeared in 2013.¹⁶¹

Figure 1. Facts Up Front Icons
Facts Up Front Icons reprinted with permission from Facts Up Front Team¹⁵⁸

The FUF system replaced Smart Choices, the discredited FOP program that the FDA threatened to investigate after its logo appeared on sugar-laden breakfast cereals like Froot Loops and Cocoa Krispies, as well as Fudgsicle bars, and mayonnaise.¹⁶² FUF highlights four “Basic Icons” that include nutrients listed on the NFP that the DGAs suggest limiting: calories, saturated fat, sodium, and total sugar per serving. Also, some products may display one to two “Optional Icons,” which are essential, often under-consumed, “nutrients-to-encourage”: potassium, dietary fiber, protein, vitamin A, vitamin C, vitamin D, calcium, and iron.^{159,163} Based on a 2,000 calorie diet, the percent daily

value (%DV) is indicated on labels for saturated fat, sodium, and all “Optional” nutrients listed.¹⁶⁴

Criticism surrounded the FUF initiative. A New England Journal of Medicine opened questioned the reasoning behind FUF’s appearance on store shelves prior to the IOM’s final report. Self-answered, the authors stated, “Perhaps so that it could lock in a system that would change food choices as little as possible and preempt the imposition of an alternative system that would be based on the available relevant science.”¹⁶⁵

Other expressed concerns were that the FUF label “only provides information about calories and a few nutrients in a food...” and is therefore not interpretive, “...providing no guidance for overall healthful choices.”¹⁶⁶ Also, maybe more fuel for this fire, the uniform FUF nutrition labels have been viewed as a marketing tool that, in addition to competitive pricing on store brand products, had the “...potential to increase attention to and sales of private-label products for health and nutrition-minded consumers.”¹⁶⁷

Nonetheless as per the FUF Web site, 79 retailers, manufacturers, and wholesalers have voluntarily placed the label on their national, private, or store brand labels.¹⁶⁸ In some food categories, that equates to 90% of products, like cereals and beverages.¹⁶⁹

Heart-Check Mark. The AHA developed the Heart-Check Food Certification Program in 1995, with an FOP heart-check symbol indicating that foods met at least a minimum FDA requirement to be considered “heart-healthy.”¹⁶⁶ This was the first program in the U.S. to be developed independently of the food industry or federal government identifying foods that met coronary health standards. Continuously evolving over the years, the most recent revision was effective January 2014. These updates encourage intakes of mono- and polyunsaturated fatty acids, certain nuts and fatty fish,

include further sodium limitations, exclude partially hydrogenated oils, and added fiber, total sugars, and calorie requirements. The existing six category certifications, each with their own set of criteria, include: (1) Standard, (2) Standard “Extra Lean”, (3) Main Dish and Meat Products, (4) Whole Grain with required levels of whole grain and dietary fiber, (5) Nuts, and (6) Fish with required level of Omega-3 Fatty Acids.^{166,170}

In 2014, researchers examined the association between foods that would meet the most recent AHA Heart-Check criteria in relation to risk factors associated with cardiometabolic risk.¹⁷¹ They extracted data from one-day dietary recalls provided by the 11,296 adult participants of the NHANES 2007-2010 study. The authors concluded that consumption of foods worthy of the AHA Heart-Check mark were associated with lower risk of cardiometabolic syndrome and higher overall diet quality. Participants who consumed AHA Heart-Check Program–certifiable foods were more likely to be nonsmokers, female, older, with a higher income, lower body weight, and attended college.¹⁷¹

The AHA markets the use of its Heart-Check Certification mark as a win-win to consumers and manufactures alike. A nutrition expert in academia, chair of the association’s Nutrition Committee, and co-author of several of the AHA-funded, Heart-Check-focused papers, Dr. Rachel Johnson, as quoted in an AHA blog post said, “The American Heart Association encourages a healthy eating pattern for all Americans as the first defense to reducing risk of heart disease and stroke....resources and tools like the Heart-Check program...can guide consumers to better food choices and, in turn, help them build a more healthful dietary pattern.”¹⁷² Some advocate the logo will clear up consumer confusion. For example, the North American Olive Oil Association

subscribes to the Heart-Check program because it believes it will quickly translate to customers that olive oil is a source of healthy (monounsaturated) fats when used in place of saturated fat.¹⁷³

The value of the AHA Heart-Check food certification mark is not without dispute. A posted AHA Heart-Check Food Certification Program application packet for food manufacturers states, “Heart-Check certification provides added credibility for your brand and boosts your product’s visibility and sales. Seeing the mark on a food package assures shoppers they are making a smart choice.”¹⁷⁴ As further confirmation, what appears to be a marketing flyer to manufacturers posted online states an 86% shopper awareness of the Heart-Check mark.¹⁷⁵ On the other hand, companies pay a fee to have their products endorsed by the AHA Heart-Check mark with revenue funding the operating costs of the program, a source of criticism by some.¹⁷⁶

Fruits & Veggies—More Matters. Produce for Better Health (PBH) is a non-profit 501(c)(3) fruit and vegetable education foundation, that collaborates with over 650 industry, government, non-profit, and community partners.¹⁷⁷ The PBH Foundation, and the U.S. National Cancer Institute initiated the “5 A Day for Better Health” (5 A Day) campaign in 1991.¹⁷⁸ It encouraged adults to consume at least five servings of vegetables and fruits each day.¹⁷⁹

In March 2007, 5 A Day was replaced with the Fruits & Veggies—More Matters campaign to reflect the 2005 DGAs, which encouraged adults to consume at least 7–13 servings of fruits and vegetables each day.¹⁷⁸ Fruits & Veggies—More Matters is the nation’s largest public-private, fruit and vegetable nutrition education initiative, co-led by the PBH and the CDC (Figure 2). The ultimate goal of the initiative is to encourage

consumers to view produce as a key element of meals and snacks for health promotion.

All forms of fruits and vegetables are included in the Fruits & Veggies—More Matters product and recipe criteria: fresh, frozen, canned, dried, and 100% juice. The Fruits & Veggies—More Matters brand logo is not intended to be presented as a stand-alone product brand, but instead an endorser brand that is licensed to companies for use on eligible products alongside their own brand logos.¹⁷⁷

Figure 2. Fruits & Veggies—More Matters Campaign Logo
Fruits & Veggies—More Matters logo reprinted with permission from Produce for Better Health Foundation¹⁷⁷

Few published studies address awareness of the Fruits & Veggies—More Matters campaign and its recommendation to eat 7 or more servings of produce daily.^{179,180} Using the U.S. National Cancer Institute’s 2007 Food Attitudes and Behaviors (FAB) Survey tool, Erinosh et al. found that few of the 3,021 adult participants (18 or older) were aware of the Fruits & Veggies—More Matters campaign (2%), with more participants aware of the former 5 A Day campaign (29%).¹⁷⁹ Campaign awareness was highest among participants who were non-Hispanic white, female, had a college degree, resided in the west, and had a child 17 or younger living in the household. However, a limitation of this study was that the FAB survey was

administered only five months following the launch of the Fruits & Veggies—More Matters campaign.¹⁷⁹

