

EFFECTS OF MENU LABELING ON CONSUMER CHOICES

by

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ABSTRACT OF THESIS

Menu labeling methods have the potential to positively impact consumer purchasing decisions by providing them with quick, easy, and accurate nutrition information. This study sought to understand purchasing behaviors on grab- and- go purchases in a hospital cafeteria located in Dodgeville, WI using a color coded (“traffic light”) labeling method: green (healthy), yellow (less healthy), and red (unhealthy). Items were designated the appropriate color based on criteria indicating their level of healthfulness and color coded signs were placed throughout the cafeteria for consumers to use. Data was measured using transaction purchases through a point-of-sale system and consumer opinion was measured through a survey. A total of 43 surveys were completed by respondents whom were primarily white or Caucasian, female and between the ages of 41-55 years. Results of the survey showed that 31% of respondents considered the healthfulness of food items at baseline while 50% and 38% reported this immediately after the intervention and three months after the intervention, respectively. Similarly, 50% of respondents reported always reading nutrition labels immediately after implementation of the intervention in comparison to only 23% and 38% reporting this at baseline and three months after the intervention, respectively. The survey also revealed that 95% of respondents felt that taste was a very important factor influencing their food purchases. Furthermore, 47% of respondents indicated price as very important, 37% indicated healthfulness to be very important, and 23% indicated convenience as a very important factors influencing their food purchases. Approximately 75% of respondents indicating noticing the color coded signs and 75% reported the signs influencing their purchase during the intervention. However, three months after the intervention only 46% of respondents indicated they noticed the color coded signs with 23% reporting the signs influenced their purchase. A total of 1,479 and 481 to-go food purchases were available for purchase before and after the intervention, respectively, and were evaluated to determine the significance in adding the “traffic light” labeling method on consumer food purchases. Prior to the intervention, 55% of the items purchased were green, 25% were yellow, and 20% were red. Following the intervention, 47% of the items purchased were green, 34% were yellow, and 19% were red. While the transaction data does not reflect significant changes in consumer behavior after the intervention, the respondent surveys indicate that a nutrition labeling method may be effective. Further research should be conducted on comparing individually color labeled items to color coded signs to determine the most effective method at impacting consumer purchases.

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CHAPTER 1: INTRODUCTION

Obesity in the United States continues to be a prevailing epidemic. In 2013, approximately 34.9% of the population was considered to be obese (“Adult Obesity Facts”, 2014). In fact, there were more people who were overweight or obese in the United States in 2011-2012 than people who were of a normal weight; approximately 69% of adults were considered overweight or obese (“Overweight and Obesity”, 2015). While overweight and obesity may not be the leading cause of death in the United States, it is a contributing factor to many of the top causes of death, including heart disease, which is the number one cause of death in the United States (“Leading Causes of Death”, 2015). Obesity also has an astronomical financial effect. In 2008, obesity costs in the United States were approximately \$147 billion dollars (“Adult Obesity Facts”, 2014). Recent research has also found that Americans spend almost half of their food budget dining out and, in fact, 45% of adults agree that restaurants are an important part of their lifestyles (“Healthy Eating Research”, 2009). These findings further accentuate the importance of effective menu labeling. The United States government is being called to action and must face this growing epidemic of unhealthy Americans.

One way the government has tried to address this epidemic is through restaurant menu labeling laws. In 2010, national restaurant menu labeling laws were put into place through the Patient Protection and Affordable Care Act (PPACA) (“Menu Labeling”, 2012). These menu labeling laws are specific to certain classes of restaurants, food service facilities, and vending machines and have been incorporated into the 2013 update of the Food Code (“Menu Labeling”, 2012). Because these standards have only recently been implemented, very few studies have looked at the effectiveness. This particular

research project evaluates the effectiveness of menu and nutrition labeling. This is especially true in the hospital cafeteria setting, where using an evidenced based method for nutrition labeling has had minimal research. Previously, in the hospital cafeteria where this research project took place, food items did not have any nutrition or ingredient information available to customers. Through this research project, all items sold in the grab and go area of the cafeteria were coded as green, yellow, or red which corresponded to nutrition criteria indicating the healthfulness of certain food items. This research project provided cafeteria customers' access to the color coded labeling signs distributed throughout the cafeteria that indicated the healthfulness of to-go food items. This information was anticipated to cause customers to make healthier food choices in the cafeteria which would likely have a positive impact on their overall health.

Research Question

Nutrition information labeled on food items in the cafeteria will allow for consumers to make healthy food choices. The nutrition facts label is not always an easy way for consumers to interpret therefore providing an additional color coded labeling sign that indicates the healthfulness of a food item would be a beneficial tool for consumers. The research question for this project was: "Will implementing a nutrition labeling system in a hospital cafeteria be an effective method for improving consumer food choices?"

Sub problems

Within the research question there are multiple problem areas that have been addressed through this research project. First, there are different methods of nutrition

labeling that have been researched to determine what methods are easy for consumers to understand and use. All to-go food items sold in the cafeteria were labeled and sales of the items were recorded before and after implementation of the chosen nutrition labeling method. In addition, a secondary method of evaluating effectiveness was conducted through a participant survey. Survey questions were developed by evaluating previous research studies survey questions and determining what questions were needed to determine the effectiveness of the labeling system from a participant perspective. Finally, many research studies have not evaluated the long term effectiveness of nutrition or menu labeling on consumer choices. To add an additional research component, the research project participants were also surveyed three months after implementation of the intervention to evaluate long term effectiveness.

