A COLOR-CODED AND CHOICE ARCHITECTURE INTERVENTION REDUCES THE SALE OF UNHEALTHY FOODS AND BEVERAGES

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ABSTRACT

Background: Americans are spending 48% of their food dollars on restaurant meals and other meals prepared outside their home and it has been shown that food eaten away from home provides more calories per eating occasion and a higher proportion of calories as fat and saturated fat and is lower in dietary fiber, calcium and iron. Modifying the away from home food environment is a promising strategy to reduce caloric intake and to also improve the health of food and beverage choices when eating away-from-home.

Methods: This study aimed to increase sales of healthy foods and decrease sales of unhealthy foods by implementing a color-coded labeling (also known as Go, Slow, Whoa) and choice architecture intervention at a hospital cafeteria. After 1 month of baseline data collection, a color-coded (green = healthy, yellow = less healthy and red = unhealthy) and choice architecture intervention was initiated for 4 months. Changes of sales in green, yellow and red foods were compared from baseline to 2 months and baseline to 4 months. At the conclusion of the intervention, a five question survey was administered to hospital employees via the internal internet.

Results: At baseline, there were 56,862 items sold in the cafeteria; 27% of the sales were green, 32% of the sales were yellow and 41% of the sales were red. During the first 2 months of the intervention, sales of red items decreased 8.0% ($p < .05$), sales of red foods decreased 8.6% ($p < .05$) and all red beverages decreased 11.8% ($p = .318$). Sales of green items increased by 8.1%, sales of green foods increased by 10.0% and green beverage decreased during the first 2 months of the intervention but the changes were not significant. From Baseline to 4 months, sales of all red items decreased by 5.8% which was significant ($p = .03$) and green items increased by 5.5% but this increase was not significant. All red foods decreased by 6.2% from baseline to 4 months ($p = .01$) and yellow foods increased by 5.8% and green foods increased by 6.0% but neither of these changes were significant.

Conclusion: A color-coded and choice architecture intervention improved sales of healthy items and decreased sales of unhealthy options.

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Chapter 1: Introduction

The obesity epidemic is a major concern to the health of Americans and many developed countries around the world. Based on data from the 2009-2010 United States National Health and Examination Survey (NHANES), approximately 33% of American adults aged 20 years and older are overweight and 35.7% are obese (Centers for Disease Control and Prevention, 2012). Assuming these same trends continue, two in every five adults and one in every four children in the United States will be obese by 2015 (Kumanyika et al., 2008). With such astounding numbers, attention in public health has turned to social and environmental factors that are influencing our waistlines. One behavior that is implicated in the changing weight status of Americans is the increasing patronage of restaurants (Mehta & Chang, 2008). Foods available at restaurants and other away-from-home eating locations tend to be higher in calories and fat compared to foods eaten at home (Rydell et al., 2008). Results from both cross-sectional and prospective studies indicate a positive association between the number of meals eaten away-from-home and energy intake (Rydell et al., 2008). One potential method of reducing the risk of obesity is to modify away-from-home food environments to improve menu choices. Therefore, the purpose of this thesis is to analyze the effect of menu labeling on food choices in the away-from-home food environment.

Rationale

In 1970, Americans spent just 26% of their food dollars on restaurant meals and other meals prepared outside their home (Center for Science in the Public Interest, 2003). Today, that number has risen to 48% (National Restaurant Association, 2012). Unfortunately, as more people eat away from home more often, the nutritional quality of these foods has a greater impact on their health. In 1970, when fast food was considered more of a treat than a lifestyle habit, the effect of the nutritional quality of the fast food on health was not a priority. However today,

given the rapidly increasing patronage of food establishments outside the home, more emphasis needs to be put on the nutritional quality and food choices that people make away from home.

Guthrie et al. (2002) found that food eaten away from home provided more calories per eating occasion and a higher proportion of calories as fat and saturated fat and was lower in dietary fiber, calcium and iron. Also, among adults but not children, away food was also more sodium and cholesterol dense (Guthrie et al., 2002). Part of the reason food away-from-home is higher in calories is increased portion sizes. Many restaurants serve two to three times the recommended portions as defined by the United States Department of Agriculture (Stran, Turner, & Knol, 2013). These findings point to the need for intervention in our away from home food environment; an example of an intervention to improve food choices away from home is point-of-purchase menu labeling at fast food and restaurant establishments.

Menu labeling of calorie content has been gaining public and legislative support since 2006 and will soon be mandated as part of the Patient Protection and Affordable Health Care Act for restaurants and food vendors with more than 20 locations (Thorndike, Sonnenberg, Riis, Barraclough & Levy, 2012). Study results have been mixed as to whether labeling menus with calories makes a difference on consumer choice. Harnack and French (2008) reviewed the literature of the effect of point-of-purchase calorie labeling on restaurant and cafeteria choices and found that there was some support that calorie information may have a positive influence on food choices (i.e. fewer calories purchased or selected) but that the magnitude of the effects tended to be small and the results were inconsistent.

The discrepancies between studies for calorie labeling may be attributed to the different types of people being studied. Menu labeling may be more effective for one population compared to another. For instance, people who are more health conscious may already know

which item is healthier and therefore calorie labels would have less influence. On the other hand, people with less nutrition knowledge may be more impacted with calorie labels. For that reason, several studies have explored reasons why menu labeling does not have an impact on all populations.

Krukowski, Harvey-Berino, Kolodinsky, Narsana, and Desisto (2006), found that listing calorie information is only effective if consumers understand how to interpret it. Unfortunately, if consumers do not understand how many calories they should be eating in a day, then labeling menus may be futile. Several counties that have mandated menu labeling have used a statement to inform the public about how many calories, saturated fat and sodium Americans should be consuming; however, if the statement is not understood by patrons or is overlooked, the menu labeling may not be utilized. Thus, examination of more effective ways to present calorie information to impact consumers' choices is warranted.

Thorndike, Sonnenberg, Riis, Barraclough, and Levy (2012) recently published a study using a two-phase labeling and choice architecture intervention to improve healthy food and beverage choices in a hospital cafeteria. Choice architecture was first described by the authors Thaler and Sunstein (2008) and refers to the framing or presentation of choice options. The Thorndike et al. (2012) study was unique because it addressed low nutritional literacy and decision biases by using a color-coded and choice architecture labeling intervention. The study found that using a color-coded and choice architecture intervention decreased sales of red foods and beverages and increased sales of green foods and beverages. There are no similar studies using both the choice architecture and color-coded interventions at point of purchase in a hospital cafeteria. Follow-up research to corroborate Throndike et al.'s (2012) research could strengthen the utilization of low literacy techniques for point-of-purchase menu labeling.

The Institute of Medicine (2012) recently recommended that health care professionals act "as role models for their patients and provide leadership for obesity prevention efforts in the communities by advocating for institutional, community, and state-level strategies that can improve physical activity and nutrition resources for their patients and their communities". Yet there has been little change in the food or the food environment at hospitals to promote healthy eating. Studying the effects of a color-coding labeling and choice architecture intervention in a hospital cafeteria can help to further expand knowledge in this area and help to prove the impacts of such interventions.

Research Question

Does a combined red/yellow/green labeling system along with a choice architecture intervention increase sales of healthy food and beverages and decrease sales of unhealthy food and beverages at a community-based hospital cafeteria?

Subproblems

Subproblems that were addressed in the research include: 1. What are consumers currently purchasing at the specific community based hospital? 2. Currently, are there any hospital influences affecting consumers' food choices? and 3. What will analysis of the choices after the implementation of the labeling and choice architecture indicate when contrasted with choices before the intervention? These subproblems add up to the totality of the principal problem and were investigated during this research.

Limitations

There was no funding available for the proposed study; however, little money was needed to carry out the intervention. The only associated costs were for labels and staff time to design labels and to educate patrons about the menu labeling. Although staff was available to help with

the intervention labels and education, they had limited time as there were no full time equivalents (FTE) to devote to the study. As the researcher, I devoted any free time to the project while at work and did the majority of the labeling and choice architecture outside of work hours. An additional limitation was human error associated with cash register entries but this was minimized as much as possible with training and also testing of the accuracy of entries.

Delimitations

This study took place at the cafeteria of Meriter hospital. These results will not include sales of vending or catering in the hospital and will also not include the patients' meal choices.

Assumptions

If customer choices change after the intervention, it was assumed the change was as a result of the intervention. It was also assumed that customer choice was internal and not being done just because of the study taking place. Finally, it was assumed that cashiers entered data correctly to the best of their knowledge.

Definitions

Away from home food: Food that is obtained from fast food outlets, restaurants, schools, hospitals and other commercial sources.

Away-from-home food environment: Establishments that serve away-from-home food.

Choice Architecture: refers to the framing or presentation of choice options (e.g. beverages, food items, condiments).

Obesity: Body Mass Index $\geq$30 kg/m^2

Overweight: Body Mass Index between 25.0 - 29.9 kg/m^2

Portion Distortion: An upward shift in the size and calorie count of a serving of a particular food served to the general public, especially in fast-food restaurants

Severe Obesity (class 2): Body Mass Index 35 - 39.9 kg/m^2

Severe Obesity (class 3): Body Mass Index 40 - 49.9 kg/m^2

Supplemental Nutrition Assistance Program (SNAP): formerly known as the Food Stamp Program, offers nutrition assistance to millions of eligible, low-income individuals and families and provides economic benefits to communities.

Chapter 2: Literature Review

According to the most recent National Health and Nutrition Examination Survey (NHANES) data, obesity, as of 2012, affects more than one third of all American adults, and

more than two thirds of American adults are overweight or obese (Schindler, Kiszko, Abrams, Islam, & Elbel, 2012). Within the population, minority groups are disproportionately affected. The rates of obesity are almost 50% for non-Hispanic black American adults and between 38% and 40% for Hispanic and Mexican-American adults, compared with 35% of non-Hispanic and Mexican-Americans (Schindler, Kiszko, Abrams, Islam, & Elbel, 2012). Obesity poses an enormous humanitarian and economic impact; in June of 2013 the American Medical Association recognized obesity as a disease state with multiple pathophysiological aspects requiring a range of interventions to advance obesity treatment and prevention (American Medical Association House of Delegates, 2013).

To help combat the growing obesity rates, social and environmental aspects of life that affect food choices are being evaluated. One such behavior is the increasing frequency of food eaten away-from-home. As our obesity rates in America have risen so has the amount of money spent on meals away-from-home. Americans now spend almost half of their food dollars on foods away-from-home (Harnack & French, 2008). This has garnered the attention of public officials because food eaten away-from-home is associated with higher energy, fat and saturated fat intake, and lower intake of fiber and calcium, resulting from greater consumption of hamburgers, French fries, soft drinks, and lower fruit and vegetable intake (Harnack & French, 2008). Higher intake of unhealthy nutrients increases the risk of obesity and therefore increases associated healthcare costs and chronic disease. Recent policy recommendations to improve the food choices that people make away-from-home include taxing unhealthy foods and beverages, limiting advertisements of junk food and beverages to children as well as menu labeling. The purpose of this literature review was to analyze the current research regarding treatment and

prevention of overweight and obesity with a focus on menu labeling. First, background on overweight and obesity will be discussed.

Overweight and Obesity

Obesity and overweight are categorized by Body Mass Index (BMI) which is calculated using the relationship of weight to height. BMI is used because it has been shown to correlate closely with body fat percentage (Centers for Disease Control and Prevention, 2012). Overweight individuals have a BMI between 25.0 - 29.9 kg/m^2. A BMI greater than 30 kg/m^2 is classified as obese. Although BMI correlates with the amount of body fat, BMI does not directly measure body fat and thus is not a perfect measure in all cases. As a result, some people, such as athletes, may have a BMI that identifies them as overweight even though they do not have excess body fat (Centers for Disease Control and Prevention, 2012). It has also been shown that fat located in the abdominal region is a greater risk factor than fat located in the peripheral region (i.e. fat in the gluteal-femoral region) (National Institutes of Health, 2008). Furthermore, abdominal fat appears to be an independent risk predictor even when BMI is not markedly increased (NIH, 2008).

Overweight and obesity substantially raise a person's risk of morbidity from hypertension, dyslipidemia, type 2 diabetes, coronary heart disease, stroke, gallbladder disease, osteoarthritis, sleep apnea and respiratory problems, and endometrial, breast, prostate and colon cancers (National Institutes of Health, 1998). Higher body weights are also associated with increases in all-cause mortality (National Institutes of Health, 1998). Because of these chronic morbidities, across all payers, obese people had medical spending that were $1,429 greater than spending for normal-weight people in 2006 (Finkelstein, Trogdon, Cohen, & Dietz, 2009). All told, in 2008, obesity cost this country an estimated $147 billion (Finkelstein, Trogdon, Cohen,

& Dietz, 2009). Without a strong and sustained reduction in obesity prevalence, obesity will continue to impose major costs on the health system for the foreseeable future (Finkelstein, Trogdon, Cohen, & Dietz, 2009).

Societal, economic and cultural factors have been sighted as being responsible for the increasing weight of Americans. Societal and environmental influences are major factors as they include unlimited access to food and inadequate physical activity (Cizza & Rother, 2011). Americans are less physically active as a result of an increase in reliance on technology as it has made jobs, transportation and entertainment more sedentary than in previous decades (Wakefield, 2004). For instance, many Americans sit at a computer for the majority of their job duties and communities are also built in a way that decreases activity. Evidence shows a direct association between community design and residents' levels of physical activity (Wakefield, 2004). Every 30 additional minutes spent in a car was linked with a 3% increase in the risk of obesity in a study of nearly 11,000 Atlanta residents (Wakefield, 2004). Most children ride to school via bus or a car instead of walking. For example, Canadian children of today expend only about one quarter of the energy their adult counterparts did 40 years ago (Lagerros & Rossner, 2013).

Another important factor that contributes to overweight and obesity is the way Americans have changed their eating habits. Over the last 30 years, the number of restaurants in the U.S. has nearly doubled and Americans eat out twice as often (Stran, Turner & Knol, 2013). Foods consumed outside the home, which account for approximately half of total food expenditures, is higher in calories, and/or of poorer nutritional quality, and served in larger portions, which promotes overconsumption (Roberto, Larsen, Agnew, Baik, & Brownell, 2010). The frequency of fast food consumption is associated with greater levels of body fat and overweight (Roberto,

Larsen, Agnew, Baik, & Brownell, 2010) related to poor nutritional quality and large portion sizes.