In the 2010 annual State of the Plate study conducted by the PBH Foundation, researchers reported that awareness of the Fruits and Veggies—More Matters campaign by Generation X (Gen X) moms had increased from 12% in 2007 to 18% in 2010.¹⁸¹ In addition, all of the Gen X and Generation Y mothers surveyed, 45% and 47%, respectively, said they were more likely to purchase a product with the Fruits & Veggies—More Matters logo on it, up from 40% and 45%, respectively, in the previous year.¹⁸¹ The most recent study available, the 2015 State of the Plate, did not publish Fruits & Veggies—More Matters campaign logo consumer awareness data.¹⁸²

Whole Grain Stamp. The Whole Grains Council is a nonprofit consumer advocacy group organized by Oldways, a nonprofit organization with a mission to inspire good health through heritage-based foods, and composed of a consortium of millers, manufacturers, scientists, and chefs (Figure 3).^{183,184} The Whole Grain Stamp was launched in 2005 as part of the Oldways Whole Grains Council campaign to increase consumption of whole grains worldwide.¹⁸⁴

Figure 3. Whole Grain Stamp
The Whole Grain Stamp is a registered trademark of the Oldways Whole Grains Council, www.WholeGrainsCouncil.org¹⁸⁵

There are two varieties of the Whole Grain Stamp, the Basic Stamp and the 100% Stamp.¹⁸⁵ The Basic Stamp appears on products offering at least 8 grams of whole grains per labeled serving. Grains in products bearing the 100% Stamp are all whole, and contain a minimum of 16 grams of whole grain per serving.¹⁸⁵ Each stamp shows how many grams of whole grain ingredients are in a serving of the product. Grains that are considered whole may include: amaranth, barley, buckwheat, corn, millet, oats, quinoa, rice, rye, sorghum, teff, triticale, all varieties of wheat, and wild rice.¹⁸⁶ The Stamp may be found on the front, side, or back of a food package. As of April 2016, the Whole Grain Stamp was on 10,700 different products in 55 countries.¹⁸⁷

In a 2010 study of the American Dietetic Association (today the Academy of Nutrition and Dietetics), the Whole Grain Stamp was the third most frequently recognized FOP nutrition symbol (76.8%), after the AHA Heart-Check mark (82.8%) and the National Dairy Council 3 A Day logo (82.8%).¹⁸⁸ The Whole Grain Stamp was the most common packaging symbol recommended to clients by 67.9% of the 3,687 surveyed dietitian respondents.¹⁸⁸

A food product can use the Whole Grain Stamp as long as it contains at least 8 grams of whole grain per labeled serving. This applies not only to bread, cereal, tortillas, and pasta products, but also cakes, cookies, crackers, energy bars, pie crusts, and chips, among others.¹⁸⁹ To use the Whole Grain Stamp, manufacturers must join the Whole Grains Council. Annual membership dues are based on a sliding scale relevant to their overall revenues.¹⁹⁰

Front-of-Package Nutrition Labels: Use Among Adults and College Students

There has been some recent research investigating the use of FOP labels among adults. These studies were conducted in the U.S. and UK, and oftentimes focused on the FUF program, or labels resembling the FUF program, such as the Multiple Traffic Light (Traffic Light) label developed by the UK Food Standards Agency, or the Guideline Daily Amounts (GDAs) developed collaboratively by the UK government, food manufacturers, and retailers.^{191,192,193,194} Some researchers have found data supporting a positive relationship between FOP food label usage with respect to consumer comprehension of product nutrition information and healthier food selections.^{195,196} Meanwhile, others have shown the availability of FOP nutrition labels to have little to no impact on consumer food choices.^{193,197,198} Objective measures such as eye-tracking methodologies have been used to examine attention to and use of FOP food labeling systems and symbols.^{199,200,201} Among the aforementioned studies, there is limited research concerning the effect of FOP labeling systems and symbols on college students in their emerging adulthood years, with none originating from the U.S.^{122,123,193,199}

Call to Action

Americans today have more nutrition-related information accessible to them than ever before. Still, this nation is facing a health crisis attributable to obesity and diet-related disorders. Clearly, there is a disconnect between nutrition recommendations and what people are eating.²⁶

Once considered to be a time of optimal health and fitness, the period of emerging adulthood is now recognized as a critical point for establishing lifelong

disease prevention and health promotion behaviors.¹⁷ Students traditionally enroll in college or university during these adolescence through young adult years. Food habits developed during this time have been customarily determined as undesirable. Needless to say, effective ways for influencing students toward positive nutrition-focused behaviors are essential.⁹¹

Researchers suggest that optimizing nutrition labeling on food products may support students' healthful food choices.^{202,203,204} One of the benefits of food labels is to provide information that is easy to comprehend and interpret so that consumers can make informed food selections. However, to be beneficial, labels must attract attention, be presented in a comprehensible format, and above all, used.^{205,206}

Although inconsistent in format, content, and criteria, current FOP nutrition labeling systems and symbols have the capacity to offer useful dietary guidance to consumers quickly and effectively. FOP labeling systems and symbols have become a common practice in the food industry, however no one system or symbol is approved or endorsed by the U.S. government. Also, despite several studies that have focused on consumer use of labels and their effect on food choices, gaps in the research remain.^{109,207}

Effective nutrition labels are part of an environment supportive of healthier dietary selections. Still, a concerted research effort is needed to uncover which FOP nutrition labeling system may be most beneficial to consumers. There are limited data regarding the efficacy of interventions to promote healthy dietary behaviors among students in college.⁹² To my knowledge, no studies regarding U.S. college students' awareness,

perception, and behavior in response to commercial FOP nutrition labeling systems have been conducted.

Therefore, the purpose of this research is to add to the limited body of knowledge regarding the impact that different nutrition fact labeling formats have on the food choices of college students. The objective of this study is to investigate whether students are familiar with and have developed opinions about four distinct FOP nutrition labeling systems and symbols frequently displayed on U.S.-sold food products, and if so, whether these FOP nutrition labeling systems and symbols influence students' food purchases.

CHAPTER 3

METHODS

Survey Design

I gathered data using a 24-question survey (Appendix A) in which East Tennessee State University (ETSU) students (undergraduate, graduate, medical, and pharmacy students) answered questions regarding their health and food purchasing behaviors, as well as their familiarity with and perceptions of front-of-package (FOP) nutrition labels. The survey also included demographic characteristics (gender, race/ethnicity, age, academic classification, weight, employment status, and place of residence). I developed the 24-question survey and sent it to five experts experienced in survey development for evaluation of the content and construct validity. Two Nutrition graduate students conducted a peer-review of the survey and I revised it based upon input from these reviewers.