Limitations

There are a few limitations to this study, first the results cannot be generalized for the larger population due to the limited variance in race/ethnicity and the majority of participants being located in rural Wisconsin. In addition, given that this study was conducted in a hospital cafeteria, there was a chance that some of the participants were already health conscious and therefore were previously making healthy choices prior to the implementation of menu labeling. This had the potential to skew the data as the intervention may have appeared to be less effective. Additionally, the to-go food items were labeled using a color coded “traffic light” sign versus individual labels on food items due to the increased labor requirements for this method. By using a sign instead of individual labels, participants may not have found this method as visible and easy to use.

The culinary services department may have also varied the to-go food products available, which would impact the overall results by not having consistent item availability.

Delimitations

Due to many participants frequenting the cafeteria, participants were only allowed to take the survey once before implementation and once after implementation. All participants in the survey needed to be 18 years of age or older. All participants needed to have purchased at least one item from the cafeteria to be eligible to take the survey. Transaction data was collected over two specific four week time frames.

Assumptions

It will be assumed that all transactions and survey participants purchased items for themselves and not for another individual. It will also be assumed that all survey respondents completed the survey honestly and without bias.

Definitions

Menu/Nutrition Labeling: A provision of nutritional information about standard menu items available at the point of purchase. (“Menu Labeling”, 2012)

Traffic Light Labeling Method: A nutrition labeling method using green, yellow, or red to express the level of healthfulness of a food item to the purchaser.

CHAPTER 2: LITERATURE REVIEW

In 2010, the Patient Protection and Affordable Care Act (PPACA) established national menu labeling laws for specific classes of restaurants, food service facilities, and vending machines (“Menu Labeling”, 2012). The menu labeling laws were established for restaurants or food service facilities with more than 20 locations throughout the United States. In 2013, updates were made to the Food Code that included changes to menu labeling requirements based on the PPACA laws that were instituted in 2010. According to the 2013 Food Code, establishments must have an accurate net quantity of contents, list of ingredients, and follow the same guidelines as presented by the FDA through the PPACA. Similar regulations related to menu labeling have also been implemented in the Centers for Medicaid and Medicare Services (CMS) and The Joint Commission (JCAHO) standards.

Background

Menu labeling or nutrition labeling is defined as a provision of nutritional information about standard menu items available at the point of purchase (“Menu Labeling”, 2012). This includes, but is not limited to, calories on menu boards and making available, upon request, written information about the total calories, calories from fat, amounts of fat, saturated fat, cholesterol, sodium, total carbohydrates, sugar, dietary fiber, and protein. Menu labeling became more important over the last several decades due to the increased consumption of food outside of the home; in fact, American’s typically eat one third of their daily calories at fast-food restaurants and food service vendors (Rudd Report, 2008). The goal for menu labeling is to provide consumers with

the nutritional content of the meals they purchase by making it readily available and visible to encourage consumers to make healthier choices.

Since the implementation of the PPACA in 2010, many research studies have been conducted to evaluate the effectiveness of menu labeling on consumer choices. There are many different aspects to menu labeling that need to be researched including education level, difference among populations, and implementation difficulties for restaurants or cafeterias. In order for the menu labeling laws to be effective, it is vital that consumers are able to easily understand what the information being provided means. It is also important that restaurants, cafeterias, and other food service entities have the ability to implement these regulations effectively. A few of the obstacles restaurants face include the nutrient analysis of all menu items and purchasing of new menu boards (Rudd Report, 2008). Opponents of menu labeling feel this new requirement is not necessary as this information is readily available for most restaurants on their websites, in a brochure, or on a poster. Opponents also believe that menu labeling will not decrease consumer calorie intake and could potentially result in a loss of business. If restaurants or cafeterias are unable to implement menu labeling effectively and if consumers are unable to understand the information, it is likely that menu labeling will not improve consumer food choices. The purpose of this literature review is to critically analyze the evidence on the effectiveness of menu labeling on consumer choices.

Methods to Evaluate Menu Labeling

There are several methods of menu labeling that have been evaluated in previous research studies. There are two categories menu labeling can fall into, those that strictly

label calories and other nutrition information and those that use a shape, color, or other symbol to indicate how healthy a food item is.

Traffic Light

In recent years, there have been many research studies conducted to evaluate the different methods of nutrition facts labeling in dining out settings. A recent research study evaluated the menu labeling using a “traffic light” food labeling intervention on point of purchase sales in a hospital cafeteria (Sonnenberg et al., 2013). The traffic light method involves labeling food items green, yellow, or red based on how healthy the item is. In this particular study, items were categorized into four different groups: food entrée, food item, food condiment, or beverage; and labeled green, yellow, or red based on a set of positive and negative criteria. Items were labeled green if they had only positive criteria or more positive than negative criteria. Items were labeled yellow if they had positive criteria equal to negative criteria or possessing only one negative criterion. Items were labeled red if they had two negative criteria and no positive criteria. The positive criteria were items that had a main ingredient that was either a fruit or vegetable, whole grain, lean protein, or a low-fat dairy product. The negative criteria included saturated fat content of ≥ 5 grams per entrée or ≥ 2 grams per food item, condiment or beverage and a caloric content of ≥ 500 calories per entrée, ≥ 200 calories per food item, or ≥ 100 calories per condiment or beverage. For beverages, each additional 100 calories was considered an additional negative criterion. Diet beverages with zero calories and water were labeled green despite lacking positive criteria. This study was designed as a randomized, controlled trial conducted at Massachusetts General Hospital cafeteria were

researchers tracked sales in the cafeteria and conducted customer surveys before and after implementation of the traffic light food labeling intervention.