Portion sizes at restaurants have become larger (Stran, Turner & Knol, 2013) and as the sizes of portions grow, consumers become accustomed to those amounts and believe they are normal. For example, an order of a spaghetti with meatball dinner at Olive Garden has 920 calories and 36 grams of total fat (Olive Garden, 2013). Add an additional 290 calories and 12 grams of fat for the typical serving of salad and a breadstick (Olive Garden, 2013), and this meal provides 60% of the calories and 74% of the total fat required for a 2,000 calorie diet. This portion distortion can have an influence on the amount that people eat and can negatively impact their eating behavior long term. Eating behavior is a complex interplay of physiologic, psychological, social and genetic factors that influence meal timing, quantity of food intake and food preference (Grimm, & Steinle, 2011). All these factors need considering when treating overweight and obesity.

Treatment of Overweight and Obesity

Management of obesity includes the reduction of excess weight and maintenance of a healthy weight, as well as the institution of additional measures to control any associated risk factors such as elevated blood pressure, cholesterol or blood sugars (National Institutes of Health, 2000). Weight loss therapy which includes dietary therapy, physical activity, behavior therapy, pharmacotherapy and surgery (National Institutes of Health, 2000) will be discussed in more detail in this section. Weight loss of even 5-10% can have significant health benefits (Carvajal, Wadden, Tsai, Peck, & Moran, 2013).

Dietary therapy for weight loss includes counseling patients in the modification of their diets to achieve a decrease in caloric intake (National Institutes of Health, 2000). A moderate

reduction in calories to achieve a 10% weight loss has been shown to reduce obesity related risk factors such as elevated blood pressure, improve insulin resistance and improve levels of total cholesterol, LDL-cholesterol, triglycerides and HDL-cholesterol (National Institutes of Health, 2000). To achieve a 10% weight loss, a reduction of 500-1000 calories each day may result in a weekly weight loss of 1-2 pounds of body weight. There is debate about whether macronutrient composition impacts weight balance independent of calorie intake but recently it has been demonstrated that reduced calorie diets result in clinically meaningful weight loss regardless of macronutrient composition (Sacks et al., 2009; Gardner et al., 2007). Long term successful weight loss requires not only alterations in energy intake but also energy expenditure.

Physical activity should be an integral part of weight loss therapy and weight maintenance because it increases energy expenditure and also helps in weight maintenance (National Institutes of Health, 2000). In addition, physical activity is beneficial for reducing risks for cardiovascular disease and type 2 diabetes, beyond that seen with weight loss alone (National Institutes of Health, 2000). For most people, physical activity should be initiated slowly and then gradually increased with a long term goal of 30 minutes of moderate-intensity aerobic exercise most days of the week (Haskell et al., 2007). Because of the dose-response relationship between physical activity and health, persons who wish to further improve their personal fitness, reduce their risk for chronic diseases and disabilities or prevent unhealthy weight gain may benefit by exceeding the minimum recommended amounts of physical activity (Haskell et al., 2007).

While the means to achieve weight loss are fairly simple, few people achieve sustained weight loss. Changing one's eating habits can be extraordinarily difficult and requires great effort and support. In order for an individual to achieve sustainable change in diet and physical activity for weight loss, behavior therapy is also often necessary.

Behavior therapy provides methods for overcoming barriers to compliance with dietary therapy and/or physical activity and these methods are important components of weight loss treatment (National Institutes of Health, 2000). If a doctor wants a patient to lose weight but the patient is unwilling or does not realize how crucial these changes are for their health, then the patient likely will not change their behavior. Thus, it is important for the practitioner to explore the patient's motivations for change and utilize specific behavior strategies. Examples of behavior strategies include: self-monitoring, stress management, stimulus control, problem-solving, cognitive restructuring and social support. These tools can be used in conjunction with physical activity and dietary therapy to improve weight loss success. To help improve weight loss success further, weight loss drugs have emerged.

Weight loss drugs approved by the FDA for long term use may be useful as an adjunct to diet and physical activity for patients with a BMI $\geq$ 30 and without concomitant obesity-related risk factors or disease or for patients with a BMI $\geq$ 27 with other risk factors or diseases (National Institutes of Health, 2000). Unfortunately, the effectiveness of different drugs differs and effect sizes are only moderate. Haddock and colleagues (2002), reported that maximum weight loss following use of weight loss medications was 4 kg in their meta-analysis of 108 randomized controlled trials with durations of 7 to 47 weeks (Haddock, Poston, Dill, Foreyt, & Ericsson, 2002). Further, many anti-obesity drugs have been taken off the market because of serious adverse side effects. To date, Orlistat, Lorcaserin, and Phentermine-topiramate are the only available long term weight loss medications approved by the Food and Drug Administration (FDA) (National Institutes of Health, 2013). Orlistat works by reducing dietary fat absorption but can also cause fat soluble vitamin malabsorption as a side effect. Lorcaserin acts on the serotonin receptors in the brain and may help decrease hunger and increase satiety. Phentermine-

topiramate also can suppress appetite and increase fullness. Other weight-loss drugs that curb appetite are only approved by the FDA for short-term use (phentermine, benzphetamine, diethylpropion, phendimetrazine) (National Institutes of Health, 2013). Weight loss drugs should only be used in combination with dietary therapy, physical activity and behavioral therapy and side effects should always be monitored by a practitioner (National Institutes of Health, 2000).

Since pharmacotherapy for obesity has shown little success, it is no surprise that the use of bariatric surgery has grown rapidly and has increasingly been recognized as an effective option in obesity management (Lagerros & Rossner, 2013). Weight loss surgery is an option for weight reduction in patients with clinically severe obesity (i.e. BMI $\geq$ 40 or BMI $\geq$ 35 with comorbid conditions) (NIH, 2000). An integrated program that provides guidance on diet, physical activity and psychosocial factors is necessary before and after surgery (NIH, 2000). Sjöström and colleagues (2004) reported that bariatric surgery was not only associated with positive effects on diabetes, cardiovascular risk factors and lifestyle, but also with reduced risk for cardiovascular events, cardiovascular mortality (Sjöström et al., 2012) and total mortality (Sjöström et al., 2007). Although there are benefits to weight loss surgery, there are also serious potential complications (i.e. incisional hernias, gallstones, and, less commonly, weight loss failure and dumping syndrome). Thus, weight loss surgery is generally reserved for those who have been unsuccessful with other weight loss methods and who have severe obesity (National Institutes of Health, 2000).

Dietary therapy, physical activity, behavioral therapy, pharmacotherapy and surgery are all strategies to treat overweight and obesity. General practitioners play a critical role in treating and evaluating patients with overweight and obesity but also important are the skills of registered dietitians, psychologists and exercise physiologists. Ideally, a team that integrates all these

disciplines provides patients with the resources they need for long term success to achieve a healthy weight. The above strategies are aimed at treating obesity once it has already ensued; many efforts are now pointing towards prevention.

Prevention of Overweight and Obesity

From 1970 to 2000 the rate of childhood obesity tripled (Gee, Chin, Ackerson, Woo & Howell, 2013) and from 2000 to 2010, no statistically significant linear trends in body mass index (BMI) were detected; however, 30.4% of children and adolescents aged 2 through 19 years were overweight or obese in 2009-2010 (Gee et al., 2013). Obesity among children is associated with significant psychological, social and health consequences including insulin resistance, cardiovascular disease, low self-esteem and poorer education and employment outcomes (Williams, Henley, Williams, Logan, & Wyatt, 2013). The rising prevalence of obese children combined with the increased likelihood of obesity continuing into adulthood, has resulted in childhood being seen as an important period for interventions and establishment of healthy lifestyle patterns to prevent overweight and obesity (Williams et al., 2013). Interventions such as a tax on unhealthy foods and beverages and reduction of junk food and sugared beverage advertising to children to help prevent obesity have been proposed and will be discussed further in this section.

Tax on Unhealthy Foods and Beverages. Consumption of snack items and sugar-based soft drinks contribute to weight gain and obesity in both juvenile and adult populations (Chriqui, Eidson, Bates, Kowalczyk, & Chaloupka, 2008) causing carbonated soft drinks and other sugar sweetened beverages such as fruit punch, sweetened tea and sports drinks to be commonly targeted in anti-obesity initiatives (Strum, Powell, Chriqui & Chaloupka, 2010). Since the 1970s, intake of sugar-sweetened beverages has increased more than two-fold, and currently they are

now the primary source of added sugar in the United States diet (Malik & Hu, 2011). The main mechanisms linking sugar-sweetened beverages intake to weight gain are the low satiety of liquid calories and incomplete compensatory reduction in energy intake at subsequent meals, leading to an increase in total energy intake (Malik & Hu, 2011). To help reduce intake of these beverages and snacks, a tax on sugar-sweetened beverages has been proposed (Strum, Powell, Chriqui, & Chaloupka, 2010).

Although government involvement in obesity prevention via taxation has been opposed by some, others point to the success of tobacco excise taxes on the reduction of smoking rates. Economic theory predicts that as the price of an item increases the consumption of that item will usually fall (Mytton, Clarke & Rayner, 2012). Therefore, a tax on snacks and sugar-sweetened beverages may discourage consumers from purchasing products that are high in calories, sugar and fat and provide little nutritional value. It could also be a revenue source for obesity prevention programs. A tax on snacks or sugar-sweetened beverages could also help to narrow the gap between the price of junk food and healthy foods. For example, between 1980 and 2011, it became more than twice as expensive to purchase fruits and vegetables compared to purchasing carbonated beverages (Powell, Chriqui, Khan, Wada, & Chaloupka, 2012). Soda, sugar-sweetened beverages, some snacks and restaurant consumption are currently taxed in some states and localities in the United States but at relatively low rates that were not intended to influence behavior but for revenue generating purposes (Chriqui, Eidson, Bates, Kowalczyk, & Chaloupka, 2008). On the other hand, Denmark, France and Hungary have introduced taxes on unhealthy foods and beverages in order to influence consumption of those foods and beverages believed to contribute to obesity and increase health care costs (Villanueva, 2011). Some critics

believe such taxes could lead to job losses in the food industry while others have questioned the exact amount that would influence consumption.

A recent review of the price elasticity of demand for sugar-sweetened beverages, fast food and fruits and vegetables (Powell, Chriqui, Khan, Wada, & Chaloupka, 2012) found that a tax that raised prices by 20% reduced sugar-sweetened beverage consumption by 24%. Fast-food consumption was price inelastic suggesting a tax that raised the price of fast food by 20% would reduce consumption by about 10%. Nonetheless, such a tax could have large implications at the population level given the extent of calorie intake from fast food among the U.S. population, particularly among youths (Powell et al., 2012). These same authors concluded that fruit and vegetable consumption was price inelastic suggesting that subsidizing fruits and vegetables by 20% would increase consumption by 10% (Powell et al., 2012). Finally, lower fruit and vegetable prices were associated with lower body weight among a low income population, particularly participants of the Supplemental Nutrition Assistance Program (SNAP). Other reviews of taxation have similar conclusions in that taxation needs to be at least 20% to have a significant effect on obesity and cardiovascular disease (Mytton, Clarke & Rayner, 2012). Two studies by French et al. (2001 & 2010) found that lowering prices of targeted food and beverages from vending machines increased the purchases of these items (French et al., 2010; French et al., 2001). These studies point to the fact that changes in prices of less healthy foods and beverages while also subsidizing healthy foods may change consumption patterns and may have significant impacts on weight outcomes at the population level.

The soft drink and snack food industry have opposed and campaigned against special taxes on their products (Jacobson & Brownell, 2000). And as a result some cities, counties and states have repealed the taxes in order that big companies keep jobs and plants open in their area.

Some opponents of the soft drink and snack food tax also site that the tax would be too hard to administer because of the unclear definition of which foods and beverages to tax (Jacobson & Brownell, 2000).

Reducing Advertising of Unhealthy Foods and Beverages to Children. Obesogenic environments have contributed to higher obesity rates over the past 30 years by exerting powerful influences on people's overall calorie intake, on the composition of their diets, and on the frequency and intensity of physical activity at work, at home, and during leisure time (Raine et al., 2013). Included in an obesogenic environment is the wide availability and heavy marketing of foods and beverages especially those that are high in fat, sugar and salt that challenge efforts to eat healthfully and to maintain a healthy weight, especially for children (World Health Organization, 2010). Children aged 2-11years see an average of 11.5 minutes of food-related TV advertising per day in the US (Powell, Szczypka, & Chaloupka, 2007). This doesn't include all the other advertising children are exposed to on the internet, radio, billboards and even at school. It has been shown that 72.5% of food ads during children's TV programming were for high-calorie, low-nutrient products, 26.6% were for high fat or sugar products and only 0.9% were for low-calorie, nutrient rich products (Kunkel, McKinley, & Wright, 2009).

In 2006, the Institutes of Medicine reviewed 123 studies related to food and drink marketing to children and youth and concluded that marketing strongly influences children's preferences, requests and consumption, and that food and drink advertising on television is associated with obesity of children and youth (Institute of Medicine, 2006). The report also found that before the age of 8 years, children are unable to distinguish between program content and the persuasive intent of advertising, showing the vulnerability of children to their

environment (Institute of Medicine, 2006). For these reasons, it has been proposed that marketing to children needs to be controlled at a national level.

Total marketing investments by food, beverage and restaurant industries have not been clearly identified, although advertising alone accounted for more than $11 billion in industry expenditures in 2004, including $5 billion for television advertising (IOM, 2006). From1994-2004, the rate of increase in the introduction of new food and beverage products targeted to children and youth substantially outpaced the rate for those targeting the whole food and beverage market (IOM, 2006). This discrepancy in growth reflects the industry's intentions to sell food and beverages to a vulnerable age group that are often lacking in nutrients and high in sugar, fat and salt.