The ETSU Office of the Provost and the Vice President of Academic Affairs (VPAA) sent all ETSU students an email including a weblink via university-assigned Gmail accounts with the subject line, “Request Student Participation in Survey” in the spring of 2016 (April 11, 2016). The Office of the Provost and VPAA sent a reminder email to the same listserv nine days later (April 20, 2016). The survey took approximately five to ten minutes to complete, after which participants were offered the opportunity to provide their contact information for the sole purpose of entering a lottery to win one of six \$25 Visa gift cards for their participation. The survey was available for completion for 17 days (4/11/16 through 4/28/16).

Study Population

The population included males and females 18 years old and older attending ETSU. ETSU has a student population of 14,334 students, including 11,392 undergraduate, 2,335 graduate, and 607 professional students; 6,111 are males and 8,223 are females.²⁰⁸ The study respondents included 908 participants who completed the 24-question survey on Survey Monkey.

Inclusion/Exclusion Criteria

Study respondents were male and female and met the following inclusion criteria: (1) 18 years or older; (2) ETSU student, enrolled as an undergraduate, graduate, medical, or pharmacy student in the Spring 2016 semester; (3) willing and able to take a web-based survey. Exclusion criteria included (1) younger than 18 years of age; (2) not an enrolled ETSU student; (3) ETSU faculty or staff.

Research Questions

The following two research questions were investigated using information obtained from the 24-question survey:

1. Are participants aware of the presence of FOP nutrition labeling systems and symbols?
2. Does the presence of FOP nutrition labeling systems and symbols on food packaging influence participants to buy those products?

Institutional Review Board Approval

I received Institutional Review Board (IRB) approval for this study from the ETSU Office for the Protection of Human Research Subjects IRB on April 4, 2016 (Appendix B).

Variable Selection

Variables of the survey included demographics, self-description of weight, grocery purchasing behaviors, exposure to FOP nutrition labeling systems and symbols, as well as recognition and use of FOP nutrition labeling systems and symbols.

The following list contains the variables used for this study.

Dependent Variables

- Prior exposure to FOP nutrition labeling systems and symbols (in general)
- Exposure to four (specific) FOP nutrition labeling systems and symbols
- Perceived usefulness of FOP nutrition labeling systems and symbols
- Perceived understanding and use of FOP nutrition labeling systems and symbols
- Perceived accuracy of FOP nutrition labeling systems and symbols
- Perceived truthfulness of FOP nutrition labeling systems and symbols
- Frequency in looking for FOP nutrition labeling systems and symbols
- Perceived effect on price of FOP nutrition labeling systems and symbols
- Likelihood of purchasing foods with FOP nutrition labeling systems and symbols
- Estimated overall amount of food products purchased displaying FOP nutrition labeling systems and symbols

Independent Variables

- Gender - Two levels (Male and Female)
- Race - Six levels (American Indian/Alaskan Native, Asian/Pacific Islander, Black/African American, Hispanic/Latino, White/Caucasian, and Other)
- Academic Classification - Seven levels (Freshman, Sophomore, Junior, Senior, Graduate student, Medical student, and Pharmacy student)
- Age - Nine levels (18, 19, 20, 21, 22, 23, 24, 25, and 26 and older)
- Employment Status - Four levels (Full-time, Part-time, Unemployed, and Not Employed)
- Residence - Five levels (On-campus dorm, Off-campus apartment, At home, Fraternity or Sorority, and Other)
- Weight Status - Four levels (Underweight, Healthy Weight, Overweight, and Obese)

Derived Variables

- Life Stage - Two levels (18-25 and 26 or older); this variable was derived from the original data, categorizing the responses for age into two categories based upon the defined age range of emerging adulthood.
- Collapsed Residence - Two levels (On Campus and Off Campus); this variable was derived from the original data, categorizing the responses for residence into two categories based upon the general location of where respondents reported living the majority of the time.
- Number of FOP Nutrition Labels Recognized - Five levels (None Recognized, 1 Recognized, 2 Recognized, 3 Recognized, 4 [All] Recognized); this variable

was derived from the original data, categorizing the responses for question 16, “Which Front-of-Package nutrition labeling system and symbols do you recognize?” into five categories based upon how many of the four specified FOP labels were recognized by each respondent.

Statistical Analysis

The purpose of this descriptive research study was to investigate whether students are familiar with and have developed opinions about four distinct FOP nutrition labeling systems and symbols frequently displayed on U.S.-sold food products, and if so, whether these FOP nutrition labeling systems and symbols influence students’ food purchases. The four FOP nutrition labeling systems and symbols include the: (1) Facts Up Front (FUF) Icons, (2) Heart-Check Food Certification mark, (3) Whole Grain Stamp, and (4) Fruits & Veggies—More Matters® seal. Also of interest was whether there were demographic characteristics that might causally influence a student’s awareness, perception, and self-reported purchasing behavior of foods displaying these FOP labeling systems and symbols.

I analyzed the data using the IBM Statistical Package for Social Sciences (SPSS), Version 22.0 software and calculated the descriptive statistics for all questions in the survey, excluding question 1, which requested informed consent. I used raw frequency data for reporting demographic information and to determine students’ level of familiarity with and recognition of the presented FOP nutrition labeling systems and symbols.

As per Green and Salkind, the independent samples t-test evaluates “whether the mean value of the test variable for one group differs significantly from the mean

value of the test variable for the second group.”²⁰⁹ Witte and Witte explain that analysis of variance (ANOVA) is, “designed to detect differences between two or more groups defined for a single factor or independent variable with measures on different subjects.”²¹⁰ Therefore, independent samples t-tests and one-way ANOVAs were the appropriate tests to conduct based on the research questions and the data collected. I used the independent samples t-tests and one-way ANOVAs to determine whether there were differences in the scores of the questions addressing FOP label awareness, perception, and/or purchasing behaviors based on the groups defined by the aforementioned independent variables. Means and standard deviations (SD) were extracted from the calculations used when these tests were performed. A 95% confidence level ($\alpha < .05$) was used for all statistical analyses.

Data gained from questions formatted in a Likert or Likert-type format (questions 9, 12-14, 17-22, and 24) were treated as interval data. The 11 Likert or Likert-type scale questions are listed in Appendix A. Some examples of Likert response format questions that have been evaluated in this way are seen in previously published research investigations that used the 14- and 10-question Rating of Perceived Exertion (RPE) and modified RPE scales, respectively.^{211,212} To further support this decision, as per Levin and Fox, “Often, variables that in the strictest sense are ordinal may be treated as if they were interval when the ordered categories are fairly evenly spaced.”²¹³ Also, among the biggest advocates for treating Likert-type responses as interval data, Carifio and Perla concluded that, “Likert response formats can empirically produce interval and even...ratio data logically and empirically.”^{214,215}

CHAPTER 4

RESULTS AND DISCUSSION

Exclusion of Surveys

A total of 936 students completed the online survey via Survey Monkey. Twenty-eight surveys (3.0%) were excluded from the study for the following reasons: On 10 surveys respondents provided informed consent but did not respond to the rest of the questions, on 6 surveys the respondents did not consent or selected “I do not agree” despite answering some or all remaining questions, and on 12 surveys, respondents only provided demographic information.