Prior to implementing the traffic light intervention, 204 cafeteria customers (out of 268 customers) completed a survey after making a purchase (Sonnenberg et al., 2013). The five question survey included: demographic data, noticing any nutrition information in the cafeteria, identifying the top two factors in determining their food choices, and beliefs on the importance of nutrition information and healthy food. After the intervention was implemented, two additional questions were added to the survey: noticing the traffic light labels in the cafeteria and if the label affected their purchase.

Cash register data was also tracked by programing the register to capture, red, yellow, or green food items. Survey respondents were linked to cash register data to determine the proportion of red, yellow, or green items they purchased. Each surveyor recorded the items purchased by the customer and this was connected with their cash register data to verify the database detail with the correct survey respondent.

Demographically, there was no significant population difference in customers from before and after the intervention (Sonnenberg et al., 2013). Most participants were women over the age of 40, white, and were hospital employees. Following the implementation of the traffic light labeling system, there was a significant increase of participants identifying health and nutrition as an important factor in their food or beverage choice from 46% to 61% ($p=0.004$). The importance of taste and price of the food or beverage purchased also increased significantly to participants from 48% to 59% and 11% to 19%, respectively ($p=0.04$; $p=0.02$). The importance of food convenience

decreased in importance to participants but was not significant, from 37% to 28% ($p=0.06$). Participants who reported “always” or “usually” choose a food that is healthy did not change from baseline to post intervention ($p=0.94$). However, results did indicate a significant increase in the amount of participants that reported reviewing nutrition information during the intervention period in comparison to baseline from 15% to 33% ($p < 0.001$).

Researchers also evaluated the proportion of green, yellow, or red items purchased per transaction by survey respondents at baseline and during the intervention. Results showed that during the intervention respondents that indicated health and nutrition as an important factor in their purchase and those that indicated they “always” choose healthy foods showed an increase in green purchases and a decrease in red purchases from baseline, although this did not show to be statistically significant ($p > 0.05$). After the traffic light implementation, respondents who reported noticing the labels purchased more green items and fewer red items compared to respondents who reported not noticing the labels ($p < 0.001$). The respondents who reported that the labels had influenced their food or beverage purchase also bought more green items and fewer red items ($p < 0.001$).

From this study, authors were able to conclude that implementing a traffic light labeling system increased participant’s awareness of the healthfulness of food and beverages at the point-of-purchase (Sonnenberg et al., 2013). The survey found that participants reported purchasing healthy items but did not actually choose healthy items in their cafeteria transaction. The authors were also able to conclude that implementing a traffic light labeling system may improve the likelihood of a customer purchasing a

healthier item as they may be prompted to consider health at the point-of-purchase by the labeling system.

A strength of this study was the connection drawn between consumer awareness and what consumers' actually purchase. This study also conducted the survey after consumers' made a cafeteria purchase, which prevented an influence on consumer purchase. In addition, the study verifies the importance of a labeling system that is easy for the consumer to understand and doesn't require a high level of education or nutrition understanding to interpret which items are healthier. On the other hand, a limitation to the study was the hospital location and the population consisting primarily of hospital employees. It is likely that some of the respondents were clinicians who may be more health conscious than the general population and generally make healthy choices. The study also did not find a statistical significance in purchase choice improvement by survey respondents, which may be due to the small sample size. The study was also not able to determine the impact of the labeling system on long term choices by consumers' over time. An additional limitation noted by authors was the possibility that the survey respondents were purchasing items for another person.

Overall, this study indicated that labeling systems that are simple and straight forward will likely have a larger impact at the point-of-purchase decision, which is often made quickly. The traffic light system was able to convey to consumers easily which items were the healthier choices and therefore increased the likelihood that a consumer would purchase a healthy option. Implementing this type of labeling system in a cafeteria or other food purchasing locations would promote healthier eating habits by making the healthy choice more obvious to consumers.

In another study using a traffic light nutrition labeling method, researchers evaluated the use of “Go-for-Green” (G4G) labels and if they would impact dietary behaviors of military personnel (Arsenault, Singleton, & Funderburk, 2014). In a cross-sectional design, the G4G labels were implemented in six military dining facilities where a survey was conducted with soldiers evaluating the effectiveness of the nutrition labeling system. Between the six dining facilities, 299 surveys were completed and returned to research assistants, from the surveys participants were categorized into “users” and “non-users” of the G4G labeling method.

The G4G labels had three tiers, green, amber (yellow), and red (Arsenault et al., 2014). The green labels were used to indicate food items that were “high-performance”, which should be eaten frequently and were nutrient dense. Amber labels were used to indicate “medium-performance” foods that are higher in fat and calories and should be ate less frequently. Finally, red labels were used for foods that were “low-performance” that were the highest in fat and calories and consumption should be limited.

The survey given to soldiers included demographic questions (age, sex, race, ethnicity, weight, and height) and questions regarding the use of the G4G labels, dietary behaviors, and dietary intake of fat, fruits, and vegetables (Arsenault et al., 2014). Specifically, respondents were asked if they noticed the G4G labels in the dining facility and if they looked at the labels. Additional questions were asked regarding if they made food choices based on the labels in general and for different food types. Survey responses were based on a 4-point scale: never, rarely, sometimes, or always. The survey also included a question on if the respondent was following a special diet for health-related issues. Respondents were asked if they took dietary supplements (multivitamins, single

vitamins or minerals, protein powder, or performance enhancing supplements) and how often they took the supplements. The dietary fat and fruit/vegetable questions were based on two different validated dietary screens: The Block Fat Screener and The National Cancer Institute's Fruit/Vegetable Screener.