In 2006, to encourage healthier dietary choices and healthy lifestyles, the Better Business Bureau, along with leading food and beverage companies, started the Children's Food and Beverage Advertising Initiative (CFBAI) in an effort to change the mix of food and beverage products advertised to children (Peeler, Kolish & Enright, 2009). A key requirement is that participants commit at least 50% of their child-directed advertising in measured media to better-for-you products (e.g., products that have fewer calories and are lower in fats, sodium and sugars, and/or are nutrient dense). Of the CFBAI's 16 voluntary participants, three are not engaging in self-directed children's advertising: The Coca-Cola Company, The Hershey Company and Mars Inc. (Kolish & Hernandez, 2012). *Children Now* commissioned a study to analyze the effectiveness of the Children's Food and Beverage Advertising Initiative and found that industry self-regulation achieved only the slightest degree of improvement in televised food marketing to children. Meanwhile, advertising of truly healthy foods to children remains virtually invisible (Kunkel, McKinley, & Wright, 2009). Given the failures of industry self-

regulation, the *Children Now* study recommends "public health officials and policymakers need to seriously consider regulatory intervention to achieve more stringent reductions in advertising of nutritionally deficient foods to children" (Kunkel, McKinley, & Wright, 2009). The Institute of Medicine has made similar recommendations that Congress intervene and adopt legislation to ensure that food marketers emphasize healthful food and beverage products in their child-oriented advertising (IOM, 2006).

All children deserve to live in a world that fosters their growth and development in a healthy way without the influence of negative marketing. Given that marketing has been shown to strongly influence children's preferences, requests and consumption, and food and drink advertising on television is associated with obesity of children suggest that action to regulate marketing to children along with taxation on unhealthy foods and beverages may help to contribute to the prevention of overweight and obesity. In Sweden, Norway and Quebec, Canada, the government has already regulated advertising to children and more specifically, the Swedish Radio and Television Act does not allow commercial television advertising intended to attract the attention of children below the age of 12 (Lagerros & Rossner, 2013). The Australian fast-food industry has voluntarily agreed to self-regulate advertising to children; however, it has been reported that children's exposure has been unchanged (Lagerros & Rossner, 2013). Clearly, there needs to be continued effort to reduce the amount of unhealthy food and beverage advertising that takes place to children but the best avenue to do so needs to be determined.

Menu Labeling

The first major policy to provide consumers with nutrition information was the *Nutrition Labeling and Education Act (NLEA)* of 1990 (Stran, Turner & Knol, 2013). This law required nutrition labels on food packaging to provide the serving size, number of servings per container,

calories, fat, saturated fat, cholesterol, sodium, total carbohydrates, sugars, total protein, and dietary fiber. The legislation's primary goal was to improve consumer welfare by providing nutrition information that will "assist consumers in maintaining healthy dietary practices" (Balasubramanian & Cole, 2002). Foods sold in restaurants did not fall under the *NLEA* unless a health claim was made about a product (Stran, Turner & Knol, 2013).

Recent legislation has required calorie labels on restaurant menus as a means to help improve the health status of Americans. As part of The Patient Protection and Affordable Care Act of 2010, chain restaurants and food vendors with 20 or more locations will be required to display the calorie content of their foods on menus, drive- through menus and vending machines. Additional information such as saturated fat, carbohydrate and sodium must be available upon request. A statement concerning suggested daily caloric intake must also be posted prominently on the menu and designed to enable the public to understand the significance of the calorie information provided on the menu (The Patient Protection and Affordable Care Act, 2010). The FDA plans to issue the final rules by the end of 2013. For covered restaurants and similar retail food establishments, the final rules will become effective six months from the date of publication and one year from the date of publication for covered vending machines (Federal Drug Administration, 2013). Menu labeling has already been voluntarily mandated in New York City as well as King County, Washington and results so far have been mixed and will be discussed next.

Menu Labeling with Calories. In 2008, New York City became the first jurisdiction in the United States to require restaurant chains to post calorie information on menus and menu boards (New York City Department of Health and Mental Hygiene, 2006). This effort was part of a broader New York City Health Department public health response to the rising rates of obesity.

The regulation requires that chains with 15 or more restaurant locations post calories on menus or menu boards. A study by Dumanovsky, Huang, Bassett, & Silver (2011) analyzed calories purchased before and after implementation of the calorie labeling and found no overall decline in calories purchased for the full sample. When analyzed individually, several major chains (KFC, McDonald's, Au Bon Pain) saw significant reductions in the number of calories that were purchased by clients. After the implementation, one in six lunchtime customers used the calorie information provided, and these customers made lower calorie choices (Dumanovsky et al., 2011). Overall, the effect of calorie labeling in restaurant chains on consumer choice in New York has been mixed (Vadiveloo, Dixon, & Elbel, 2011). This is consistent with other studies that have looked at voluntary menu labeling in away-from-home food environments and will be discussed below.

Some studies show there was no overall decline in calories from foods purchased with the addition of calorie labels (Dumanovsky et al., 2001; Elbel, Kersh, Brescoll & Dixon, 2009; Harnack & French, 2008) while others have shown there was a slight decrease in calories ordered (Harnack & French, 2008; Pulos & Leng, 2010; Roberto, Larsen, Agnew, Baik & Brownell, 2010). Most studies measuring the impact of menu labeling focused on the effect of patron's purchasing patterns, but there may also be an effect on the menu items that the restaurants offer.

Another way to measure the effect of menu labeling is from the restaurant's perspective. As of January 1st, 2009, King County, Washington required menu labeling for any restaurant chain that had 15 or more establishments in the United States and at least $1 million in annual sales (Bruemmer, Krieger, Saelens, & Chan, 2012). At all King County establishments mandated to have menu labels, the regulations required menu items available more than 90 days to display

calories, grams of saturated fat, and milligrams of sodium at point of purchase as well as a statement about recommended limits for calories, saturated fat and sodium. Bruemmer, Krieger, Saelens & Chan (2012), analyzed nutrient content of menu items before and after the introduction of the menu labels and found that there was a significant decrease in calories, saturated fat and sodium (for all $p < .0001$) for entrees after implementation of the nutrition information at sit down restaurants. The changes were attributed to decreased portion size, substitution of ingredients or both from the restaurant. This highlights the fact that menu labeling can increase awareness of nutritional content from a corporate perspective and can lead to unexpected changes to consumer health by increasing the number of healthier options offered.

Ellison, Lusk, & Davis (2013) suggested that the influence of the calorie labels on purchasing patterns away-from-home depends on the health consciousness of the consumer as well as demographics such as gender, income, age, education, and cultural background. For instance, Galz, Basil, Maibach, Goldberg & Snyder (1998) concluded that women and older men are more health conscious and therefore menu labels may be more influential for these sections of the population. In a qualitative research study, Schindler, Kiszko, Abrams, Islam, & Elbel (2012) found that degree of hunger and preference for a particular menu item prevailed regardless of caloric content when making food choices. Restaurant patrons have different motivations, backgrounds and desires for food, which may limit the impact that menu labeling has on food choices.

Nutrition labeling has evolved since 1990 when it was first required that food packaging have labels. Today the Patient Protection and Affordable Care Act will require the labeling of calories of foods on menus, drive- through menus and vending machines. There have been different counties and cities that have already mandated menu labeling, but the results on

purchasing patterns have been mixed. Some authors cite that the lack of effect may be due to the health consciousness or demographics of the consumer or just taste preference for a food in general. Other studies have suggested that different ways of conveying caloric information may reach a broader population and have a greater effect.

Menu Labeling with Physical Activity Equivalents. One suggested intervention has been to present nutrition information in a more tangible and familiar way by using physical activity equivalent labels. Physical activity equivalent labels present calorie information in terms of the amount of physical activity required to expend the calories in a specific food item (Swartz, Dowray, Braxton, Mihas, & Viera, 2013). In a qualitative study Swartz et al. (2013), found that portraying calories in minutes or miles personalized the food label and also helped to promote exercise in everyday life. On the other hand, Fitch et al. (2009) examined consumer views when presented with different calorie presentations on a menu and they found that 71% preferred the calorie information over the physical activity equivalents. Other studies have gone a step further and found that using physical activity equivalents alone can help decrease calories from sugar sweetened beverages purchased by low income black adolescents (Bleich, Herring, Flagg, & Gary-Webb, 2011). Specifically, Bleich et al. (2011), saw that providing adolescents with caloric information in the form of a physical activity equivalent (represented as the minutes of running necessary to burn off a bottle of soda or fruit juice), compared with providing no information, reduced the odds of a sugar-sweetened beverage purchase by half (OR = 0.51; 95% CI = 0.31, 0.85). Although much research in this area remains qualitative, and further testing on additional populations using exercise equivalents for both food and beverages is needed, using exercise equivalents may potentially influence choices in the away-from-home food environment.

Menu Labeling with Traffic Lights or Color-Coded Labels. Another intervention that has been proposed is adding a traffic light or color-coded label to food products and menus to help guide customer choice because it has been suggested that symbols may be more effective than calorie labeling because it simplifies cognitive processing (Payne, Bettman & Johnson, 1999). In 2006, the United Kingdom (UK) Food Standards Agency (FSA) recommended that food retailers and manufacturers in the UK place front-of-pack traffic-light labels on products in a range of categories to help people make healthier choices (Sack, Rayner & Swinburn, 2009). The recommended labeling consists of three separate color-coded lights indicating the level of fat, saturated fat, sugar and salt in the product. A 'red' light indicated a 'high' level, an 'amber' light indicated a 'medium' level and a 'green' light indicated a 'low' level for each of fat, saturated fat, sugar and salt (Sack et al., 2009). Following the recommendation, several grocery store chains started to include front of pack traffic light nutrition information. A short-term study based on a small number of ready meals and sandwiches by Sack et al. 2009, found that the introduction of the three traffic-light label system had no discernible effect on the relative healthiness of consumer purchases (Sack et al., 2009). Although sales may also be influenced by other factors such as price and promotion, sales data from the UK suggest that this labeling system may be effective (Chun-Yu Louie, Flood, Rangan, Hector, & Gill, 2008). As of June 2013, the FSA is still recommending a labeling scheme with front-of-pack traffic light labels as well as percentage reference intakes (Food Standards Agency, 2013).

In the United States, food and beverage manufacturers and retailers released the Facts Up Front program which includes information about calories, saturated fat, sodium, sugars and up to two (of possible eight) nutrients to encourage on food packaging that manufacturers can opt to include (Roberto et al., 2012). However, little publicly available research has evaluated the

utility of the Facts Up Front so Roberto et al., 2012, compared Facts Up Front to Traffic Light labeling in a randomized controlled trial. They found that the Traffic Light label performed better than the Facts Up Front label on measures of nutrition knowledge and label perceptions ($p < .001$ for both) and they concluded that the Facts Up Front could be improved by using a color-coded traffic light scheme. The traffic light on food products is an important consideration when shopping at grocery stores and other away-from-home food environments could benefit from the color-coded traffic light label.

Menu Labeling at a Hospital Cafeteria. The following studies will be analyzed more thoroughly as they have used traffic light labels in their intervention at away-from-home food environments and this is a promising strategy to address nutritional literacy. Thorndike, Sonnenberg, Riis, Barraclough, and Levy (2012) studied a two-phase food-labeling intervention that addressed low nutritional literacy and decision biases during six months in a large cafeteria at Massachusetts General Hospital in Boston. Phase 1 was a labeling intervention designed to inform cafeteria patrons about the relative healthiness of cafeteria items with a simple color-coded scheme. Phase 2 maintained the labeling and added a choice architecture intervention to increase the visibility and convenience of some healthy items.

Phase 1 involved labeling all items red, yellow, or green on the basis of the United States Department of Agriculture's 2005 My Pyramid healthy eating recommendations along with help from the hospital's nutritionists. New signage was posted in the cafeteria to describe the labeling and highlighted that green meant "consume often," yellow meant "consume less often," and red meant "there is a better choice in green or yellow." Baseline cash register data was collected for three months prior to the study intervention.

After three months of the phase 1 intervention, the phase 2 intervention was added and data was collected for another three months. The phase 2 intervention added choice architecture, which involved rearranging beverages, chips, and premade sandwiches to emphasize the healthier options (green and yellow labels). For example, all five beverage refrigerators were rearranged so that the green beverages (water, diet beverages, and low-fat dairy products) were located at eye level and yellow and red beverages were located below eye level. The authors hypothesized that location and convenience would influence purchases.

The primary outcome was a change in sales of red and green items from baseline to phase 1 and from phase 1 to phase 2. Secondary outcomes were a change in sales of cold beverages, premade sandwiches, and chips. For the primary outcome, they compared the proportion of total sales that were labeled red or green across all phases. As a secondary outcome, the authors compared the proportion of cold beverages sold that were labeled red, yellow, or green as well as the proportion that were diet soda, regular soda and bottled water. The proportions of premade sandwiches that were labeled red or green as well as the proportion of chips that were labeled red were also analyzed. Finally, the authors used a comparison site analysis, which involved two on-site cafeterias that did not have the labeling or choice architecture interventions. The sales of only bottled water, premade sandwiches, and chips were compared in the main cafeteria with the two on-site cafeterias as the comparison sites' cash registers were unable to collect data for all food and beverage purchases. A statistically significant interaction between the intervention and comparison cafeterias indicated the change in sales was associated with the intervention rather than existing trends in purchasing.

The results showed that sales of red items decreased 9.2% from baseline to phase 1 and then decreased an additional 4.9% between phase 1 and phase 2 (for both, $p < .001$). Green items

increased 4.5% in phase 1 ($p < .001$) and then in phase 2 sales of all green items decreased 0.8% ($p < .001$) relative to phase 1. During both phases, sales of red beverages decreased ($p < .001$) and green beverages increased compared to baseline ($p < .001$).

To better understand beverage sales, the authors looked specifically at diet soda, regular soda and bottled water. Diet soda sales increased 9.2% ($P < .001$) during phase 1 and then decreased 0.8% ($P < .001$) during phase 2 relative to phase 1. Regular soda sales decreased 23.1% ($P < .001$) during phase 1 and then decreased an additional 5.9% ($P < .001$) in phase 2. Bottled water sales decreased 2.4% ($P < .001$) during phase 1 but then there was a large increase in sales of 25.8% ($P < .001$) during phase 2. Compared with baseline, the mean number of red beverages sold daily in phase 2 decreased by 238 purchases, and the mean daily number of green beverages increased by 199 purchases.

For the choice architecture, the study compared main cafeteria sales (intervention site) and two on-site comparison cafeterias. Sales of bottled water increased significantly more in the intervention cafeteria than in the comparison sites during phase 2 (between-group absolute difference was 3.2%, $p < .001$). The sales of red sandwiches decreased more (-0.7%) and the sales of green sandwiches increased more (4.3%) in the intervention site compared with the comparison sites and the sales of chips labeled red decreased significantly more (-11.2%) in the intervention site than in the comparison sites ($p < .001$ for all).