Considerations for “Other” Responses

On three survey questions I provided an “Other” response, requesting that participants who select this response to “Please Specify,” or provide further detail. These questions included: question 7, “Where do you live for the majority of the time?”; question 10, “Where do you buy the majority of your groceries?”; and question 11, “Where do you consume most of your meals?” If a response selected as “Other” could easily and with confidence fit into an existing category, I re-categorized the response into the appropriate existing category.

For question 7, fifty-six respondents selected “Other.” Examples of specified participant responses included, “Homeowner,” “Off-campus townhouse,” “On campus apartments,” “Homeless,” “my home, not parents,” “Asheville, NC,” and “Cookeville, TN - I am an online student.” Based on the responses provided, none of the 56 participant responses of “Other” could easily or with confidence be re-categorized into the existing categories of “On-campus dorm,” “Off-campus apartment,” “At home,”

or “Fraternity or Sorority.” Instead, the derived variable, “Collapsed Residence” was created with two levels only, including “On Campus” and “Off Campus,” as described in the data analysis sections of chapter three.

Seventeen respondents selected “Other” for question 10. Eleven of these responses were re-categorized. For example, specified responses including “Aldi,” “Buc Mart” (a university affiliated, on-campus convenience store), and “Walmart” were re-categorized into the existing categories of “Grocery Store,” “Convenience Store,” and “Superstore,” respectively. To keep validity, when not possible, responses were kept as “Other.” For example, when “African Market,” “Amazon Pantry,” “Meal plan,” “Fast food,” “Garden,” “Walgreens,” and “Discount store” were specified, these responses remained under the existing category of “Other” for that question.

Five respondents selected “Other” for Question 11. The locations specified where these respondents consumed most of their meals included, “Breakfast and dinner at home, lunch at work,” “Either Chick-Fil-A, Moe’s, or food that my parents bring me,” “Fast food,” “Home, work and school,” and “It would have to be a solid tie between home and vehicle on the go.” Therefore, no “Other” responses for this question were re-categorized.

Respondent Demographics

It is estimated that the entire ETSU student body--excluding medical and pharmacy residents--composed of 14,334 students, received the survey request via email, with a calculated response rate of 6.5%. Of the participants that completed the 908 usable surveys, 119 (13.1%) were freshmen, 124 (13.7%) were sophomores, 151 (16.6%) were juniors, 217 (23.9%) were seniors, 255 (28.1%) were graduate students,

22 (2.4%) were medical students, and 20 (2.2%) were pharmacy students. The survey respondent and ETSU 2015-2016 student body demographics based on academic classification are presented in Figure 4 and Figure 5.

Figure 4. Survey Respondent Demographics: Academic Classification

Figure 5. ETSU 2015-2016 Student Body Demographics: Academic Classification

Regarding race/ethnicity, students identified overwhelmingly as White/Caucasian, representing 85.9% of respondents, followed by Black/African American at 5.7%, Asian/Pacific Islander at 3.0%, Hispanic/Latino at 2.1%, American Indian/Alaskan Native at 0.1%, and 3.2% of participants responded as “Other” or preferred not to answer (Table 1).

Table 1. Survey Respondent and ETSU Student Body Demographics: Gender, Race/Ethnicity, and Age

Demographics	FOP Survey		ETSU 2015-16	
	Frequency (n)	Percentage (%)	Frequency (n) ^a	Percentage (%)
Gender	908	100.1	14,334	100.0
Male	233	25.7	6,111	42.6
Female	669	73.7	8,223	57.4
Not Answered	6	0.7	-	-
Racial/Ethnic Heritage	908	100.0	14,334	100.0
American Indian or Alaskan Native	1	0.1	33	0.23
Asian or Pacific Islander	27	3.0	247	1.7
Black or African American	52	5.7	909	6.3
Hispanic or Latino	19	2.1	293	2.0
White / Caucasian	780	85.9	11,625	81.1
Other	13	1.4	1,227	8.6
Not Answered	16	1.8	-	-
Age	908	100.0	14,334	100.0
17 or younger	-	-	327	2.3
18 years old	57	6.3	1,749	12.2
19 years old	110	12.1	1,749	12.2
20 years old	112	12.3	1,687	11.8
21 years old	95	10.5	1,685	11.8
22 years old	94	10.4	1,229	8.6
23 years old	55	6.1	925	6.5
24 years old	52	5.7	709	4.9
25 years old	53	5.8	559	3.9
26 or older	280	30.8	3,715	25.9
^a Medical residents (323) and Pharmacy residents (2) were excluded from total ETSU student body.				

Of the eligible survey respondents, 25.7% were male, 73.7% were female, and 0.7% preferred not to answer. Six hundred twenty-eight (69.2%) respondents were in their emerging adulthood years (18-25 years old). Students that were 18 years old comprised 6.3% of respondents, 12.1% were 19 years old, 12.3% were 20 years old, 10.5% were 21 years old, 10.4% were 22 years old, 6.1% were 23 years old, 5.7% were 24 years old, 5.8% were 25 years old, and 30.8% were 26 or older (Table 1).

The participants of this study population in comparison to the ETSU student body over-represented females, graduate students, and those 26 or older in age, and under-represented freshman and those 18 years old. Nonetheless, there were similarities in reported racial/ethnic heritage and those in their emerging adulthood years (69.2% in the study vs. 71.8% in ETSU student body).

With reference to weight, 3.6% of respondents self-described as underweight, 60.8% as being of a healthy weight, and 35.6% as overweight or obese (Figure 6). When asked about employment, 67.8% reported being employed in some capacity. As for location of residence, 21.8% lived on campus and 78.2% lived off campus (Figure 7).

Figure 6. Survey Respondent Demographics: Self-Reported Weight Status

Figure 7. Survey Respondent Demographics: Residence the Majority of the Year

Research Questions

Research Question 1

- 1) Are participants aware of the presence of FOP nutrition labeling systems and symbols?

The responses to questions 15 and 16 pertained to this research question (Appendix A). Four participants opted not to answer question 15. Of the 904 responses, 335 (37.1%) were “Yes,” indicating the respondent had prior exposure to FOP nutrition labeling systems and symbols, whereas 195 (21.6%) were “No,” indicating the respondent did not have prior exposure to FOP nutrition labels, and 374 (41.4%) were not sure if they had had any exposure to FOP labels.

In contrast, when asked to identify whether they were familiar with any of the four specified FOP nutrition labeling systems and symbols in question sixteen, 851 (93.7%) recognized the Facts Up Front (FUF) label, 614 (67.6%) recognized the Whole Grain Stamp, 612 (67.4%) recognized the Heart Check mark, and 363 (40.0%) recognized the Fruits & Veggies—More Matters logo (Table 2). When calculating how many of the four FOP nutrition labeling systems and symbols were recognized by each respondent, 133 (14.7%) recognized one, 215 (23.8%) recognized two, 289 (32.0%) recognized three, and 251 (27.8%) recognized all four. Fourteen (1.5%) respondents did not recognize any of the FOP nutrition labeling systems and symbols, and six did not mark a response on this question (Table 3).