Results found that almost half (47%) of soldiers were classified as “users” of the G4G labels by selecting either “always” or “sometimes” to the survey question regarding usage of the labels (Arsenault et al., 2014). Demographically, the “users” and “non-users” did not differ in respect to age, sex, race/ethnicity, or BMI. Users were found to be more likely following a special diet such as low carbohydrate/high protein, low cholesterol/fat, healthy, balanced, or weight loss ($P=0.04$). Overall use of the G4G labels was associated with a lower dietary fat intake ($P<0.0001$) but was not associated with a change in fruit or vegetable intake.

A multivariate model was conducted with fat intake including covariates of age, sex, and use of a special diet as “yes” or “no” variable (Arsenault et al., 2014). The adjusted mean intake of fat was 82.6 g (32% of energy) for users and 98.4 g (36% of energy) for non-users ($P<0.0001$). Within the multivariate model, the use of a special diet was not associated with fat intake. Overall this model indicated that users of the G4G labels consumed 15 g less fat per day than non-users.

Generally, this study found that the G4G labels were associated with a lower fat intake among users but no association was made between label usage and fruit/vegetable intake (Arsenault et al., 2014). The authors suggested a few different causal reasons for these results; one being that label users may tend to overall be healthy and therefore

consume fruits and vegetables more often than non-users so their overall F/V intake may not have changed. Another potential reason the authors indicated was a lack of label display for F/V or that consumers in general know F/V are healthy and therefore a label is not necessary. Authors also found this for dessert label usage and indicated that this may be because consumers already generally associate that desserts are unhealthy. The usage of the labels for entrée items was the most common in this particular study. While authors found that healthier dietary behaviors were associated with lower fat intake, following a special diet, and supplement intake this was not found to be associated with BMI.

A strength to this study was that it did find the usage of labels to be associated with healthier dietary patterns, which is in line with other current research findings. However, there were a few limitations to this study, one being the population demographics being primarily male, young, and Caucasian. The size of the study could also be larger; authors indicate this as a limitation as some variables to the study were limited due to a small sample size. In addition, the study design was cross-sectional therefore researchers were unable to directly correlate the label usage with overall lower dietary fat intake and researchers did not use broad dietary questions to determine further long term diet associations. The survey also poses selection bias, indicated by the authors, as surveys were only completed by those who were willing to take the survey which could be impacted by personal characteristics. Despite the limitations, this study does provide further evidence that the use of a color coded labeling system has an impact on consumer choices and further research should be conducted to further evaluate the long term effectiveness.

Calorie Labeled Menus

In a cross-sectional study, researchers evaluated the effectiveness of calorie menu labels on consumer purchases at 29 McDonald's fast food restaurants located in Phoenix, Arizona (Green, Brown, & Phri-Vachaspati, 2015). The study was designed to evaluate the sociodemographic disparities and the likelihood of customers noticing and using calorie menu labels in a diverse sample size. Of the 29 restaurants, 14 were categorized as "lower income" (based on a median household income of 185% of the federal poverty guidelines in 2012, <\$42,600 per year) and 15 were categorized as "high income" (based on a median household income of \geq \$70,000 per year). Data was gathered using a survey by way of the street-intercept survey method for 8 weeks at lunch (11 AM to 2 PM) and dinner (5 PM to 8PM). A total of 1,159 McDonald's customers were approached outside of the restaurant and data were collected from 330 participants (28% response rate).

Participants were considered eligible if they were greater than 18 years of age, could read, speak and understand English, and were purchasing food for personal consumption (Green et al., 2015). Participants were first asked to go into the restaurant, make their purchase, and return to the research assistant with a receipt. Upon return with the receipt, the survey was conducted by a trained research assistant and after completion of the survey the participant was offered \$5. The survey included questions regarding: age, sex, race, ethnicity, education level, annual household income, if the participant had children, frequency of their fast food visits, and zip code of their residence. In addition, participants were asked: "Did you notice the calorie information listed for the menu items?" and "If yes, did the calorie information affect your purchase today?"

Respondents were categorized into low income (\leq \$50,000/yr.), middle income (\$50,000-\$100,000/yr.), or high income (\geq \$100,000/yr.). The total number of calories purchased and total costs were also evaluated using the provided receipt from the participant.

Results found that more than half of the study population were categorized as low income, more than one third (35%) had a high school diploma or less, 53.8% were non-Hispanic white, 26.4% were Hispanic, 62.6% had children, and 66.3% of participants frequented fast food restaurants more than once per week (Green et al., 2015). Approximately 57.4% of participants reported noticing the calorie labels before placing their order while only 16% of participants reported using the calorie labels for their purchase. Overall, in a bivariate analysis, results found that noticing and using calorie menu labels was significantly, positively associated with customer income categories and levels of education. In the multivariate model, it was found that with noticing menu labels as a dependent variable, individuals with a high income were two times more likely to notice the calorie menu labels ($P=0.029$) while no other variables played a significant role in noticing the labels. In another multivariate model, where using menu labels was the dependent variable, individuals between the ages of 36-49 years were 82% less likely to use the calorie labels compared to individuals between the ages of 18-25 years ($P=0.046$). Additionally, this multivariate model found that individuals with middle income were 3.5 times more likely to use the calorie menu labels in comparison to those within the low income category ($P=0.004$). Individuals with a bachelor's degree or higher were also found to be three times more likely to use the calorie menu labels than those with a high school diploma or less ($P=0.023$). Results also found a statistically significant difference

that when participants noticed the menu labels it was associated with purchasing 146 fewer calories ($P=0.001$). In this particular analysis, income and education did not have a statistically significant effect on the total number of calories purchased.