The authors concluded that a simple color-coded labeling intervention increased sales of healthy items and decreased sales of unhealthy items in a large hospital cafeteria. They also concluded that a choice architecture intervention that improved visibility and convenience of healthy items further improved the effectiveness of labeling.

One limitation of this study was lack of a control cafeteria. The study was able to use on-site cafeterias as controls to compare beverage, sandwiches, and chips sales, but that option was not available for all food sales. The study was also unable to include a washout period in between interventions or after the phase 2 intervention. The effect of time was difficult for the authors to examine given the second phase of the study added an additional intervention. For that reason, they were also unable to draw any direct conclusions about the impact of time. This information would have been useful to determine if the effect of the intervention decreased over time and if, for instance, patrons' choices reverted back to baseline. It would have been useful to have an additional phase after the second intervention to see if over time the effect of the labeling and choice architecture started to decrease. This study did not characterize the patrons of the hospital cafeteria so it is difficult to generalize the conclusions to any hospital cafeteria. Finally, the study did not compare a different form of menu labeling (i.e. calorie information) to see which was more effective. This would be helpful in order to analyze what labeling strategies are most influential. Although there were some limitations in this study there were many strengths.

Reading and understanding nutrition labels can be a complex task which is why this study introduced a labeling intervention to address low literacy. This study also introduced choice architecture as a way to rearrange the presentation of foods and beverages to encourage intake of healthier options both of which are doable interventions in a worksite cafeteria. The authors provided a diagram illustrating how they carried out the choice architecture intervention making it easy to replicate. Even though this study did not have a control cafeteria, they did use alternate on-site cafeterias to compare purchases of chips, sandwiches, and bottled water thus strengthening their results.

In a separate paper of the same study, Levy, Riis, Sonnenberg, Barraclough and Thorndike, (2012), found that the previous color-coded and choice architecture intervention helped to improve food and beverage purchases across racial and socioeconomic groups. The authors tracked purchases of employee patrons during the same intervention period using an electronic card which auto deducted from direct payroll. Based on human resource files, the authors gathered data on age, gender, self-reported race/ethnicity, full/part time status and job type, and tracked purchases over the study period. Results showed that compared to white employees, Latino and black employees purchased a higher proportion of red items at baseline (18%, 28%, and 33%, respectively, $p < .001$) and a lower proportion of green (48%, 38%, and 33%, respectively, $p < .001$) but after the green, yellow, and red labeling intervention was introduced, all employee red item purchases decreased significantly (−11.2%, $p < .05$) and green purchases increased compared to baseline (6.6%, $p < .05$). Red beverage purchases decreased most (−23.8%, $p < .05$) and this was a significant change. The choice architecture intervention further decreased red purchases after labeling. Across all race/ethnicity and job types, intervention effects were similar ($p > .05$ for interaction between race or job type and intervention). This study adds to the evidence that the color-coded and choice architecture intervention can equally impact all race/ethnicity and job types which is especially important given that in this study the Latino and black employees purchased a higher proportion of red items at baseline.

In a follow-up study, these same authors (Sonnenberg et al., 2013) surveyed customers in the hospital cafeteria before and after the traffic light labeling intervention to assess the influence of labeling on customer awareness of health and healthy purchases. The authors found that the percentage of respondents who identified health and nutrition as being an important factor in

making their food and beverage choice significantly increased after the labeling intervention ($p = .004$) (Sonnenberg et al., 2013). They also found that respondents who reported that the labels influenced their purchase bought a higher proportion of green items and a lower proportion of red items compared to those who reported the labels didn't influence their purchases ($p < .001$) (Sonnenberg et al., 2013). This follow-up study provided more evidence that a traffic light food labeling intervention increased customer awareness of the healthfulness of food and beverages at point of purchase (Sonnenberg et al., 2013). A traffic light food labeling system may be effective but more studies would be helpful to identify ideal length of intervention and if the color coded intervention has the same affects at all away-from-home food environments (fast food, sit down restaurants, etc.).

A Program at a Worksite Cafeteria to Improve Nutritional Intake. Lowe et al., (2010) evaluated nutrition and weight changes as a result of a worksite cafeteria program designed to reduce the calorie content of purchased foods. Participants were randomly assigned to one of two conditions: environmental change (EC) or the environmental change plus pricing incentives and education (EC-Plus). The environmental change involved the introduction of ten new low-energy-dense (ED) foods and provision of labels for all foods sold at lunch, which listed ED, calories and macronutrient content. The EC-Plus group was exposed to the environmental change plus given pricing incentives for low-ED foods and education about low-ED eating delivered in four, one-hour group sessions.

Ninety-six employees of two hospitals volunteered to take part in the study and their food and beverage purchases were monitored electronically by scan card technology coupled with computerized cash registers. Baseline data was collected for two months, followed by a three month intervention period and a six and twelve-month post-intervention follow-up. Dietary

recalls were also conducted at all four assessment points to determine if participants' food intake outside the cafeteria changed as a result of the interventions (Lowe et al., 2010).

The environmental change that took place at both cafeterias involved the addition of ten new low-energy-dense foods as well as a food labeling system that contained a color-coded system based on energy density (very low in energy density, low energy density, medium energy density and high energy density). The labels also showed the total calories, fat, carbohydrate, protein, and energy density for the portion of food being sold.

Participants in the EC-Plus group were exposed to the new labeling system in the cafeteria and also attended four, 60-minute group sessions in which they were taught the principles of energy density. The EC-Plus group participants also received financial discounts of 15% off for purchasing "low energy density" or 25% off for "very low energy density" food items. There was no mention how the participants in the EC-Plus group became aware of the financial discounts.

There were no statistically significant differences in gender, ethnicity, weight or BMI between the two groups (Lowe et al., 2010). There was no difference between groups in total self-reported energy intake over the study period. During the baseline and intervention periods, both the EC and EC-Plus groups decreased the overall energy content of their lunch purchases ($p < .001$). The largest change in energy occurred between baseline month 1 and baseline month 2 ($p < .001$) during which mean energy intake from cafeteria foods decreased from 656.09 kcal to 585.47 kcal. All time points showed a statistically significant decrease in calories ordered when compared to baseline month 1 (p for all $< .001$); however, there were no further month-to-month statistically significant changes (Lowe et al., 2010). Across both groups, percentage of energy from fat in purchased lunches also decreased over the 5-month period ($p = .001$) with a general

downwards trend noted specifically during the intervention months. Across groups, percentage of energy from fat was significantly lower in intervention month 3 compared to intervention month 1 but no other time points compared to baseline or between two consecutive months were significant. Follow-up analyses, conducted by averaging baseline month 1 and 2 and comparing them to the final month of intervention as a conservative estimate of overall impact of the intervention, indicated that change in energy, carbohydrate and fat intake was significantly lower during the intervention compared to baseline ($p < .001$).

The 24-hour recalls analyzed calorie intake, energy density, fruit, vegetable, bread, meat and dairy product intake, intake as well as fat and sweets. For both groups, the 24-hour recalls comparing the pre-study baseline to the end of the study period showed no significant difference in energy density of foods ($p = .29$). There were also no significant changes in reported intake of total energy, vegetables, bread products or dairy products. There was a significant difference ($p < .05$) for fruit intake in EC-Plus group vs. EC group such that the EC-Plus group increased their fruit intake (from 0.77 servings to 0.98 servings) and the EC group decreased theirs (from 1.41 servings to 0.96 servings); however, there was a large between-group difference in baseline fruit intake making it impossible to determine if the change was as a result of the intervention. Finally, there was a significant decrease ($p < .05$) in meat servings across both groups during the cafeteria monitoring period but the amount was not reported in the study.

The authors concluded that relatively small modifications to worksite cafeterias with calorie labels, the addition of less energy dense items, as well as pricing incentives may result in improvements in fat, carbohydrate and energy intake. Although, this study also shows that more intensive environmental changes are likely necessary to produce larger effects. Total energy intake from foods purchased in the cafeteria did decrease as did the percent of energy from fat

during the 6 month study period but when the 3-day food records were analyzed, total energy intake did not change. This suggests that although patrons were purchasing fewer calories at the cafeteria, possibly as a result of the intervention, they may have been eating more calories at home or at other establishments.

There were several limitations in this study. There could have been a Hawthorne effect in that participants reduced their fat and energy intake because they knew certain outcomes were being studied. This same type of effect could have happened just because participants knew their lunch purchases were going to be scanned and reviewed by researchers. This is evidenced by the large decrease in calories during the baseline period. It is also possible that contamination occurred across the two intervention groups because both hospitals carried out both interventions and the participants were employees at the same worksites. There was also an absence of a control group and there were also no plate waste studies to determine actual food intake. The study had a high attrition rate (19.8%) which was significantly higher in the EC-Plus vs. EC group ($p < .05$) and could therefore introduce bias. This study assessed multiple environmental interventions so it was difficult to ascertain which intervention had the greatest effect. The authors did assess dietary intake outside of the cafeteria, thus giving a complete picture of how total intake was affected. Overall, this study had many strengths and introduced interesting interventions to influence food and beverage choices, but further research is needed to clarify the impact of these interventions.

Different Menu Label Presentations to Influence Choice. Liu, Roberto, Liu and Brownell (2012) took the results from Thorndike, Sonnenberg, Riis, Barraclough, and Levy (2012) and Lowe et al. (2010) a step further and examined the influence of different calorie label presentation formats on calories ordered. Participants were recruited from an online database

and were randomly assigned to one of four restaurant menus from which they were asked to select all items they would order for themselves for a single dinner. The four menus were: 1) no calorie labels (No Calories), 2) items labeled with calories and a label stating: "The recommended daily caloric intake for an average adult is 2,000 calories" (Calories), 3) calorie labels appearing next to items that were ranked from low to high calories and the daily caloric intake statement (Rank-Ordered Calories), and 4) calorie labels, items ordered from low to high calories, the daily caloric intake statement, and green or red circles indicating lower and higher calorie choices (Colored Calories). All food was from the chain restaurant Chili's and the beverages were from Applebee's. Applebee's drink menu was included because, unlike Chili's, its website had calorie information for beverages.

After making meal selections, participants estimated how many calories they had ordered in their meal, indicated how hungry they were prior to the survey, how often they used nutritional labels, and how healthy they thought the restaurant menu appeared. They also answered questions about menu labeling and the format of the calorie information as well as demographic questions about age, gender, race/ethnicity, education and income level, height and weight.

Ultimately there were 418 responses included for the analysis of calories ordered. There were no significant differences among groups in age, BMI or any of the other eating practice variables. Including covariates (frequency of nutrition label use, hunger prior to the survey and gender), people who chose from the Calories only menu ordered 84 fewer calories compared with the No Calories menu, ($p = .262$). A second comparison, including covariates, found that the Rank-Ordered Calories condition ordered 154 less calories than the No Calories condition; this difference was significant ($p = .013$). Finally, the difference between the No Calories

condition and the Colored Calories was marginally significant ($p = .095$); the Colored Calories menu group ordered 305 less calories than the No Calories group. Regardless of statistical significance, these differences in calories ordered could be clinically significant, given that consuming an extra 100 calories per day could lead to gaining ten pounds per year.

In relation to estimating calories ordered, all intervention menu groups (Calories, Rank-Ordered Calories and Colored Calories) when compared to the No Calories menu group were significantly different ($p = .009$, $p = .005$, $p = .003$, respectively) in that people who had the intervention menus were more accurate at estimating how many calories they ordered. Fifty-nine percent of participants underestimated calories ordered, 34% overestimated calories ordered, and 7% accurately estimated calories ordered but this did not differ significantly ($p = .119$) across menu groups. However, when the intervention menus were collapsed into one group compared with the control group (No Calories), there was a significant difference ($p = .010$) in the control condition being more likely to underestimate calories compared to the calorie label groups.

When participants were asked about perceived healthfulness of the restaurant, the Colored Calories menu group perceived the restaurant as healthier when compared to all other menu groups and the differences were significant ($p < .05$ for all). The majority (71.8%) of participants thought that all restaurants should offer calorie information on their menus and 75.2% felt that restaurants should label the healthier choices on their menus with a special symbol. Among participants who were exposed to calories on their menu, 35.3% reported that calorie information on the menu influenced their food choices while 57.7% reported it did not.

The findings from this study suggested that presenting menus with different calorie formats by ranking calorie information from low to high or adding red and green colors to highlight healthy and less healthy food, may lead consumers to make healthier choices rather

than presenting calorie information alone. Perceptions about the healthfulness of the menu increased with the color-coded menu, so future research will need to examine if this leads to more or less consumption of calories at the meal. Being able to estimate calories from menus could also be useful for people who are trying to reduce their daily caloric intake.

Limitations of this study included the online survey using a hypothetical situation. The online survey also was a convenience sample of mostly white, female, participants having some college education. Another limitation was that it was not clear if the food items were labeled the same as on a Chili's and Applebee's menu as this may cause some bias if participants had visited these restaurants before. Also, the generalizability of these findings to other types of restaurants (fast-food, cafeterias, etc.) is limited given that only one menu was tested. Finally, in the Color Coded group it was difficult to isolate the one variable that had the greatest effect given the group had multiple interventions.

Morley et al. (2013) conducted a similar experiment in Australia by exposing participants from an existing online marketing panel to five randomly selected menu boards. The five menu labeling conditions were: no menu labeling, kilojoule menu labeling, kilojoule plus percent daily intake menu labeling, traffic light menu labeling and kilojoule plus traffic light plus percent daily intake menu labeling. The participants were instructed to imagine they were at a fast food restaurant chain making their evening meal selection and were going to eat the meal they ordered. All respondents were also asked a series of questions about their demographics, health consciousness, the extent to which they read nutrition information as well as what information on the menu board they were presented that they used to make their dinner selections.