Table 2. Frequencies: Respondent Recognition of Four Commercial FOP Nutrition Labeling Systems and Symbols

FOP Nutrition Labeling System and Symbol Recognized	Frequency (n) (n=908)	Percentage (%)
Facts Up Front	851	93.7
Whole Grain Stamp	614	67.6
Heart Check Mark	612	67.4
Fruits & Veggies—More Matters	363	40.0
Failed to Respond (Missing)	6	0.7

Table 3. Frequencies: Number of Commercial FOP Nutrition Labeling Systems and Symbols Identified by Each Respondent

Number of FOP Nutrition Labeling System and Symbols Recognized	Frequency (n) (n=902)	Percentage (%)
1	133	14.7
2	215	23.8
3	289	32.0
4 (all)	251	27.8
None	14	1.6
Failed to Respond (Missing)	6	

Interestingly, those participants who recognized one FOP nutrition labeling system or symbol were significantly less likely to place high importance on nutrition and healthy eating than those who recognized three ($P = 0.006$) or four ($P < 0.001$) FOP nutrition labels. Also, those who recognized two labels were significantly less likely to place high importance on nutrition and healthy eating than those who recognized four FOP labels ($P = 0.045$).

Participants who recognized two, three, or four FOP nutrition labels were significantly more likely than those who recognized one FOP nutrition label to state that FOP nutrition labels are easy to understand and use ($P = 0.047$, $P < 0.001$, and $P < 0.001$, respectively). Those respondents who recognized all four FOP labels were

significantly more likely than those who recognized one ($P = 0.004$), two ($P = 0.001$), or three FOP labels ($P = 0.017$) to look at these types of labels when purchasing a food product. I noted no significant differences among groups regarding the perceived accuracy, truthfulness of, or effect on cost that FOP nutrition labeling systems and symbols have on products displaying them (P -values ranged from 0.795 to 1.00).

Of note, females recognized significantly more FOP nutrition labeling systems and symbols than did males ($P = 0.016$) (Table 4). Also, freshman recognized significantly fewer labels than juniors ($P = 0.048$) and graduate students ($P = 0.049$) (Table 5). I found no significant differences in the number of FOP nutrition labeling systems and symbols recognized between those with ages in and those with ages beyond their emerging adulthood years ($P = 0.302$).

Table 4. Independent Samples T-Test: Number of FOP Nutrition Labeling Systems and Symbols Recognized by Gender

Dependent Variable	Gender	Frequency (n)	Mean $\pm$ SD ^a	Independent Samples T-Test P Value ^b
Number of FOP Nutrition Labeling Systems and Symbols Recognized	Male	232	2.55 $\pm$ 1.07	0.016
	Female	664	2.75 $\pm$ 1.08	
^a 0 = None Recognized, 1 = One Recognized, 2 = Two Recognized, 3 = Three Recognized, 4 = Four Recognized				
^b Significant at $\alpha < .05$				

Table 5. Independent Samples T-Test: Number of FOP Nutrition Labeling Systems and Symbols Recognized by Age Classification

Dependent Variable	Age Classification	Frequency (n)	Mean ± SD ^a	Independent Samples T-Test <i>P</i> Value ^b
Number of FOP Nutrition Labeling Systems and Symbols Recognized	In Emerging Adulthood	622	2.67 ± 1.06	0.302
	Not In Emerging Adulthood	280	2.75 ± 1.10	
^a 0 = None Recognized, 1 = One Recognized, 2 = Two Recognized, 3 = Three Recognized, 4 = Four Recognized				
^b Significant at α < .05				

Research Question 2

2) Does the presence of FOP nutrition labeling systems and symbols on food packaging influence participants to buy those products?

The responses to questions 17-24 on the survey pertained to this research question (Appendix A). Among respondents who recognized one to four (all) specified FOP nutrition labeling systems and symbols, I identified no significant differences among these groups in their stated likelihood to purchase foods with the specified FOP labels.

I did find significant differences among participants who stated a likelihood to purchase products with FOP nutrition labeling systems and symbols, including those participants who: placed a higher importance on nutrition and healthy eating ($P = 0.004$); more frequently paid attention to making nutritious and healthy food purchases ($P = 0.002$); more strongly agreed that FOP nutrition labeling systems and symbols were useful tools ($P < 0.001$); more strongly agreed that such labels were easy to understand and use ($P < 0.001$); more strongly agreed that they were accurate ($P < 0.001$); and finally, more strongly agreed that they were truthful ($P < 0.001$) (Table 6).

Additionally, participants more likely to purchase products with FOP labels reported looking at FOP nutrition labels more often when purchasing food ($P < 0.001$), believed the presence of FOP labels more frequently increased the cost of products for consumers ($P < 0.001$), and, perhaps logically, a high amount of products they purchased displayed FOP labels ($P < 0.001$). Participants more likely to purchase products displaying FOP nutrition labeling systems and symbols displayed no significant differences based upon the frequency of purchasing their own groceries ($P = 0.735$) nor the confidence they possessed in their ability to select nutritious and healthy food choices ($P = 0.576$) (Table 6).

Table 6. Independent Samples T-Test: Respondent Likelihood to Purchase Products with FOP Nutrition Labeling Systems and Symbols

Likert or Likert-Type Survey Question	Likely to Purchase	Frequency (n)	Mean $\pm$ SD a, b, c, d, e, f	Independent Samples T-Test P Value ^g
9. Do you buy your own groceries?	Yes No	384 496	1.79 $\pm$ 0.99 1.77 $\pm$ 1.04 ^a	0.735
12. How important is nutrition and healthy eating to you?	Yes No	384 496	1.90 $\pm$.076 2.06 $\pm$ 0.82 ^b	0.004
13. Do you pay attention to making nutritious and healthy food choices when you purchase foods?	Yes No	384 496	2.06 $\pm$ 0.75 2.22 $\pm$ 0.81 ^c	0.002
14. How confident are you in selecting nutritious and healthy food choices?	Yes No	384 496	2.16 $\pm$ 0.86 2.20 $\pm$ 0.90 ^d	0.576
17. Front-of-Package nutrition labeling systems and symbols that appear on some food packages are useful tools for consumers.	Yes No	384 496	1.64 $\pm$ 0.57 2.10 $\pm$ 0.77 ^e	<0.001
18. Front-of-Package nutrition labeling systems and symbols are easy to understand and use.	Yes No	384 496	2.11 $\pm$ 0.85 2.33 $\pm$ 0.92 ^e	<0.001
19. Front-of-Package nutrition labeling systems and symbols are accurate.	Yes No	384 496	2.51 $\pm$ 0.81 2.91 $\pm$ 0.83 ^e	<0.001
20. Front-of-Package nutrition labeling systems and symbols are truthful.	Yes No	384 496	2.66 $\pm$ 0.86 2.96 $\pm$ 0.85 ^e	<0.001
21. When you purchase a food product, do you look for Front-of-Package nutrition labeling systems and symbols?	Yes No	384 496	2.54 $\pm$ 0.85 3.25 $\pm$ 0.92 ^a	<0.001
22. Do you think Front-of-Package nutrition labeling systems and symbols increase the price of products to consumers?	Yes No	384 496	3.04 $\pm$ 0.92 3.28 $\pm$ 0.85 ^a	<0.001
24. How many food products that you purchase display a Front-of-Package nutrition labeling system or symbol?	Yes No	384 496	2.88 $\pm$ 0.92 3.56 $\pm$ 1.05 ^f	<0.001
^a 1 = Always, 2 = Very often, 3 = Sometimes, 4 = Rarely, 5 = Never				
^b 1 = Very important, 2 = Important, 3 = Moderately important, 4 = Not important				
^c 1 = I always pay attention, 2 = I frequently pay attention, 3 = I sometimes pay attention, 4 = I never pay attention				
^d 1 = Very confident, 2 = Confident, 3 = Somewhat confident, 4 = Not confident				
^e 1 = Strongly agree, 2 = Agree, 3 = No opinion, 4 = Disagree, 5 = Strongly disagree				
^f 1 = All, 2 = Most, 3 = Some, 4 = None, 5 = I'm not sure				
^g Significant if $\alpha < .05$				