Overall, the authors determined that nearly 60% of fast-food customers interviewed noticed the menu labeling information but only 16% of customers reported using the information (Green et al., 2015). Due to this result, authors determined there to be a large gap between customers seeing and using the information and that additional research needs to be done to determine why the labels are not used. It is possible that not including the daily recommendation for calories impacted the consumers' ability to interpret the information. Another possibility authors considered may have impacted the usage of the information is that consumers may already assume their calorie intake will be high and therefore are not concerned about the calories they are consuming. In general, authors concluded that calorie menu labeling can be an effective way to reduce the number of calories consumed by fast-food customers who use the information.

Authors noted a few limitations with this study, one being the location of the study (Green et al., 2015). Phoenix as a city is more spread out and therefore more people tend to drive to fast food restaurants than walk, which may have decreased the amount of customers lingering outside of the restaurant. The researchers also did not have baseline data for the restaurants customers prior to implementation of the calorie menu labels. The cross-sectional design of the study only allows for associations to be made between the calorie menu labels and total calories purchased and authors were not able to directly conclude that the calorie menu labels resulted in a decrease in total calories purchased. Additionally, researchers were unable to determine if participants consumed all of the

food they purchased or if they had compensated and ate fewer calories at other times during the day. The study was only conducted in one city and at one fast food chain restaurant therefore the data collected could vary depending on location and fast food restaurant which was not analyzed in this study. Despite these limitations, the study had a major strength which was its design to have a sample size with variability in sociodemographic characteristics. The study also assessed individual customer receipts which is likely more accurate than using retrospective data. As a whole, in evaluating the study, researchers were able to determine that calorie menu labels are an effective method to promote decreased calorie intake despite that not many people are using the information. However, large amounts are at least noticing the information. In addition, authors note it is likely that higher income and higher educated individuals are more likely to benefit from the calorie menu labels which would widen the current health disparities without addressing the causes of non-use among other individuals.

In a randomized, controlled trial research study researchers reviewed three different methods of menu labeling and its impact on consumer purchases (Roberto, Larsen, MPhil, Balk, & Brownell, 2010). The 303 participants were randomized into three different menu labeling groups: a menu with calorie labels, a menu without calorie labels, or a menu with calorie labels and the recommended daily calorie intake for adults (calorie labels plus). Participants were initially given a survey on dining preferences and then asked to order an item from their provided menu. All meals were weighed prior to serving to participants; after the finishing their meal, researchers evaluated the amount of the meal consumed by weighing the meal again. Finally, participants scheduled a follow up interview for the following day to provide a food recall.

Results were based on 273 participants with no statistically significant difference in demographics (Roberto et al., 2010). Researchers found that the menu type had a significant effect on total calories ordered ($P=0.04$; $\eta^2=0.005$). Findings indicated a statistically significant difference in calories ordered between the no calorie labels menu and the calorie labels menu ($P=0.03$; $d=0.32$) and between the no calorie labels menu and the calorie labels plus menu ($P=0.03$; $d=0.31$). Results did not show a significant difference in calories ordered between the calorie labels menu and the calorie labels plus menu ($P=0.99$). Overall, participants in the no calorie labels menu chose an average of 2,189 calories ($SD=1,081$) compared to an average of 1,862 calories ($SD=937$) in the calorie labels menu and 1,860 ($SD=1,063$) calories in the calorie labels plus menu.

Authors were able to conclude that in both menu conditions which contained the nutrition labeling intervention participants chose 14% less calories or about 124 and 203 calories per meal for the calorie labels and the calorie labels plus menu, respectively (Roberto et al., 2010). The authors did acknowledge a few limitations in the study, one being that calorie items labeled in the menus were estimated based on standard calorie databases rather than a direct assessment of total calories. Authors also stated that because there was no pricing listed on the menu they were unable to determine if price and menu labeling would have an effect on total calories ordered. In addition, authors indicated that the study sample was not truly a randomized sample from a national perspective as the participants were all from the same location in the United States.

A strong point to this particular study was the assessment of the effect on calorie labeling and calorie labeling with daily caloric requirement on consumers food choices (Roberto et al., 2010). The study also was a diverse population when comparing gender,

race/ethnicity, and body mass index value. Along with the diverse population, participants were also randomized into different menu groups. Additionally, for a more realistic effect, the study provided participants with a wide variety of menu options while instructing participants to choose something they typically would eat when dining out.

Despite the study not having a national representation, this study does provide positive feedback on the impact of nutrition labeling laws. When looking at the first major outcome of the study, total calories ordered, results indicated calorie labeling (with or without daily caloric recommendations) on menus caused participants to order fewer calories than those participants whom had a menu without calorie labeling. This result is supportive of the nutrition labeling laws for restaurants as it indicates the menu labeling can lead consumers to choosing fewer calories when dining out.

Labeling Effects on Food Choices and Intakes

In the same study by Roberto, there were an additional four outcomes that were measured: total calories consumed, total calories consumed after the study meal, calories consumed at and after the meal, and accuracy of estimating calories consumed (2010). The meals that were served to participants were weighed before and after the meal in order to determine the amount of calories consumed. Overall results did not find a significant effect on calories consumed between the three different menu scenarios (no calorie labels, calorie labels, or calorie labels plus) ($P=0.12$; $n^2=0.003$). The study did find however a significant effect on total calories consumed when comparing both calorie labeled menu conditions to the menu without calorie labels. The average total number of calories consumed in both calorie label conditions (1,289 +/- 656 calories) was significantly lower than the calories consumed in the menus without calorie labels

condition (1,466 \pm 724; $t_{285}=2.07$; $P=0.04$; $d=0.26$). A t-test also confirmed a significant difference in calories consumed between the menus without calorie labels and the menus with calorie labels and recommended daily caloric intake ($t_{193}=2.00$; $P=0.047$).