Respondents did not differ significantly across menu labeling conditions in terms of demographic characteristics, their perceived weight status, usual frequency of eating out at fast

food restaurants, awareness that kilojoules are a measure of energy, self- reported importance of nutrition when eating out, knowledge about health and nutrition issues, or frequency of reading nutrition information panels and kilojoule information on packaged foods at the supermarket (Morley et al., 2013). Participants who viewed the menu without any labeling ordered the highest amount of calories (4627 kJ [1,105 kcals]). There was a significant difference in the mean energy content of meal selections by menu labeling conditions ($p = .001$). More specifically, participants who were exposed to the kilojoule menu compared to the no menu labeling condition ordered 490 kJ (117 kcals) less ($p < .05$) and 500 kJ (119 kcals) less for the kJ plus traffic light labeling condition. The differences between participants that saw the kJ + traffic light + percent daily value when compared to the no menu labeling condition were not statistically significant. There were no significant differences in nutrition knowledge and usage of nutrition information among groups.

Interestingly, of the participants who were exposed to some nutrition labeling, 37% reported using some aspect of the information and in each group the traffic light was reported to be utilized by 36% of respondents. 25% of the respondents reported using the kilojoule information when provided and 20% reported using the percent daily intake information. For those participants who were exposed to all the labeling conditions, the traffic light labeling was reported to be utilized most often by participants to make their selections (38%).

This study supports Liu, Roberto, Liu and Brownell's (2012) results in that the color coded (traffic light) intervention had the greatest effect on calories ordered. As mentioned earlier, even small decreases in calories can lead to large population effects overtime. However, small changes in caloric intake also might be within the error of measurement. This study was similar to Liu et al.'s (2012) study in that it was a simulation and may not have accurately

captured real life situations. Further research has evaluated actual restaurant labeling interventions which can more closely simulate real world purchasing.

Different Menu Labeling Interventions. Ellison, Lusk, & Davis (2013) conducted a field experiment and looked at two different ways of labeling menus to influence patrons' choices. A restaurant on the Oklahoma State University campus was split into three sections with each having a different menu intervention. Restaurant diners were randomly assigned to a table in one of the three sections. The three menu interventions were: no calorie information, calorie-only, and calorie and traffic light. The traffic light menu contained a green, yellow or red symbol according to the caloric content of the food item. Green light options were less than 400 calories, yellow options were between 401 - 800 calories and red light options contained greater than 800 calories.

All diners had 51 menu options to choose from. Upon finishing their meal, diners were asked to complete a survey. The one-page survey contained 15 questions and asked diners about: demographics, levels of health consciousness, frequency of and reasons for dining at the restaurant, method of item selection (i.e., was selection based on taste, price, healthfulness, etc.) and menu label preference. Prior to the survey, diners were unaware their dining choices were being recorded as part of the research study. In total, there were 138 observations of which 55.8% were female, 63% were current Oklahoma State students, 34.1% had already obtained a bachelor's degree, 18.1% were between the ages of 35-54.99 and 12.3% were older than 55 years of age.

The authors compared average number of entrees, extra and total calories ordered for the three different menu types. Individuals who ordered from the calorie-only and calorie plus traffic light labeling treatments on average ordered fewer calories of entrée items relative to the control

menu. Those who ordered from the calorie plus traffic light menu on average ordered significantly fewer entree calories compared to the other two labeling formats (114 and 129 calories fewer than the calorie only and control menus, respectively) ($p = .033$). There were no significant differences in the average number of extra calories ordered across treatments. For total calories (entree calories plus extra calories), neither intervention significantly changed total average calories ordered relative to the control menu; however, those who ordered from the calorie plus traffic light menu averaged 121 fewer calories than those who ordered from the calorie-only menu ($p = .063$).

When examining the health consciousness of patrons, the study found that the effects of the labels were less pronounced with more health conscious individuals. But when comparing the two labels, the authors found that at low levels of health consciousness, the calorie-only label led to larger calorie reductions; however, as health consciousness increased, the calorie plus traffic light was more effective. In general, the study found that entree calories were negatively related to health consciousness. In terms of demographics, women ordered significantly less entree calories than men ($p = .026$). Other demographic variables had no significant difference.

The authors concluded that if numeric calorie labels are implemented, they are most likely to influence consumers who are less health conscious; whereas, numeric labels did little for those consumers who were already more knowledgeable about health and nutrition. To reach a broader group of diners, a symbolic calorie label may be preferred as it reduced caloric intake across all levels of health consciousness (Ellison, Lusk & Davis, 2013).

This study suggested that menu labels have a greater effect on entree calories compared to extra calories. The traffic light plus calorie label intervention led to significantly fewer entree calories being ordered compared to the other two menu formats; however, there was no

difference in the average number of total calories that were ordered from the three different menus. This could suggest that consumers who order lower calorie entrees may feel they have license to order more extra calories. Some of the extra items (drink or desserts) were not shown on the menu and therefore diners were not exposed to any menu label. This was a flaw in the study because disguising labels for desserts and drinks may have unintentionally led to patrons to order more calories.

Results of the study also suggested that menu labels may have a greater impact on less health conscious individuals. This is important given the overall goal of menu labeling is to positively impact those who are not as concerned about their health. Interestingly, the calorie only menu labels impacted less health conscious individuals the greatest while the calorie plus traffic light had more impact on the health consciousness individuals. These results suggested that the calorie-only label does not really tell the most health conscious individuals any new information and also emphasized that menu labeling will affect individuals differently depending on their health consciousness.

One of the key strengths of this study was the real restaurant setting with all three interventions happening at the same time. This does not allow for any time discrepancies. Another positive attribute of this study was that it used a survey to help further investigate purchasing patterns. One major flaw in this study was that it did not label drinks, desserts or specials on the menu. The authors also did not mention a statement concerning suggested total daily calorie guidelines, which will be required with the upcoming menu labeling legislation. This could have positively or negatively affected patrons' purchasing patterns. A small sample size was another issue with this study and the authors mentioned that larger follow-up studies are

warranted. Finally, this study took place at a restaurant on a University campus so the application to the larger population is difficult.

Holmes, Serrano, Machin, Duetsch, and David (2012), also looked at different labeling interventions in a private club restaurant, but they focused on decision-making when children interact with families. Most research has focused on adult choices in point-of-purchase menu labeling so this study is unique. Nutrition bargain pricing that adjusted the price by nutritional quality was also introduced in this study. The authors used four different menus for two months each and tracked sales data. The four different menus were: Control which had no nutritional information, Nutrition Labeling with calorie and fat information, Healthy Symbol which added an apple symbol before healthy foods and Nutrition Bargain Pricing which adjusted price by nutritional quality. The authors found there were slight non-significant decreases in calories ordered when compared to baseline; there were also no significant decreases in total fat ordered. They did find some shifts in a la carte and combo meal purchases and overall, the Nutrition Bargain Pricing menu had the most significant effects. This study used a menu with limited food options so the generalizability to a broad menu with many options isn't possible. It is also difficult to assume menu labeling would have the same impact in other away-from-home food environments (e.g. fast food establishments and cafeterias).

Summary

The previous studies represent the studies that involved some kind of traffic light labeling in an away-from-home food environment. The limited number of studies using the traffic light indicates that more research is needed in specific areas of the away-from-home food environment. The previous studies demonstrated that modifying the food environment can have influence on food and beverage choices and the energy consumption of patrons; however, the

degree of impact differed among studies. Liu et al. (2012) saw an average decrease of 305 calories ordered for customers that ordered from a menu that had calorie labels ranked from low to high along with red/green circles indicating higher and lower calorie choices compared to a menu with no calories. Morey et al. (2013) saw slightly less effects of calorie and traffic light labels in that participants in their online study ordered about 100 calories less than the control group. Thorndike et al. (2012) did not look at calories consumed but instead looked at purchasing patterns in a cafeteria and found the traffic light and choice architecture intervention did increase purchases of green or healthy options and decreased purchases of red items. Lowe et al. (2010) saw a decrease in 95 calories ordered at a lunch meal at a worksite cafeteria with introduction of calorie labels, color-coding, an increase in energy-dense entrees and education. Finally, Ellison, Lusk & Davis (2013), did find a significant decrease in entree calories (114 and 129 fewer entree calories than the calorie only and the control menus) ordered with the use of the calorie plus traffic light menu label. Holmes et al. (2013) did not see any significant decrease in calories or fat ordered but their menu options were limited as was the generalizability of the population studied. Although the decrease in calories sounds small, in the long run with widespread implementation, even 100 fewer calories in a meal purchased away from home could have a significant effect on the population. All of these studies did show some effect of menu labeling; however, it is difficult to compare these studies side-by-side because they had different interventions.

Differences in study design and also intervention may explain the contrasting results from these studies. Thorndike et al. (2012) seemed to have the most applied intervention for a cafeteria type, away from home food environment, and the effectiveness of color-coding; however, this study did not compare color-coding with an alternative intervention (i.e. calorie

labels). Lowe et al. (2010) also used color-coding in a cafeteria type setting and added in calories but they did not detail what exactly the color coding entailed (red, green, yellow) and they did not compare the interventions. Worksite cafeterias are a good setting to implement labeling interventions because companies usually pay less for health insurance if their employees lead healthier lifestyles. These establishments would therefore be more motivated for the interventions to be successful and to ensure there are plenty of healthy options.

On the other hand, fast food and other restaurant-type establishments do not necessarily have an incentive for customers to order healthy options and therefore may not be in favor of the majority of their menu being labeled with red and yellow symbols. This may be the case if many food items fall into the unhealthy category and in the long run could affect sales. For that reason, Liu et al.'s (2012) online survey of a restaurant menu intervention may not be widely accepted at an actual restaurant or it may not have as many positive effects. Ellison et al. (2013) also implemented a labeling intervention in a restaurant but there was no mention of long term use or if the labeling intervention affected the restaurant's bottom line. Continued research into the acceptability and long term use of different labeling interventions in fast food and restaurants is warranted.

The diverse away-from-home food environment, as well as the unique population mix of patrons that visit such venues, warrants further research in all these areas. There may be different labeling interventions that work better than others in certain away-from-home food environments. Given there are few studies that have looked at point-of-purchase color-coded labeling in hospital cafeterias, this is an area to focus research. Hospitals should be a model for health care reform in their communities, and initiatives to improve the nutritional offerings at hospital cafeterias can be a model for efforts to address obesity (Wojcicki, 2012).

Conclusion

There needs to be continued research regarding the most effective way to help combat the increasing global obesity epidemic. Treatment of overweight and obesity continues to focus on weight loss, and management of associated risk factors and the prevention of obesity remains debated. Taxing unhealthy foods and beverages and providing subsidies for healthy foods and beverages, as well as mandates on controlling advertising of unhealthy foods and beverages to children, has been proposed. Modifying the away-from-home food environment is another idea gaining popularity and attention for research.

As part of The Patient Protection and Affordable Care Act of 2010, chain restaurants and food vendors with 20 or more locations will be required to display the calorie content of their foods on menus, drive- through menus and vending machines. Even though this legislation has already been passed, there is mixed results for the effects of menus labeled with calories on consumer purchases. For that reason other menu labeling interventions, such as using physical activity equivalents or traffic light labels, have been proposed. So far, the research for using traffic lights has been promising and can help to address low nutritional literacy. Even if the traffic light menu labels decrease purchases by 100 calories per order, this would be a significant worldwide decrease over time and could have a significant positive impact on the health of the nation and the world.

Menu labeling may also help to transform the food and beverage industry's offerings by putting more responsibility for health in their hands. At present, there is no reason for the restaurant industry to promote or even provide healthy options. Given the large burden that obesity puts on the health and finances in America and around the world, the solution will need

to be a priority to all. Although menu labeling is not going to solve the obesity epidemic, it can be a part of an integrated approach to help prevent obesity.

Chapter 3: Methods

To determine whether modifications to a hospital cafeteria impact purchasing patterns of patrons, an experimental study was conducted at the Meriter Hospital cafeteria in Madison, Wisconsin. Meriter is a nonprofit, 448 bed community hospital, providing a complete range of medical and surgical services. Meriter has one main cafeteria, which is open from 6:30 a.m. to 7 p.m. seven days a week. The average number of transactions per month at the Meriter cafeteria is 27,000. In efforts to improve food choices at the cafeteria, a color-coded intervention was implemented to reflect the health content of foods and beverages (green = healthy, yellow = less healthy, red = least healthy) along with choice architecture which refers to the framing or presentation of choice options. Data on purchasing patterns in the cafeteria was collected for one month prior to the intervention and for 4 months following the intervention to determine whether there was a difference in purchasing patterns before and after the intervention.

Intervention

A color-coded and choice architecture intervention was initiated on April 8th, 2013. All foods in the cafeteria were labeled as green, yellow, or red. The message associated with the color-coding for foods was “consume at every meal” for green foods, “consume a couple times per day” for yellow foods, and “consume rarely, if at all” for red foods.

The rating system for green, yellow and red labeling was based on calories, saturated fat and sodium, and three possible positive criteria. The three possible positive criteria for a food were: 1) being a fruit or vegetable, 2) being a whole grain, or 3) having a lean protein as the main component. The cutoff for calories for a green entree was set at 500 calories based on the standard reference diet of 2,000 calories per day with 500 discretionary calories. The upper limit for calories for food items or desserts was 200 for green, while the upper limit for condiments

was 100 calories. For saturated fat, the upper limit was 5 grams per food entree and 2 grams of saturated fat per smaller food item, dessert or condiment for green. This was based on a 2,000 calorie diet with the recommended amount of less than 10% of calories coming from saturated fat. This assumes 5 grams of saturated fat per meal and 5 grams of discretionary saturated fat for snacks. Sodium was also analyzed and the cutoff was 800 mg for a green entree, based on the Dietary Guideline's daily recommendation of no more than 2,300 mg.

To classify a food entree or item into the green category, it had to be less than 500 calories, less than 5 grams of saturated fat and less than 800 mg of sodium. Green foods also had to have some nutritional benefit from containing a whole grain, containing a fruit or vegetable or being a lean protein. A green food that was less than 500 calories and less than 5 grams of saturated fat but greater than 800 mg of sodium was moved to the yellow category. Yellow foods were either greater than 500 calories or greater than 5 grams of saturated fat. There also needed to be some nutritional benefit in this category as well from positive criteria. For instance, if a food that would normally fit into the yellow category based on calories, saturated fat and sodium but didn't have any positive criteria then it would be downgraded to the red category. Finally, red foods were those that had greater than 500 calories and greater than 5 grams of saturated fat. Most likely a food in this category was also greater than 800 mg of sodium. For smaller food items, which included soups, snacks, side dishes, fruit, jello or desserts, the same category criteria applied except the calorie cut off was 200, the saturated fat was 2 grams and the sodium was 500 milligrams.