Other Significant Findings

Gender, Residence, and Emerging Adulthood

In the current study, females reported purchasing their own groceries significantly more often than males ($P < 0.001$) (Table 7). Paradoxically, males reported being significantly more confident than females in selecting nutritious and healthy food choices ($P = 0.03$) (Table 7). Also, participants residing off campus reported buying their own groceries significantly more frequently than those residing on campus ($P < 0.001$) (Table 8). Participants not in their emerging adult years reported significantly more frequently buying their own groceries ($P < 0.001$), as well as placing significantly higher importance on and more frequently paying attention to nutrition and healthy eating than those in their emerging adult years ($P < 0.001$ and $P < 0.001$, respectively) (Table 9). Participants 26 years or older also expressed significantly more confidence in their ability to select nutritious and healthy choices than those participants 25 and younger ($P < 0.001$) (Table 9).

Table 7. Independent Samples T-Test: Respondent Frequency to Purchase Own Groceries and Confidence in Selecting Nutritious/Healthy Food Choices by Gender

Dependent Variable / Survey Question	Gender	Frequency (n)	Mean $\pm$ SD ^{a,b}	Independent Samples T-Test <i>P</i> Value ^c
Do you buy your own groceries?	Male	233	2.00 $\pm$ 1.14 ^a	<0.001
	Female	669	1.70 $\pm$ 0.99 ^a	
How confident are you in selecting nutritious and healthy food choices?	Male	233	2.08 $\pm$ 0.88 ^b	0.030
	Female	669	2.23 $\pm$ 0.88 ^b	

^a 1 = Always, 2 = Very Often, 3 = Sometimes, 4 = Rarely, 5 = Never

^b 1 = Very Confident, 2 = Confident, 3 = Somewhat Confident, 4 = Not Confident

^c Significant at $\alpha < .05$

Table 8. Independent Samples T-Test: Respondent Frequency to Purchase Own Groceries by Location of Residence

Dependent Variable / Survey Question	Location of Residence	Frequency (n)	Mean ± SD ^a	Independent Samples T-Test <i>P</i> Value ^b
Do you buy your own groceries?	On Campus	198	2.08 ± 1.08	<0.001
	Off Campus	710	1.70 ± 0.99	
^a 1 = Always, 2 = Very Often, 3 = Sometimes, 4 = Rarely, 5 = Never				
^b Significant at α < .05				

Table 9. Independent Samples T-Test: Respondent Frequency to Purchase Own Groceries and Importance on, Frequency Paying Attention to, and Confidence in Making Nutritious/Healthy Food Choices by Age Classification

Dependent Variable / Survey Question	Age Classification	Frequency (n)	Mean $\pm$ SD _{a,b,c,d}	Independent Samples T-Test <i>P</i> Value ^e
Do you buy your own groceries?	In Emerging Adulthood	628	1.98 $\pm$ 1.09 ^a	<0.001
	Not In Emerging Adulthood	280	1.33 $\pm$ 0.65 ^a	
How important is nutrition and healthy eating to you?	In Emerging Adulthood	628	2.08 $\pm$ 0.80 ^b	<0.001
	Not In Emerging Adulthood	280	1.80 $\pm$ 0.76 ^b	
Do you pay attention to making nutritious/healthy food choices when you purchase foods?	In Emerging Adulthood	628	2.24 $\pm$ 0.80 ^c	<0.001
	Not In Emerging Adulthood	280	2.00 $\pm$ 0.77 ^c	
How confident are you in selection nutritious and healthy food choices?	In Emerging Adulthood	628	2.08 $\pm$ 0.88 ^d	<0.001
	Not In Emerging Adulthood	280	2.23 $\pm$ 0.88 ^d	
^a 1 = Always, 2 = Very Often, 3 = Sometimes, 4 = Rarely, 5 = Never				
^b 1 = Very Important, 2 = Important, 3 = Moderately Important, 4 = Not Important				
^c 1 = Always Pay Attention, 2 = Frequently Pay Attention, 3 = Sometimes Pay Attention, 4 = Never Pay Attention				
^d 1 = Very Confident, 2 = Confident, 3 = Somewhat Confident, 4 = Not Confident				
^e Significant at $\alpha < .05$				

Self-Reported Weight Classification

Participants self-reported as obese were significantly more likely than healthy weight participants to always buy their own groceries ($P = 0.014$). Additionally, healthy weight participants were more likely than overweight or obese participants to consider nutrition and healthy eating to be very important ($P < 0.001$ and $P = 0.002$, respectively). Healthy weight participants reported significantly more frequently paying attention to making nutritious/healthy food choices than overweight participants ($P < 0.001$). Also, self-described healthy weight participants reported that they were significantly more likely to feel confident in their selection of nutritious/healthy food choices than were those who were self-described as overweight ($P < 0.001$).

Discussion

Despite a large percentage (41.4%) of students lacking familiarity with the term “Front-of-Package nutrition labeling system and symbol,” most students recognized at least one of the four presented commercial FOP labels. In general, the more FOP nutrition labeling systems and symbols participants recognized, the higher the importance they placed on nutrition and healthy eating, the more positively they responded to the ease in comprehending and using FOP labels, and ultimately the more likely they were to look at FOP labels when purchasing a food product.