Two additional outcomes from the study focused on calories consumed after the meal independently and in combination with the calories consumed at the meal (Roberto et al., 2010). Results found a significant difference in calories consumed after the meal between the no calorie labels menu condition (179 \pm 310 calories), the calorie labeled menus and calorie labeled menu plus conditions (294 \pm 387 calories; 177 \pm 309 calories, respectively; $P=0.02$; $d=0.33$). There was not a significant difference between the no calorie labels menu condition and the calorie labeled plus recommended daily caloric intake ($P=0.96$). In addition, 57% percent of the participants in the no calorie labels condition, 70% of the calorie labels condition, and 46% of the calorie labels plus condition had snacks after the study meal. Researchers also compared the total calories consumed at and after the meal; results found a significant difference from the no calorie labels menu to the calorie labels plus menu ($P=0.02$; $d=0.34$) but did not find a significant difference between the no calorie labels menu and the calorie labels menu ($P=0.96$). The two different calorie labels conditions also showed a significant difference in total calorie intake ($P=0.03$; $d=0.35$). On average participants consumed a total of 1,630 calories in the no calorie labels condition, 1,625 calories in the calorie labels condition, and 1,380 calories in the calorie labels plus condition.

The final outcome of the study reviewed the accuracy of the estimated calories consumed by participants. Participants were asked to estimate how many calories they believed to have consumed and this was compared with the total number of calories that

was actually consumed by the participant (Roberto et al., 2010). Generally, participants that had a menu in both calorie labels conditions estimated the total number of calories consumed more accurately than the participants without a calorie labeled menu.

Participants ability to accurately estimate the number of calories consumed between the no calorie labels condition and the calorie labels condition showed a significant difference in accuracy ($P=0.02$; $d=0.37$). A significant difference was also found between the no calorie labels condition and the calorie labels plus condition ability to estimate accurately ($P=0.003$; $d=0.42$).

Overall results evaluating the calories consumed portion of the study found that when both calorie labels and recommended daily intakes were combined participants consumed 14% fewer calories than those without calorie labels (Roberto et al., 2010). Authors were therefore able to conclude that providing consumers with information on recommended daily caloric intake makes calorie labeling a more effective intervention. Authors also found it notable how many calories participants in the calorie labels condition ate in the evening following the meal. In fact, when looking at the combined number of calories consumed at and after the meal there was no advantage to menu calorie labeling. Results also suggested that there was an additive effect when both calorie labels and recommended daily intake were combined. In previous studies, it has been documented that individuals' awareness of what has been eaten at one meal will affect subsequent meals (Shide, 1995 & Tomiyama, 2009). Therefore, it is possible that participants in the intervention group which included calorie labels believed that had chosen a "healthier" item on the menu and then believed they could eat more later or felt hungrier. Authors were able to conclude that providing the recommended daily intake

level for the average adult to participants puts the calorie labels into perspective and is therefore an essential component of calorie labeling.

A few additional limitations of the study were the reliability of the dietary recall used in the assessment of intakes after the meal, no pricing information on the menus to determine if price would have impacted the participant's decision, and the participants were not followed over a period of time to determine if nutrition labeling affected their food choices beyond the study (Roberto et al., 2010). The study does however provide a wide variety of comparison and analysis of the different methods and their relation to calories ordered, consumed at and after the meal, and the participants accuracy of estimated calories consumed. This study was able to demonstrate the importance of including a recommended daily intake for calories to put the calorie labels into perspective. It also showed the participants total calorie intake at and after the meal, which provides insight into the consumers' perspective on calories and overall food choices.

Effectiveness of the Amount of Nutrition Information Available

A different study conducted by Hwang and Lorenzen, evaluated effective menu nutrition labeling and the effects of pricing on a healthy menu (2008). This was a survey study designed to determine what the most preferred method of nutrition labeling is to consumers, whether the use of the nutrition information influenced the consumer's choice, and if consumers were willing to pay more for food choices that they perceived to be healthier. The research for this study was conducted in two phases, first the researchers surveyed to identify the amount and type of nutrition information participants found to be helpful and secondly to assess the menu labeling, using the preferred method.

The second phase measured the effects on what people chose to eat and if they were willing to pay more for a perceived healthier menu item.

The first formative phase, consisted of a survey where participants (n=120) were presented with one menu item (southwestern chicken sandwich) followed by five different amounts of nutrition information (Hwang & Lorenzen, 2008). The five different amounts of nutrition information provided were: type I, no nutritional information; type II, only calories; type III, calories plus macronutrients; type IV, calories and macronutrients plus fat; and type V, calories, macronutrients and fat, plus fiber. The different amounts of nutrition information presented on the surveys were randomly rotated. Nutrition information was rated on a scale from 1 (not helpful at all) to 7 (very helpful). The survey also asked participants to rate on a scale from 1 to 7 the dependability, honesty, and trustworthiness of the source of nutrition information. Results from phase one helped form phase two of the study.