For the salad bar, all items are sold by weight. All salad bar purchases were sold as green even if they didn't meet the criteria for green (veggies, dried fruit, nuts, beans, soy beans, eggs, low-fat cheese, etc.) because the majority of the food items on the salad bar were green (>75% of

items were green). Fat-free, low-fat dressings and oil based dressings were sold by weight whereas high fat creamy dressings were sold separately in packages and classified as red.

The color-coded labeling intervention for beverages was based on the "Go, Slow, Whoa" concept which was adapted from CATCH: Coordinated Approach to Child Health curriculum (Coordinated Approach to Child Health curriculum, 2002). The message associated with red beverages was, "Whoa" and examples included regular sodas, energy or sports drinks and fruit drinks without 100% juice. For yellow beverages the message was "Slow" and included diet soda, low-calorie, low-sugar drinks, and 100% juices. Water, seltzer water, and skim or 1% milk were classified as green beverages with the slogan "Go". Beverages available at Meriter were identified as green, yellow or red based on these criteria. Green, yellow and red tape was used along the beverage coolers to help visually identify categories. Signs were also taped on the outside glass of the coolers identifying, "Go", "Slow" or "Whoa", so that customers could see them at point of purchase.

The second intervention in this study was choice architecture. Choice architecture was first described by the authors Thaler and Sunstein (2008) and refers to the framing or presentation of choice options. Cold beverages in coolers were rearranged so that green beverages were at eye level and yellow and red beverages were below eye level. Water was emphasized with additional signs. Entrees, desserts and side dishes were rearranged so that green options were displayed first where possible. For example, on the cafeteria line, fruit, cottage cheese and yogurt were displayed before desserts. For condiments, fat free or low fat options were displayed in front of their full fat counterparts. The chip racks displayed the green and yellow options at eye level and red options were put at the bottom.

Signage throughout the cafeteria explaining the "Go, Slow, Whoa" as well as the green, yellow, and red meanings for the food items were used. Registered Dietitians (RDs) at the hospital held two meet and greet sessions to educate patrons and provide educational tools explaining the changes. During the week of initiating the program, a dietitian was available one hour during lunch to answer questions and continue to introduce the intervention to curious customers. Handouts detailing healthy foods and beverages in the cafeteria, as well as information about the green, yellow, and red categories, were given out by the RDs and were available at a table in the cafeteria when dietitians were not available. Finally, the cafeteria menu on the Meriter website also provided colors for each of the entrees and food items.

Survey

A "Go, Slow, Whoa" survey was administered on the Meriter intranet for two weeks after the conclusion of the data collection asking random employees to give their opinion about the labeling intervention (See Appendix A). The employees that took the survey were not selected but volunteered to take the survey after seeing it under the News section on the Meriter homepage. Five questions were asked on the survey asking employees to rank their health consciousness, effectiveness of the Go, Slow Whoa intervention including its' application outside the cafeteria as well as asking patrons to rank the importance of price, convenience, taste and healthfulness in making food and beverage selections. The survey questions were not validated.

Data Collection

Prior to the baseline period, the two cafeteria cash registers were programmed to capture sales of food and beverages in the appropriate green, yellow and red categories. At the time of checkout, the number of foods and beverages sold were collected using cash register software

and analyzed. Special buttons were added to the cash registers to accurately capture green, yellow and red foods and beverages. There were some foods and beverages that were not given special buttons because it was predicted that check out time would have increased and therefore customer satisfaction would have decreased. Soup, chips, breads, taco bar, potato bar and pizza were not given buttons and therefore were not captured in the data analysis. Prior to the baseline data period, cashiers were trained by study personnel. Training included explaining the study and the importance of collecting accurate data. Cashiers were tested during month 4 of the intervention period by collecting receipts of 50 random patrons during the lunch hour on different days. The cashiers entered 143 out of 155 items correctly (92% accuracy).

Analysis

The data was analyzed using T-tests and ANOVA in Excel software. Change in sales of green, yellow and red items from baseline to the end of the intervention period were compared by T-tests. Baseline, 2 month and 4 month average sales were compared by ANOVA. Significance level was established at $p \leq .05$. Approximately 12% of food sales were unable to be included in the analysis because it was too difficult to add buttons for those items on the cash register. For example, Meriter offers around twenty different soups throughout the three week menu cycle so having that many different soup buttons would have slowed down check out time. The food items that were chosen to be omitted were determined with feedback from the Meriter staff.

Chapter 4: Results

During the 28 day baseline period, there were 56,862 items, including foods and beverages, sold in the cafeteria; 27% of the sales were green, 32% of the sales were yellow and 41% of the sales were red. There were 17,859 beverages sold; 17% of beverage sales were green, 60% were yellow and 23% were red. There were 39,003 foods sold; 31% were green, 20% were yellow and 49% were red (Table 1).

Table 1 shows the changes in sales of red, yellow and green items during the intervention phases. During the first 2 months of the intervention, sales of red items decreased 8.0% ($p < .05$), sales of red foods decreased 8.6% ($p < .05$) and sales of red beverages decreased 11.8% ($p = .318$) compared to baseline. Sales of green items increased by 8.1%, sales of green foods increased by 10.0% and green beverages decreased by 5.9% during the first 2 months of the intervention compared to baseline but the changes were not significantly different from baseline. The sales of yellow beverages increased 6.2% during the first 2 months of the intervention compared to baseline but the increase was not significant.

Sales at the two month time point were not significantly different from sales at the 4 month time point, indicating that the impact of the intervention largely took place within the first two months and was stable (Table 1). Sales of red items slightly increased by 2.4% during months 3 & 4 compared to months 1 & 2 but this increase was not significant. Also during months 3 & 4, sales of red beverages decreased further by 1.6% compared to months 1& 2 but this decrease was not significant. Also during this time period, sales of green foods decreased by 3.6%, but this was not significantly different from baseline.

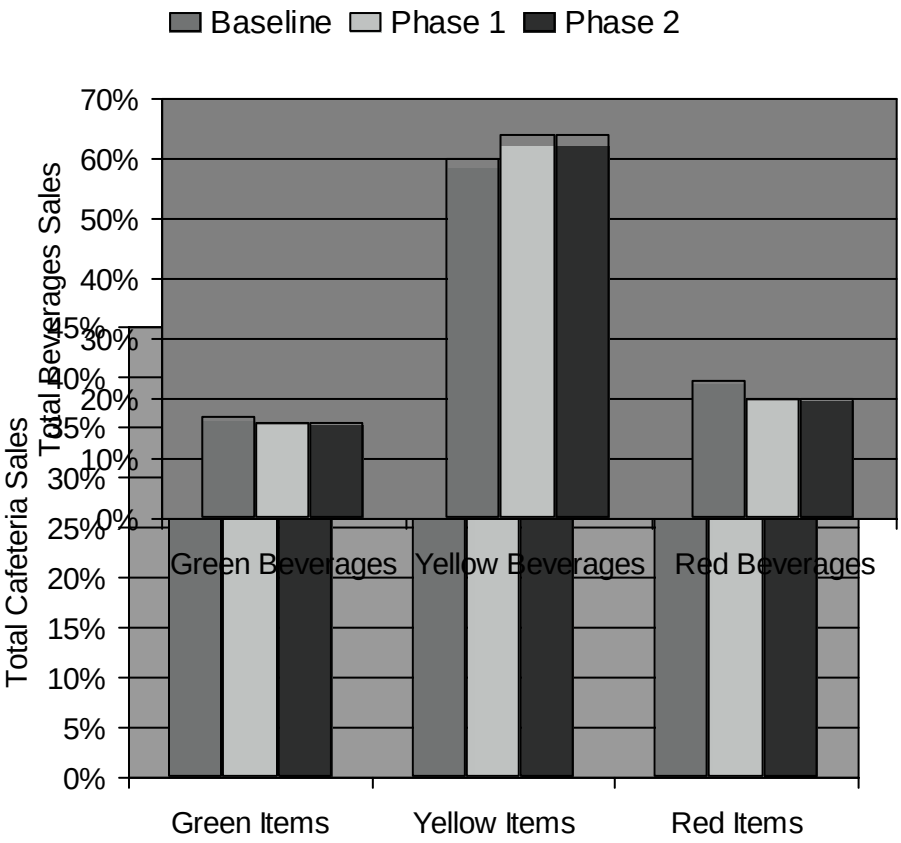
At the 4 month time point, sales of all red items had decreased by 5.8% compared to baseline which was significant ($p = .04$) and green items increased by 5.5% but this increase was

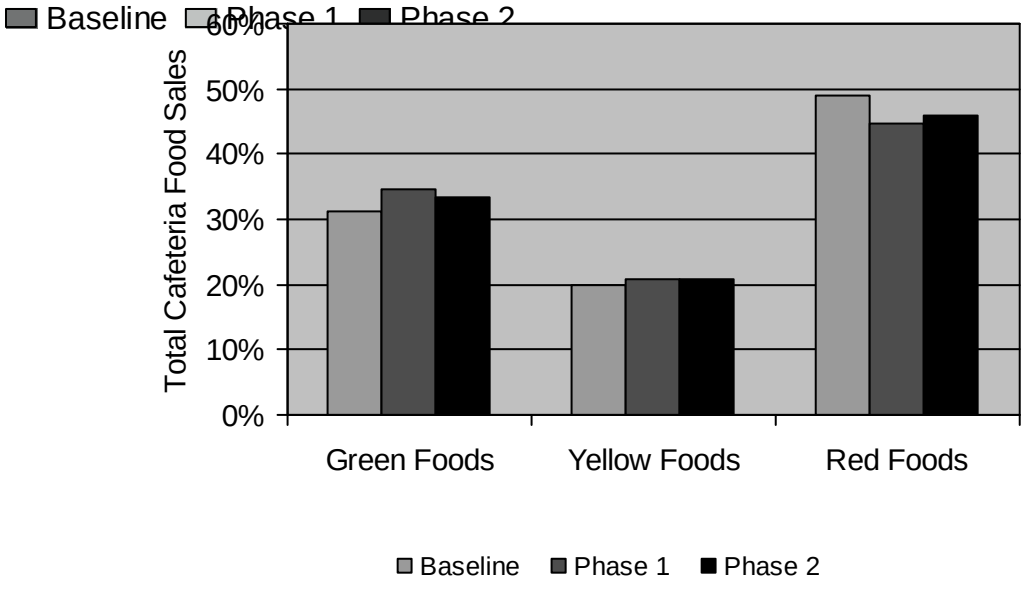
not significant. All red foods decreased by 6.2% from baseline to 4 months ($p = .01$); yellow foods increased by 5.8% and green foods increased by 6.0% compared to baseline but neither of these changes were significant. Red and green beverages decreased by 13.2% and 5.4%, respectively, compared to baseline while yellow beverages increased by 6.6% from baseline to 4 months but none of these changes were significant.

Figure 1 shows the proportion of sales that were red, yellow and green at baseline, and at 2 and 4 months. From baseline to 4 months the total sales of red food and beverages decreased and the total sales of green food and beverages increased but neither of these changes were statistically significant (Figure 1a). The sales of foods alone closely mirrored the changes in total food and beverages in that green and yellow food sales increased from baseline to month 4 while red foods decreased, although none of these changes were significant (Figure 1b). The sale of both red and green beverages decreased from baseline to 4 months but the sales of yellow beverages increased from baseline to 4 months (Figure 1c). None of the changes in beverage sales were significantly different from baseline.

Table 1 - Change in Sales of Green, Yellow, and Red Cafeteria Items

Sale Item	Baseline, %	2 Months, % Change in Sales from Baseline	4 Months, % Change in Sales from 2 Months	4 Months, % Change in Sales from Baseline
Total Sales				
All red items	40.7	-8.0*	2.4	-5.8*
All yellow items	32.4	3.4	-0.6	2.8
All green items	26.9	8.1	-2.4	5.5
Food Sales				
All red foods	48.8	-8.6*	2.6	-6.2*
All yellow foods	19.8	5.4	0.4	5.8
All green foods	31.4	10.0	-3.6	6.0
Beverage Sales				
All red beverages	23.0	-11.8	-1.6	-13.2
All yellow beverages	59.9	6.2	0.4	6.6
All green beverages	17.1	-5.9	0.6	-5.4


Baseline
Phase 1
Phase 2
Total Cafeteria Sales
Total Beverages Sales
70%
60%
50%
40%
30%
20%
10%
0%
Green Beverages
Yellow Beverages
Red Beverages
Green Items
Yellow Items
Red Items


Baseline
Phase 1
Phase 2
Total Cafeteria Food Sales
60%
50%
40%
30%
20%
10%
0%
Green Foods
Yellow Foods
Red Foods
Baseline
Phase 1
Phase 2

*p < 0.05

Figure 1 (a, b, c) - Proportion of green, yellow and red items sold during baseline, 2 months and 4 months

The results of the survey (n = 306) showed that the majority of respondents found the Go, Slow, Whoa intervention very helpful (37.3%)(Table 2). 28.8% of respondents rated the Go, Slow, Whoa labeling system as a 4 out of 5 with 5 being very influential. In relation to health consciousness, the majority of respondents (37.6%) rated themselves as a 4 out of 5 with 5 being very health conscious. The majority of respondents (26.1%) found that the Go, Slow, Whoa labeling in the cafeteria definitely raised their awareness of healthy and unhealthy foods outside the cafeteria. Finally, respondents were asked to rank taste, healthfulness, convenience and price in order of importance when making selections in the cafeteria. Taste was found to be most important to respondents, followed by Healthfulness and Price with Convenience being least important.