These findings are compatible with previous studies. It appears that consumers living in the Mediterranean area with higher levels of nutrition knowledge (who read ingredient lists and assigned higher importance to overall nutrition), were more likely to use the NFPs and other types of food labels, nutrition-related or otherwise.²⁰⁷ Also, existing European Union (EU) and U.S.-based research has indicated consumers’

appreciation of FOP nutrition labels along with an ability to differentiate healthier choices between foods when referencing FOP nutrition labels.^{192,216,217}

Nonetheless, it appears in the current study that recognition and reference to FOP nutrition labeling systems and symbols by college students during the task of grocery shopping is not significantly correlated with a likelihood to purchase products displaying these labels. This finding is similar to that of the IOM's six years ago, that despite demonstrating some success in the marketplace, no existing FOP systems were conclusively shown to consistently influence consumer choice.²⁶ In contrast, however, researchers of an eye-tracking (forced exposure) study more recently found that fixation on, and therefore attention to, FOP labels among university students did in fact mediate food selections.¹⁹⁹

Additionally, participant gender was significantly correlated with the number of FOP labels recognized in the current study. Female college students recognized more FOP labels than males. This finding supports previous studies conducted by Smith et al., Byrd-Bredbenner, and Huang et al., in which female college students were also more likely than male college students to use nutrition labels.^{128,129,130}

CHAPTER 5

CONCLUSION

Sometimes called “young invincibles,” adolescents and young adults are embarking on a developmental phase referred to as emerging adulthood. It is during this age range (18-25 years old) that students enroll in college or university. This population is not invulnerable to the potential long-term implications of overweight or obesity resulting from poor dietary habits. Hence, the college years represent a critical time to assess dietary habits and establish healthier behaviors for the prevention of weight-related morbidity and mortality later in life. Recognition, knowledge, and response to nutrition labeling are ways to assess students’ dietary habits. One method of providing nutrition information to consumers is via voluntary front-of-package (FOP) labeling.

I evaluated university students’ awareness, perception of, and self-reported behaviors regarding four FOP nutrition labeling systems and symbols using an online survey tool. Despite a large proportion of students lacking familiarity with the term “Front-of-Package nutrition labeling system or symbol,” the majority of students were aware of some or all of the four commercial FOP nutrition labels presented in the survey instrument. In general, the more FOP nutrition labeling systems and symbols participants recognized, the more positively they responded to the ease in comprehending and using FOP labels, and ultimately the more likely they were to look at the FOP label when purchasing a food product. Nonetheless, it appears recognition, and therefore reference to FOP nutrition labeling systems and symbols by college

students during the process of grocery shopping, is not significantly correlated with a likelihood to purchase products displaying these labels.

Limitations

This study had limitations, including respondents were predominantly White/Caucasian, with a higher percentage living off campus. Therefore, the results may not be generalizable to other institutions with a more ethnically/racially diverse student population and/or have a larger ratio of students residing on campus. Also, because 28 (3%) surveys were excluded, certain student demographics may have been under or over-represented. However, the large study population ($n = 908$) may help to overcome this limitation.

Other limitations relate to the survey structure and contents itself, including that “healthy” and “nutritious” were not defined, and therefore subjectively defined by participants when responding to questions 12-14. Also, since the belief statements (questions 17-20) were positively worded, responses may have been subject to acquiescence bias. Perhaps if belief statements were both positively and negatively worded, results obtained may have been more accurate. Additionally, it is possible that the Facts Up Front (FUF) label format may have been mistaken for the required Nutrition Facts Panel (NFP), and therefore reported recognition of this FOP label among respondents may have been over-represented.

Of note, the survey was originally intended to include medical residents, as evident from question 4 of the study survey (Appendix A). However, I was informed by the Office of the Provost that the survey link was not, in fact, emailed to ETSU medical

residents. Therefore, medical residents were not reported in the results of the current study.

Assumptions

I made certain assumptions in conducting this study, and therefore excluded them as potential limitations. These assumptions are as follows: (1) the participants were honest in their responses to the survey questions; (2) all of the study population was accessible by email; (3) the email addresses provided by the University were accurate; (4) the intended recipient of the email responded to the survey, and not someone posing as the intended recipient; and (5) the intended recipients answered the survey only once.

Additionally, although the study was limited to self-reported measures, previous researchers have suggested that college students report weight and height accurately.^{218,219} The study population showed a combined overweight and obesity rate of 35.6%, similar to the average range of overweight and obesity rates reported in the national College Health Risk Behavior Study of 30 to 40%.⁶⁰ Therefore, I also assumed that participants provided accurate demographic information on the surveys.

Future Research

Based on my findings, I would suggest further investigation into how and if various formats of food labeling (including different FOP labels) influence college-age consumer purchasing decisions, as well as additional factors that may impact the food choices (and eventual health outcomes) of young adults who are in the process of forming lifelong eating patterns.

Whether FOP nutrition labeling systems and symbols are used to market healthier food selections, for selling more products, or both, I would suggest to food manufacturers, retailers, and public health advocates alike that to effectively influence the behavior of traditional college-age Americans, the four FOP labels presented in this research likely require additional education and/or incentives. Another option to consider may be the implementation of one standardized FOP nutrition labeling system for all food packaging, and then develop a national campaign to educate consumers of all ages.

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APPENDICES

APPENDIX A

24-Question Anonymous Online Survey

1. Informed Consent

Dear Participant:

My name is Audrey Kessler, and I am a graduate student at East Tennessee State University (ETSU). I am working on a Master of Science in Clinical Nutrition. In order to finish my studies, I need to complete a research project. The name of my research study is Knowledge, Perception, and Self-Reported Behavior of College Students Regarding Front-of-Package Nutrition Labeling Systems and Symbols.

The purpose of this study is to identify whether students are familiar with nutrition labeling systems and symbols, and if so, whether they impact students' purchasing behavior. I would like to give a brief survey to ETSU students using SurveyMonkey. It should only take about five to ten minutes to complete. You will be asked questions about nutrition labeling systems and symbols and your food purchasing behavior. Since this project deals with purchasing behaviors, no risk to participants is expected. However, this study may provide benefit by providing more information about nutrition labeling systems and symbols.

Your confidentiality will be maintained to the degree permitted by the technology used. Specifically, no guarantees can be made regarding the interception of data sent via the Internet by any third parties, as is the case with emails. In other words, we will make every effort to ensure that your name is not connected with your responses. Specifically, SurveyMonkey has security features that will be enabled: SSL encryption software will be utilized. Although your rights and privacy will be maintained, the ETSU IRB and personnel particular to this research Dr. Michelle Lee, Department of Clinical Nutrition have access to the study records.

If you do not want to fill out the survey, it will not affect you in any way. Or you may simply exit the online survey form if you wish to remove yourself entirely. A Visa Gift Card in the amount of \$25.00 will be randomly awarded to six students who complete the survey. Student names and email addresses will be collected via a hyperlink at the end of the survey for the sole purpose of distributing the six Visa Gift Certificates and will not be associated with the survey information collected.

Participants must be 18 or older to participate. Participation in this study is voluntary. You may refuse to participate. You can quit at any time. If you quit or refuse to participate, the benefits or treatment to which you are otherwise entitled will not be affected.

If you have any research-related questions or problems, you may contact me, Audrey Kessler, at kesslera1@goldmail.etsu.edu. I am working on this project under the supervision of Dr. Michelle Lee. You may reach her at (423) 439-7524 or leeml2@etsu.edu. Also, the chairperson of the Institutional Review Board at East Tennessee State University is available at (423) 439-6054 if you have questions about

your rights as a research subject. If you have any questions or concerns about the research and want to talk to someone independent of the research team or you can't reach the study staff, you may call an IRB Coordinator at (423) 439-6055 or (423) 439-6002.