In the second part of the study, 60 individuals were surveyed to measure the participants' nutrition-related and overall attitudes toward a menu item before and after reviewing the nutrition information. Demographic information was collected including gender, age, education, income, and how frequently they exercise and dine out. Participants were first given a regular menu item without any nutrition information followed by a menu item with nutrition information and a low-fat menu item. The survey asked participants to rate the healthiness of the item including nutritional value of the item, the importance of the item to a healthy diet and the benefit of the item to the heart on a scale from 1 to 7. The survey then evaluated the participants overall attitude towards the menu item by asking participants if the menu item was favorable or

unfavorable, good or bad, and positive or negative. Researchers chose to use fat as an additional focal point based on the results of phase one where participants indicated that fat and calories were the biggest dietary concerns. The survey then evaluated the participants' willingness to pay more based on the nutritional information. Participants were told that the regular menu item and the low-fat menu item cost was \$6.99; after completing the first part of the survey participants were then asked how much more they would be willing to pay for the item given the nutrition information.

Results from the 120 participants that were part of the formative phase of the study were primarily female with a mean age of 43 years and 60 (50%) had at least a college degree (Hwang & Lorenzen, 2008). Eighty-three percent of participants indicated that they read nutrition labels when they shop and more than 90% indicated they were supportive of nutrition labeling in restaurants. Participants also averaged dining out about 2.44 times per week. Results of the first phase of the study showed significant differences among the five different types of nutrition information provided when looking at helpfulness and source credibility ($P < 0.001$). Results found that as the amount of nutrition information increased the helpfulness of the nutrition information and the source's credibility also increased. To be more specific, type V (calories, macronutrients, fat, and fiber) and IV (calories, macronutrients, and fat) were preferred over type III (calories and macronutrients), type III was preferred over type II (calories), and type II was preferred over type I (no nutrition information) ($p < 0.001$). Statistical analysis did not indicate a significant difference in preference between type V and IV. This pattern was also followed for the source credibility and was statistically significant aside from there being no statistical significance between credibility in type I and II ($p <$

0.001). These results indicated that participants did not find the addition of fiber to the nutrition information to be more helpful when evaluating the menu item.

Results found that participants' nutrition-related attitude and overall attitude decreased after being presented with the nutrition information about the menu item ($P < 0.001$). Once presented a menu with the nutrition information, participants perceived the menu item to be unhealthy and therefore, showed an unfavorable attitude towards the item. When participants were presented with the nutrition information for the low-fat menu nutrition-related and overall attitude increased significantly ($P < 0.001$).

Researchers also found that participants were willing to pay approximately \$2.00 more for the low-fat menu item when the nutritional information was provided, but this was not statistically significant. Participants were not willing to pay additional cost for a menu item when they perceived it to be unhealthy, even when the nutrition information was provided.

From this study, the authors were able to conclude that the most effective amount of nutritional information included calories, macronutrients, and fat (Hwang & Lorenzen, 2008). Providing additional information, such as fiber, could potentially be too much information and does not provide an increase in effectiveness according to this study. Similarly, authors found that when restaurants provide nutrition information about healthy menu choices, customers are more likely to select these items over the unhealthy items. In addition, it appears that customers are willing to pay more for the healthier menu options than the unhealthy menu options. Overall this study indicates that it would be beneficial for restaurants to provide nutritional information on menus as customers tend to have an improved perception of the restaurant's credibility. Restaurants may also

benefit from providing healthier menu options as indicated by this study; customers may be willing to pay more for healthier menu options. An increase in both credibility and potential for higher sales due to this credibility and customer's willingness to pay more for healthier menu items would be a huge benefit for restaurants financially and nutritionally for consumers.

There were a few limitations with this particular study, one being that there was only one menu item used to conduct this study, which makes it more difficult to draw generalizations from the study (Hwang & Lorenzen, 2008). The study also used \$6.99 as a reference price for the regular menu item without nutrition information, if the price had been lower or higher it is likely that participants' responses would have been different. Despite these limitations, the research covered different amounts of nutrition information effectiveness on consumers; it is likely that the amount of nutrition information provided would not have been affected by different menu options therefore the results remain useful to menu nutrition labeling research. The study also included the consumer's perception, this is a strength as often times a consumer's perception of a restaurant or menu item is what will affect the consumer's final decision about either a restaurant itself or a chosen menu item. In conclusion, this study determined what amount of nutrition information is preferred by the consumer: calories, macronutrients, and fat. They also found that consumers were more willing to pay more for a healthier menu option.

Conclusion

Overweight and obesity will continue to be a battle that the United States will face for decades; therefore, public health policies will be needed in an effort to control this

epidemic. Implementing of federal laws requiring menu labeling in restaurants and other venues selling food has the potential to be an effective method at impacting the point-of-purchase choices made by consumers. The five different research studies reviewed different menu labeling methods and their effectiveness on consumer purchases. The studies by Sonnenberg, Arsenault, and Roberto indicated that providing additional information or signs outside of the general nutrition information, such as the recommended daily calorie intake level for adults or a green, yellow, or red label was more effective at influencing consumer choice at the point-of-purchase. All three of these studies found that participants that reported using the menu labels typically purchased fewer calories or healthier items. In addition, both the Sonnenberg and Roberto studies found that while consumers' may think they are making a healthy choice, it is likely that the choice they have made is not healthy based on lack of knowledge and interpretation of nutrition information. This is where providing a green, yellow, or red label, such as in the Sonnenberg and Arsenault studies, guided consumers' to making a healthier choice.