Table 2 - Results of Go, Slow, Whoa survey

Question	0	1	2	3	4	5
I find the Go, Slow, Whoa (green, yellow, red) labeling system helpful in making food and beverages choices in the cafeteria (0 = not helpful at all and 5 = very helpful)	11.1*	6.5	5.6	12.4	27.1	**37.3**

Question	0	1	2	3	4	5
The Go, Slow, Whoa labeling system influences my food and beverage choices (0 = not influential and 5 = very influential)	15.7	6.2	7.2	19.6	**28.8**	22.5
The Go, Slow, Whoa labeling in the cafeteria has raised my awareness of healthy and unhealthy foods outside the cafeteria (0 = not at all and 5 = definitely)	14.1	9.2	8.8	17.6	24.2	**26.1**
How health conscious are you? (0 = not health conscious at all and 5 = very health conscious)	1.0	1.6	8.2	33.7	**37.6**	18.0

Question	Taste	Healthfulness	Convenience	Price
How would you rank the following characteristics in importance when making your selections in the cafeteria? (1 = most important, 4 = least important)	**1.52****	2.03	3.09	2.91

*All numbers are % of respondents, n = 306

**All numbers are response average, n = 306

Chapter 5: Discussion

This study found that a color-coded and choice architecture labeling intervention may modestly increase sales of healthy foods and beverages and decrease sales of unhealthy foods and beverages. Significant decreases were seen in total sales of all red foods and beverages and sales of red foods following the four-month intervention. Interestingly, the intervention had the

greatest impact in the first two months; after that, sales of red items increased slightly and sales of green items decreased slightly; however, they were not significantly different from sales at two months. Nonetheless, this suggests that the impact of the intervention began to wear off, and that refreshing the message in a new way may have been beneficial. Regardless, at four months, there was still a significant decrease in sales of red items compared to baseline.

As part of The Patient Protection and Affordable Care Act of 2010, chain restaurants and food vendors with 20 or more locations will be required to display the calorie content of their foods on menus, drive- through menus and vending machines; however, labeling menus with calories has shown mixed results. Some studies showed that there was no overall decline in calories purchased with the addition of calorie labels (Dumanovsky et al., 2001; Elbel, Kersh, Brescoll & Dixon, 2009; Harnack & French, 2008) while others have shown there was a slight decrease in calories ordered (Harnack & French, 2008; Pulos & Leng, 2010; Roberto, Larsen, Agnew, Baik & Brownell, 2010). The current study can provide insight into the effects of alternate menu labeling interventions at point of purchase and can be a viable addition to calorie labeling.

This study closely duplicated a color-coded and choice architecture intervention by Thorndike et al. (2012) who's study showed significant increases in sales of green foods and beverages after the intervention as well as significant decreases in sales of red foods and beverages while our study only found significant decreases in sales of red items. Part of the reason for the differences in results could be that the choice architecture for the present study was less pronounced. Thorndike et al. (2012) placed baskets of water throughout the cafeteria to promote sales of bottled water and the present study did not do so for spatial reasons. The present study also did not keep track of tap water usage, which may have changed throughout the study

period as well. Similar to Thorndike et al. (2012), the present study did arrange yellow chips on the higher eye level racks and the red chips on the bottom but we were unable to include chip purchases as the added buttons may have slowed down check-out time.

Items that were unable to be included in the data analysis is another important difference between the current study and Thorndike et al. (2012). Our study was unable to record 12% of foods and beverages sold because of difficulty with adding extra buttons whereas Thorndike et al. (2012) were unable to include only 2.7% of items sold. Items missing detailed sales data included soups, pizza, taco bar, potato bar, chips and bread. Adding these items into our data may have increased the effect observed? of the intervention.

Another factor which may have influenced the effect of our labeling intervention was the number of green, yellow and red options available in the cafeteria. Of the 162 total food and beverage options in the cafeteria throughout the three week menu cycle, 46% of the options were red and the other 54% were green and yellow. Overall, the customers had fewer green and yellow options compared to red options, which could have affected their purchases. There was no way to add additional green beverages as there were a limited number that fell into the green category (water, fat free/1% milk, low sodium V8 juice and seltzer water without added sugar substitutes); however, adding green food options was a possibility. Thorndike et al. (2012) did not provide information about the breakdown of their food and beverage offerings. As discussed earlier, Lowe et al. (2010) did try adding less energy dense menu options at a worksite cafeteria and this did have a favorable decrease in fat intake but total energy intake throughout the day did not decrease. Further research analyzing the effect of having more healthy options available at point of purchase is warranted.

Eating behavior is as individual as each human being and for that reason analyzing purchases of food and beverages alone does not provide a complete picture of what influences purchasing patterns. The survey that was administered provides some additional insight into the purchasing patterns of the employees at Meriter. The majority of respondents (37.3%) found the Go, Slow, Whoa intervention very helpful ("5" out of 5 on the scale) in making food and beverage choices. When asked about the influence of the Go, Slow, Whoa intervention, the majority of respondents (28.8%) rated it as a "4" out of 5 with 5 being very influential. These first two questions showed that the intervention influenced choice and was helpful to patrons when making food and beverage choices.

The survey results also indicated that patrons thought the Go, Slow, Whoa intervention raised their awareness of healthy and unhealthy foods outside the cafeteria. This may translate to improved food and beverage intake in other away from home food environments, or even at home. Finally, the last two questions on the survey were intended to look further into influences of eating behavior. The majority of respondents (37.6%) ranked themselves as "4" out of 5 on a scale for health consciousness with 5 being very health conscious. This is interesting because the majority of respondents then said that 'Taste' was the most important characteristic when making a meal choice. These answers suggest that, although the respondents are health conscious, taste is still more important than healthfulness when choosing what to eat. To help cater to both patrons' desire to be healthful and eat good tasting food, it may be worth offering a taste sample of more healthy options. Overall, the survey showed that the labeling intervention was well received by patrons and Meriter has continued with the labeling intervention after the data collection ended.

One limitation of the survey was that it was posted on Meriter's intranet and therefore was only available to employees. The survey did not capture the opinions of all patrons of the hospital cafeteria (i.e. patients' family members). Another limitation of the present study was there was no control cafeteria. We also were not able to separate the choice architecture intervention and the color-coded intervention, making it impossible to distinguish which intervention had a greater affect. Accuracy of cashiers was not tested until the last month of the intervention, but was similar to Thorndike et al. (2012). It would have been useful to test accuracy of the cashiers during baseline, month 2 and month 4 to make sure that it did not change throughout the study period. Another limitation of this study was that we were not able to make any conclusions about sales after 4 months of the intervention. The hope is that the intervention continued to affect patrons' meal choices; however, long term follow-up would be useful to determine the lasting effects of the intervention.

Future research should focus on introducing the traffic-light and choice architecture intervention in other away-from-home food environments (fast food or restaurants) to test its effectiveness. The traffic-light labeling could also be combined with calorie labeling at a worksite cafeteria to examine if the effects are greater than the traffic-light labeling alone. Finally, future research could also examine the effects of increasing the percentage of green foods and beverages offered compared to red. These additional interventions could help to increase the effects of the traffic light and choice architecture intervention.

This study demonstrated that adding a simple color-coded and choice architecture intervention at a worksite cafeteria may decrease purchases of unhealthy foods and beverages and increase purchases of healthy foods and beverages. The survey that was administered also showed that the intervention was well received by patrons and was influential for the majority of

respondents. Our results add to the current evidence for the use of menu label interventions that address nutritional literacy and in the future, can be used to determine the best way to influence consumer choice in the away-from-home food environment.

BIBLIOGRAPHY*:*

American Medical Association House of Delegates. (2013). Recognition of Obesity as a Disease, Resolution 420. Retrieved September 27, 2013 from http://media.npr.org/documents/2013/jun/ama-resolution-obesity.pdf,

Andreyeva, T., Long, M., Brownell, K.D. (2010). The impact of food prices on consumption: a systematic review of research on price elasticity of demand for food. *American Journal of Public Health*,100(2): 216–22.

Balasubramanian, S.K., Cole, C. (2002). Consumers' search and use of nutrition information: the challenge and promise of the nutrition labeling and education act. *The Journal of Marketing,* 66, 112-127.

Bleich, S.N., Herring, B.J., Flagg, D.D., Gary-Webb, T.L. (2012). Reduction in purchases of sugar-sweetened beverages among low-income black adolescents after exposure to caloric information. *American Journal of Public Health*, 12: 329–335.

Bruemmer, B., Krieger, J., Saelens, B.E., Chan, N. (2012). Energy, saturated fat, and sodium were lower in entrees at chain restaurants at 18 months compared with 6 months following the implementation of mandatory menu labeling regulation in King County, Washington. *Journal of the Academy of Nutrition and Dietetics,* 112(8): 1169-1176.

Center for Science in the Public Interest. (2003). *Anyone's guess: the need for nutrition labeling at fast-food and other chain restaurants.* Retrieved on October 22, 2012 from: http://www.cspinet.org/restaurantreport.pdf

Centers for Disease Control and Prevention. (2010). *Programs and Campaigns.* Division of Nutrition, Physical Activity, and Obesity, Programs and Campaigns Retrieved on February 20, 2013 from http://www.cdc.gov/nccdphp/DNPAO/programs/index.html

Centers for Disease Control and Prevention. (2012). *Defining overweight and obesity.* Retrieved on February 22, 2013 from http://www.cdc.gov/obesity/adult/defining.html

Centers for Disease Control and Prevention, Division of Health and Nutrition Examination Surveys. (2012). *Prevalence of Overweight, Obesity, and Extreme Obesity Among Adults: United States, Trends 1960–1962 Through 2009–2010.* Retrieved on March 14, 2013 from:http://www.cdc.gov/nchs/data/hestat/obesity_adult_09_10/obesity_adult_09_10.htm

Chun-Yu Louie, J., Flood, V., Rangan, A., Hector, D.J., Gill, T. (2009). A comparison of two nutrition signposting systems for use in Australia. *Public Health Bulletin,*19: (7-8).

Cizza, G., Rother, K.I. (2011). Was Feuerbach right: are we what we eat? *Journal of Clinical Investigation*, 121(8): 2969-2971.

Chriqui, J.F., Eidson, S.S., Bates, H., Kowalczyk, S., Chaloupka, F.J. (2008). States sales tax rates for soft drinks and snacks sold through grocery stores and vending machines, 2007. *Journal of Public Health Policy,* 29: 226-249.

CATCH: Coordinated Approach to Child Health, 4th Grade Curriculum, University of California and Flaghouse, Inc. 2002. Retrieved on October 11, 2013 from

http://www.nlm.nih.gov/medlineplus/magazine/issues/summer07/articles/summer07pg28.html

Dumanovsky, T., Huang, C.Y., Bassett, M.T., Silver, L.D. (2010). Consumer awareness of fast-food calorie information in New York City after implementation of menu labeling regulation. *American Journal of Public Health,* 100(12): 2520-2525.

Dumanovsky, T., Huang, C.Y. Nonas, C.A., Matte, T.D., Bassett, M.T., Silver, L.D. (2011). Changes in energy content of lunchtime purchases from fast food restaurants after introduction of calorie labeling: cross sectional customer surveys. *British Medical Journal,* 343, d4464.

Elbel, B., Kersh, R., Brescoll, V.L., Dixon, L.B. (2009). Calorie labeling and food choices: a first look at the effects on low-income people in New York City. *Health Affairs,* 28(6): w1110-w1121.

Ellison, B., Lusk, J.L., Davis, D. (2013). Looking at the label and beyond: the effects of calorie labels, health consciousness and demographics on calorie intake in restaurants. *International Journal of Behavioral Nutrition and Physical Activity,* 10(21).

Federal Drug Administration (2013). *Questions and Answers on the New Menu and Vending Machines Nutrition Labeling Requirements*. Retrieved on September 30, 2013 from http://www.fda.gov/Food/IngredientsPackagingLabeling/LabelingNutrition/ucm248731.htm#5

Finkelstein, E.A., Trogdon, J.G., Cohen J.W., Dietz, W. (2009). Annual medical spending attributable to obesity: payer-and service-specific estimates. *Health Affairs*, 28(5): w822-w831.

Fismen, A.S., Samdal, O., Torsheim, T. (2012). Family affluence and cultural capital as indicators of social inequalities in adolescent's eating behaviors: a population-based survey. *Bio Med Central Public Health*, 12: 1036.

Fitch, R.C., Harnack, L.J., Neumark-Sztainer, D.R., Story, M.T., French, S.A., Oakes, J.M., Rydell, S.A. (2009). Providing calorie information on fast-food restaurant menu boards: consumer views. *American Journal of Health Promotion*,12: 119–132.

Food Standards Agency. (2013). *Front of Pack Nutrition Labeling.* Retrieved on October 1, 2013 from http://www.food.gov.uk/scotland/scotnut/signposting/#.Ulg5iKWfc6U

French, S.A., Hannah, P.J., Harnack, L.J., Mitchell, N.R., Toomey, T.L., Gerlach, A. (2010). Pricing and availability intervention in vending machines at four bus garages. *Journal of Occupational and Environmental Medicine,* 52(Suppl 1): S29.

French, S.A., Jeffery, R.W., Story, M., Breitlow, K.K., Baxter, J.S., Hannan, P., Snyder, M.P. (2001). Pricing and promotion effects on low-fat vending snack purchases: the CHIPS study. *American Journal of Public Health,* 91(1): 112-117.

Gahagan, S. (2012). The development of eating behavior - biology and context. *Journal of Developmental & Behavior Pediatrics,* 33(3): 261-271.

Glanz, K., Basil, M., Maibach, E., Goldberg, J., Snyder, D. (1998). Why Americans eat what they do: taste, nutrition, cost, convenience, and weight control concerns as influences on food consumption. *Journal of the American Dietetic Association,* 98: 1118–1126.

Grimm, E.R., Steinle, N.I. (2011). Genetics of eating behavior: established and emerging concepts. *Nutrition Review*, 69(1): 52-60.

Guthrie, J.F., Lin, B.H., Frazao, E. (2002). Role of food prepared away from home in the American diet, 1977-78 versus 1994-96: changes and consequences. *Journal of Nutrition Education and Behavior*, *34*: 140-150.

Haddock C., Poston W., Dill P., Foreyt J., Ericsson M. (2002) Pharmacotherapy for obesity: a quantitative analysis of four decades of published randomized clinical trials. *International Journal of Obesity and Related Metabolic Disorders*, 26: 262–273

Harnack, L.J., French, S.A. (2008). Effect of point-of-purchase calorie labeling on restaurant and cafeteria food choices: A review of the literature. *International Journal of Behavioral Nutrition and Physical Activity 2008, 5*(51).

Haskell, W.L., Lee, I., Pate, R.R., Powell, K.E., Blair, S.N., Franklin, B.A., Macera, C.A., Heath, G.W., Thompson, P.D., Bauman, A. (2007). Physical activity and public health updated recommendations for adults from the American College of Sports Medicine and the American Heart Association. *Circulation*, 116:1081-1093.