Sincerely,
Audrey Kessler, RD, LDN

Clicking the AGREE button below indicates:

- * You have read the above information
- * You voluntarily agree to participate
- * You are at least 18 years of age or older

- I Agree
- I Do Not Agree

2. With what gender do you identify?

- Male
- Female
- Prefer not to answer

3. What do you consider to be your main racial or ethnic heritage? (select all that apply)

- American Indian or Alaskan Native
- Asian or Pacific Islander
- Black or African American
- Hispanic or Latino
- White / Caucasian
- Other
- Prefer not to answer

4. What is your current academic classification?

- Freshman
- Sophomore
- Junior
- Senior
- Graduate student
- Medical student
- Medical resident
- Pharmacy student

5. What is your age?

- 18 years old
- 19 years old
- 20 years old
- 21 years old
- 22 years old
- 23 years old

- 24 years old
- 25 years old
- 26 or older

6. What is your current employment status?

- Full-time employment
- Part-time employment
- Unemployed (seeking employment)
- Not employed (not seeking employment)

7. Where do you live for the majority of the time?

- On-campus dorm
- Off-campus apartment
- At home
- Fraternity or Sorority
- Other (Please specify) _____

8. How do you describe your weight?

- Underweight
- Healthy weight
- Overweight
- Obese

9. Do you buy your own groceries?

- Always
- Very often
- Sometimes
- Rarely
- Never

10. Where do you buy the majority of your groceries? (Please select all that apply)

- Supermarket/Super store (Target, Walmart, Costco, Sam's Club)
- Grocery store (Food City, Kroger)
- Convenience store (gas station)
- Farmer's market
- Other (Please specify) _____

11. Where do you consume most of your meals?

- At home (including dorm, apartment, family home)
- On campus
- At a restaurant (located off campus)
- In a vehicle (on-the-go)
- At work
- Other (Please specify) _____

12. How important is nutrition and healthy eating to you?

- Very important
- Important
- Moderately important
- Not important

13. Do you pay attention to making nutritious and healthy food choices when you purchase foods?

- I always pay attention
- I frequently pay attention
- I sometimes pay attention
- I never pay attention

14. How confident are you in selecting nutritious and healthy food choices?

- Very confident
- Confident
- Somewhat confident
- Not confident

15. Do you have any prior exposure to Front-of-Package nutrition labeling systems and symbols?

- Yes
- No
- I'm not sure

16. Which of the following Front-of-Package nutrition labeling systems and symbols do you recognize? Please select all that apply.

[Permission not obtained to display Heart-Check mark]

- I do not recognize any of the Front-of-Package labeling systems or symbols.

17. The Front-of-Package nutrition labeling systems and symbols that appear on some food packages are useful tools for consumers.

- Strongly agree
- Agree
- No opinion
- Disagree
- Strongly disagree

18. Front-of-Package nutrition labeling systems and symbols are easy to understand and use.

- Strongly agree
- Agree
- No opinion
- Disagree
- Strongly disagree

19. Front-of-Package nutrition labeling systems and symbols are accurate.

- Strongly agree
- Agree
- No opinion
- Disagree
- Strongly disagree

20. Front-of-Package nutrition labeling systems and symbols are truthful.

- Strongly agree
- Agree
- No opinion
- Disagree
- Strongly disagree

21. When you purchase a food product, do you look for Front-of-Package nutrition labeling systems and symbols?

- Always
- Very often
- Sometimes
- Rarely
- Never

22. Do you think that Front-of-Package nutrition labeling systems and symbols increase the price of products to consumers?

- Always
- Very often
- Sometimes
- Rarely
- Never

23. Are you more likely to purchase products with Front-of-Package nutrition labeling system or symbol?

- Yes
- No

24. How many food products that you purchase display a Front-of-Package nutrition labeling system or symbol?

- All
- Most
- Some
- None
- I'm not sure

APPENDIX B

IRB Approval Letter

Office for the Protection of Human Research Subjects • Box 70565 • Johnson City, Tennessee 37614-1707
Phone: (423) 439-6053 Fax: (423) 439-6060

IRB APPROVAL – Initial Exempt

April 4, 2016

Audrey Kessler

RE: Awareness, Perception, and Self-Reported Purchasing Behaviors of College Students Regarding Front-of-Package Nutrition Labeling Systems and Symbols
IRB#: c0316.41e
ORSPA#: ,

On **April 4, 2016**, an exempt approval was granted in accordance with 45 CFR 46.101(b)(2). It is understood this project will be conducted in full accordance with all applicable sections of the IRB Policies. No continuing review is required. The exempt approval will be reported to the convened board on the next agenda.

- New protocol submission xForm, Bibliography, PI CV, Informed consent, Recruitment email, Survey

Projects involving Mountain States Health Alliance must also be approved by MSHA following IRB approval prior to initiating the study.

Unanticipated Problems Involving Risks to Subjects or Others must be reported to the IRB (and VA R&D if applicable) within 10 working days.

Proposed changes in approved research cannot be initiated without IRB review and approval. The only exception to this rule is that a change can be made prior to IRB approval when necessary to eliminate apparent immediate hazards to the research subjects [21 CFR 56.108 (a)(4)]. In such a case, the IRB must be promptly informed of the change following its implementation (within 10 working days) on Form 109 (www.etsu.edu/irb). The IRB will review the change to determine that it is consistent with ensuring the subject's continued welfare.

Sincerely,
Stacey Williams, Chair
ETSU Campus IRB

Cc: Michelle Lee

Accredited since December 2005

VITA

AUDREY L. KESSLER

- Education: B.A. Advertising/Public Relations, University of Central Florida, Orlando, Florida 2003
Didactic Program in Dietetics, Hunter College, CUNY, New York, New York 2009
RD, Dietetic Internship, ARAMARK Healthcare, Edison, New Jersey 2010
M.S. Clinical Nutrition, East Tennessee State University, Johnson City, TN 2016
- Professional Experience: Supervisor of Nutrition and Food Service, Village Adult Day Health Center, New York, NY 2010 - 2012
Corporate Dietitian, K-VA-T Food Stores, Inc. (Food City), Abingdon, VA, 2013 - 2014
Graduate Assistant, East Tennessee State University, Department of Allied Health Sciences, 2015 - 2016
- Honors and Awards: Outstanding Clinical Nutrition Graduate Student 2016, East Tennessee State University
Alpha Eta National Scholastic Honor Society for the Allied Health Professionals 2016, East Tennessee State University
Outstanding Dietitian of the Year 2014-2015, Tri-Cities Academy of Nutrition & Dietetics
Emerging Dietetic Leader Award 2013-2014, Tri-Cities Academy of Nutrition & Dietetics
Healthcare Heroes "Cup of Kindness" Innovation Award 2014, The Business Journal of Tri-Cities / Virginia
The National Society of Collegiate Scholars, University of Central Florida 2003