Holmes, A.S., Serrano, E.L., Machin, J.E., Duetsch, T., Davis, G.C. (2013). Effect of different children's menu labeling designs on family purchases. *Appetite,* 62: 198-202.

Institute of Medicine. (2006). Committee on Food and Marketing and the Diets of Children and Youth 2006. *Food Marketing to Children and Youth: Threat or Opportunity?* Retrieved on September 10, 2013 from http://www.nap.edu/catalog/11514.html

Institute of Medicine. (2012). *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation.* Retrieved on November 12, 2012 from http://www.iom.edu/~/media/Files/Report%20Files/2012/APOP/APOP_insert.pdf

Jacobson, M.F., Brownell, K.D. (2000). Small taxes on soft drinks and snack foods to promote health. *American Journal of Public Health,* 90(6): 854-857.

Kenny, P. (2011). Reward mechanisms in obesity: new insights and future directions. *Neuron*, 69(4): 664-679.

Krukowski, R.A., Harvey-Berino, J., Kolodinsky, J., Narsana, R.T., Desisto, T.P. (2006). Consumers may not use or understand calorie labeling in restaurants. *Journal of the American Dietetic Association, 106*(6): 917-920.

Kumanyika, S.K., Obarzanek, E., Stettler, N., Bell, R., Field, A.E., Fortmann, S.P., Franklin, B.A., Gillman, M.W., Lewis, C.E., Poston, W.C., Stevens, J., Hong, Y. (2008). AHA Scientific Statement Circulation. Population-Based Prevention of Obesity. The Need for Comprehensive Promotion of Healthful Eating, Physical Activity, and Energy Balance: A Scientific Statement From American Heart Association Council on Epidemiology and Prevention, Interdisciplinary Committee for Prevention (Formerly the Expert Panel on Population and Prevention Science). *Circulation, 118*: 428-464.

Kunkel, D., McKinley, C., Wright, P. (2009). *The Impact of Industry Self-Regulation on the Nutritional Quality of Foods Advertised on Television to Children*. Children Now; Oakland, CA. Retrieved on September 12, 2013 from http://www.childrennow.org/uploads/documents/adstudy_2009.pdf

Kolish, E.D., Hernandez, M. (2012). Council of Better Business Bureau. *The Children's Food and Beverage advertising initiative: a report on compliance & implementation during 2011.* Retrieved on September 12, 2013 from http://www.bbb.org/us/storage/16/documents/cfbai/CFBAI%20Report%20on%20Compliance%20and%20Progress%20During%202011.pdf

Lagerros, Y.T., Rossner, S. (2013). Obesity management: what brings success? *Therapeutic Advances in Gastroenterology,* 6(1): 77-88.

Levy, D.E., Riis, J., Sonnenberg, L.M., Barraclough, S.J., Thorndike, A.N. (2012). Food choices of minority and low-income employees. *American Journal of Preventative Medicine*, 43(3): 240-248.

Liu, P.J., Roberto, C.A., Liu, L.J., Brownell, K.D. (2012). A test of different menu labeling presentations. *Appetite,* 59*:* 770-777.

Lowe, M.R., Tappe, K.A., Butryn, M.L., Annunziato, R.A., Coletta, M.C., Ochner, C.N., Rolls, B.J. (2010). An intervention study targeting nutritional intake in worksite cafeterias. *Eating Behavior, 11*(3): 144-151.

Malik, V.S., & Hu, F.B. (2011). Sugar-sweetened beverages and health: where does the evidence stand? *American Society of Nutrition,* 94(5): 1161-1162.

Mehta, N.K., Chang, V.W. (2008). Weight status and restaurant availability: a multilevel analysis. *American Journal of Preventative Medicine, 34*(2): 127-133.

Morley, B., Scully, M., Martin, J., Niven, P., Dixon, H., Wakefield, M. (2013). What types of nutrition menu labeling lead customers to select less energy dense fast food? An experimental study. *Appetite,* 67: 8-15.

Mytton, O.T., Clarke, D., Rayner, M. (2012). Taxing unhealthy food and drinks to improve health. *BMJ,* 344: e2931.

The National Institutes of Health. (1998). *Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults, the Evidence report.* Obesity Education Initiative.

The National Institutes of Health. (2000). *The practical guide: identification, evaluation and treatment of overweight and obesity in adults.* Obesity Education Initiative.

The National Institutes of Health. (2013). *Prescription Medications for the Treatment of Obesity.* Weight-control Information Network.

The National Restaurant Association. (2012). *The 2012 Industry Fact Sheet*. Retrieved on October 22, 2012 from http://www.restaurant.org/pdfs/research/PocketFactbook_2012.pdf

New York City Department of Health and Mental Hygiene. (2006). *Board of health votes to require calorie labeling in some New York City restaurants.* Retrieved on December 11, 2013 from http://www.nyc.gov/html/doh/html/pr2006/pr113-06.shtml.

Olive Garden (2013). Nutrition. Retrieved October 30, 2013 from: https://www.olivegarden.com/Menu/Nutrition/

Osilla, K.C., Busum, K.V., Schnyer, C., Larkin J.W., Elbner, C., Mattke, S. (2012). Systematic review of the impact of worksite wellness programs. *The American Journal of Managed Care*, 18(2): e68-e81.

Payne, J.W., Bettman, J.R., & Johnson, E. (1999). *The Adaptive Decision Maker.* New York, NY: Cambridge University Press.

Peeler, C.L., Kolish, E.D., Enright, M. (2009). Council of the Better Business Bureau. *The Children's Food and Beverage advertising initiative in action: a report on compliance and implementation during 2008* Retrieved on September 12, 2013 from http://www.bbb.org/us/storage/0/Shared%20Documents/finalbbbs.pdf

Powell, L.M., Chriqui, J.F., Khan, T., Wada, R., Chaloupka, F.J. (2012). Assessing the potential effectiveness of food and beverage taxes and subsidies for improving public health: a systematic review of prices, demand, and body weight outcomes. *Obesity Reviews,* 14: 110-128.

Powell, L.M., Szczypka, G., Chaloupka, F.J. (2007). Exposure to food advertising on television among US children. *Arch Pediatric Adolescent Medicine,* 161(6): 553-560.

Public Law 111-148, 111th Congress. (2010). *The Patient Protection and Affordable Care Act. (124 STAT. 119).* Retrieved on June 12, 2013 from http://www.gpo.gov/fdsys/pkg/PLAW-111publ148/pdf/PLAW-111publ148.pdf

Pulos, E., Leng, K. (2010). Evaluation of a voluntary menu-labeling program in full-service restaurants. *American Journal of Public Health,* 100(6): 1035-1039.

Raine, K.D., Lobstein, T., Landon, J., Kent, M.P., Pellerin, S., Caulfield, T., Finegood, D., Mongeau, L., Neary, N., Spence, J.C. (2013). Restricting marketing to children: consensus on policy interventions to address obesity. *Journal of Public Health Policy, 34(2):239-253.*

Roberto, C.A., Bragg, M.A., Schwartz, M.B., Seamans, M.J., Musicus, A., Novak, N., Brownell, K.D. (2012). Facts up front versus traffic light labels: a randomized controlled trial. *American Journal of Preventative Medicine, 43(2):134-141.*

Roberto, C.A., Larsen, P.D., Agnew, H., Baik, J., Brownell, K.D. (2010). Evaluating the impact of menu labeling on food choices and intake. *American Journal of Public Health,* 100(2): 312-318.

Rydell, S.A., Harnack, L.J., Oakes, J.M., Story, M., Jeffery, R.W., French, S.A. (2008). Why eat at fast-food restaurants: reported reasons among frequent consumers. *Journal of the Academy of Nutrition and Dietetics*, 108(12).

Sack, G., Rayner, M., Swinburn B. (2009). Impact of front of pack 'traffic light' nutrition labeling on consumer food purchases in UK. *Health Promotion International,* 24(4): 344-352.

Sacks, F.M., Bray, G.A., Carey, V.J., Smith, S.R., Ryan, D.H., Anton, S.D., McManus, K., Champagne, C.M., Bishop, L.M., Laranjo, N., Leboff, M.S., Rood, J.C., de Jonge, L., Greenway, F.L., Loria, C.M., Obarzanek, E., Williamson, D.A. (2009). Comparison of weight-loss diets with different compositions of fat, protein and carbohydrates. *New England Journal of Medicine, 360(9): 859-873.*

Schindler, J., Kiszko,K., Abrams, C., Islam, N., Elbel, B. (2012). Environmental and individual factors affecting menu labeling utilization: a qualitative research study. *Journal of the Academy of Nutrition and Dietetics,* (http://download.journals.elsevierhealth.com/pdfs/journals/2212-2672/PIIS221226721201893X.pdf

Shomaker, L.B., Tanofsky-Kraff, M., Zocca, J.M., Courville, A., Kozlosky, M., Columbo, K.M., Boston Public Health Commission. (2011). *Healthy Beverage Toolkit*. Retrieved on October 8, 2012 from

http://www.bphc.org/programs/cib/chronicdisease/healthybeverages/Forms%20%20Documents/toolkit/HealthyBeverageToolkitFinal.pdf

Sjöström L., Lindroos A., Peltonen M., Torgerson J., Bouchard C., Carlsson B., et al. (2004) Lifestyle, diabetes, and cardiovascular risk factors 10 years after bariatric surgery. *New England Journal of Medicine*, 351: 2683–2693.

Sjöström L., Narbro K., Sjöström C., Karason K., Larsson B., Wedel H., et al. (2007) Effects of bariatric surgery on mortality in Swedish obese subjects. *New England Journal of Medicine*, 357: 741–752.

Sjöström L., Peltonen M., Jacobson P., Sjöström C., Karason K., Wedel H., et al. (2012) Bariatric surgery and long-term cardiovascular events. *Journal of the American Medical Association*, 307: 56–65

Sonnenberg, L., Gelsomin, E., Levy, D.E., Riis, J., Barraclough, S., Thorndike, A.N. (2013). A traffic light food labeling intervention increases customer awareness of health and healthy choices at the point-of-purchase. *Preventive Medicine,* 57: 253-257.

Stran, K.A., Turner, L.W., Knol, L. (2013). Mandating nutrient menu Labeling in restaurants: potential public health benefit. *The Journal of the Arkansas Medical Society,* 109(10):209-11.

Strum, R., Powell, L.M., Chriqui, J.F., Chaloupka, F.J. (2010). Soda taxes, soft drink consumption and children's body mass index. *Health Affairs, 29(5): 1052-1058.*

Swartz, J.J., Dowray, S., Braxton, D., Mihas, P., Viera, A.J. (2013). Simplifying healthful choices: a qualitative study of a physical activity based nutrition label format. *Nutrition Journal, 12: 72.*

Thaler, R., Sunstein, C. (2008). *Nudge: Improving Decisions about Health, Wealth, and Happiness.* Retrieved on June 12, 2013 from http://www.princeton.edu/~tleonard/reviews/nudge.pdf

Thorndike, A.N., Sonnenberg, L., Riis, J., Barraclough, S., Levy, D.E. (2012). A 2-phase labeling and choice architecture intervention to improve healthy food and beverage choices. *American Journal of Public Health, 102*(3).

Turner, L.R., Chaloupka, F.J. (2012). Student access to competitive foods in elementary schools. *Archives of Pediatrics Adolescent Medicine*, 166(2): 164-169.

Vadiveloo, M.K., Dixon, L.B., Elbel, B. (2011). Consumer purchasing patterns in response to calorie labeling legislation in New York City. *International Journal of Behavioral Nutrition and Physical Activity*, 8(51).

Villanueva, T. (2011). European nations launch tax attack on unhealthy foods. *CMAJ, 183(17): E1229-E1230.*

Vos T., Carter R., Barendregt J., Mihalopoulos C., Veerman J., Magnus A., Cobiac, L., Bertram, M., Wallace, A. (2010). *Assessing Cost-Effectiveness in Prevention (Ace–Prevention): Final Report.* Retrieved on September 15, 2013 from http://www.deakin.edu.au/strategic-research/population-health/assets/resources/ace-prevention-report.pdf

Wakefield, J. (2004). Fighting obesity through the built environment. *Environmental Health Perspectives,* 112(11): A616 - A618.

Wilkins, Rebecca. (2010). Danes impose 25% tax on ice cream, chocolate and sweets to curb disease. *BMJ,* 341: c3592.

Williams, A.J., Henley W.E., Williams, C.A., Logan, S., Wyatt, K.A. (2013). Systematic review and meta-analysis of the association between childhood overweight and obesity and primary school diet and physical activity policies. *International Journal of Behavioral Nutrition and Physical Activity, 10: 101.*

Wojcicki, J.M. (2012). Healthy hospital food initiatives in the United States: time to ban sugar sweetened beverages to reduce childhood obesity. *Acta Paediatrica,* ISSN 0803-5253.

Wolkoff, L.E., Brady, S.M., Crocker, M.K., Ali, A.H., Yanovski, S.Z., Yanovski, J.A. (2010). Eating in absence of hunger in adolescents: intake after a large-array meal compared with that after a standardized meal. *American Journal of Clinical Nutrition,* 92(4): 697-703.

World Health Organization. (2010). *Set of recommendations on the marketing of foods and non-alcoholic beverages to children.* Retrieved on October 12, 2012 from http://whqlibdoc.who.int/publications/2010/9789241500210_eng.pdf

APPENDIX A

Go, Slow, Whoa Survey

1. I find the Go, Slow, Whoa (green, yellow and red) labeling system helpful in making my food and beverage choices in the cafeteria (Please rank from 0-5 with 0 being not helpful and 5 being very helpful).

2. The Go, Slow, Whoa labeling system influences my food and beverage choices. (Please rank from 0-5 with 0 being not influential and 5 being very influential).

3. How would you rate the following characteristics in importance when making your selections in the cafeteria (Please rank from 1 to 4 with 1 being more important and 4 being least important)?

4. How health conscious are you (Please rank from 0-5 with 0 being not health conscious and 5 being very health conscious)?

5. The Go, Slow, Whoa labeling in the cafeteria has raised my awareness of healthy and unhealthy foods outside the cafeteria (Please rank from 0-5 with 0 being not at all and 5 being definitely).