In the study by Hwang and Lorenzen, researchers surveyed participants to determine the appropriate amount of nutrition information preferred by the participants. Similarly, the study by Roberto, Hwang and Lorenzen found that providing more nutrition information tended to be more effective than less nutrition information. Both of these studies found that providing no nutrition information was not preferred by the participants. The study by Roberto also looked at calories consumed as an additional factor while the study by Hwang and Lorenzen looked at the pricing of healthy menu items. Roberto found that participants who had calorie information on their menus

consumed fewer calories than those without any calorie information. This result is similar to the result found in the study by Green where they found that participants that used the calorie labels purchased fewer calories than those that did not use the calorie labels. Participants in the Roberto study also consumed fewer calories in the evening after the meal when provided a menu with calories and recommended daily intake levels.

The study by Hwang and Lorenzen also found that participants were willing to pay more for healthy menu options but were not willing to pay more for unhealthy menu options. In a demographic comparison, the study by Green found characteristics to the participants that used the calorie labels in comparison to those who did not and found that participants with a higher income and higher level of education were more likely to use the calorie menu labels. Overall, it appears that users of the menu labels were more likely to be at a higher level of income, have a higher level of education, were more willing to pay more for a healthier menu item, and typically purchased fewer calories.

Menu labeling can be an effective method at improving consumer choices at the point-of-purchase. When labeling menu items it is important to consider the amount of information provided to consumers as well as how well they will be able to interpret the information quickly. The studies reviewed indicated that providing more nutrition information was more helpful to consumers but also including a method of interpretation, such as the traffic light method, proved to be a quick, easy method for consumers to make a healthier choice. Research suggests that combining the nutrition information with a method like the traffic light method is easier for consumers to decipher quickly and likely will improve their decision. Additional research is needed on the long term effects of the

menu labeling methods as each of these studies acknowledged limitations on assessing the long term effects the menu labeling may have consumers' choices.

CHAPTER 3: METHODS

The purpose of this research study was to determine the effectiveness of nutrition labeling using a traffic light labeling system on consumer purchases in a hospital cafeteria. This research study was a quasi-experimental design to evaluate the effectiveness of labeling foods for purchase using a traffic light labeling system on consumer purchases and on consumer opinion. Consumer purchasing behavior was measured using a survey to evaluate the nutrition information's impact on consumer purchases. This quasi-experimental study was approved by the Mount Mary University Institutional Review Board.

Hypothesis

The primary hypothesis for this quasi-experimental study was that consumers would purchase healthier items following a 3-month labeling intervention (versus baseline). The secondary hypothesis was that consumers would be more aware of the nutritional value of the food items they choose to purchase following the 3-month traffic light labeling intervention.

Subjects

Subjects were customers of Upland Hills Health Center Café, located in Dodgeville, Wisconsin. Customers of the café are typically employees, patients, or visitors. The cafeteria is open from 6:30 am to 6:30 pm daily and serves three meals per day. The cafeteria is typically the busiest from 11:00 am to 1:00 pm, Monday through Friday. All customers were eligible to participate in the survey if he/she was over the age of 18 and had made a purchase from the cafeteria.

Intervention

The intervention was a “traffic light” nutrition labeling method which includes labeling items green, yellow, or red based on a set of nutrition criteria. Criteria for labeling the items green, yellow, or red were based on four positive and three negative criteria. The positive criteria were: fruit or vegetable, 100% whole grain, lean protein, or low-fat dairy. The negative criteria were: saturated fat content, sodium content and total calories per serving. For example, if a main entrée item had 5 grams or more of saturated fat or if a food/beverage item had 2 grams or more of saturated fat were considered negative. For calories, an entrée with more than 500 calories per serving or an individual item with more than 200 calories per serving was considered negative. For sodium, an entrée with 600 mg or more of sodium per serving or an individual item with 250 mg or more of sodium per serving were considered negative. For beverages, positive criteria were 100% fruit juice or 100 calories or less per serving. An item was considered green if it contained only positive criteria, if an item had one positive and one negative criterion it was considered yellow, if an item had no positive or negative criteria it was also considered yellow, and if an item had more negative criteria than positive it was considered red. Table 1 shows the to-go food items that were labeled in the cafeteria in addition to the corresponding color determined based on the criteria listed above. All items in the cafeteria were labeled in one day following collection of the baseline data by providing signs throughout the cafeteria. No additional items were labeled in the cafeteria throughout the study to maintain consistency. Only to-go food items were labeled in the cafeteria due to lack of nutrition analysis for hot entrée/side dish and salad bar items. Each food item listed was designated a certain color according to the traffic

light criteria following baseline data collection and remained labeled for three months. The items were then listed on a sign with the appropriate color that was posted in three different locations throughout the cafeteria (see appendix B). In addition to the color coded signs, an educational sign was displayed near the entrance of the cafeteria indicating the level of healthfulness depicted by each color (see appendix C).

Table 1

Food Items with Corresponding Labeled Color

Color	Food Item	Color	Food Item	Color	Food Item
Green	Skim Milk	Yellow	2% Milk	Red	Cappuccino
	1% Milk		Chocolate Milk		Bakery Doughnuts
	Vanilla Soy Milk		Chocolate Soy Milk		Pie Slice
	V8 Juice		Hot Chocolate		Fresh Baked Cookies
	V8 Juice Low Sodium		Fruit Dip		Chicken Salad Wrap
	Coffee		Autumn Apple Salad		Juice Cocktail
	Tea Bags		Vegetable Dip		Regular Soda
	Crystal Light Packets		Egg Salad Sandwich		Regular PowerAde
	Fresh Fruit		Tuna Salad Sandwich		Regular Vitamin Water
	Tangy Poppy Seed Fruit Salad		Turkey Wrap		
	Fresh Vegetables		Pudding		
	Applesauce		Hummus w/ Pretzels		
	Berry Yogurt Parfait		Diet Soda		
	String Cheese		Sparkling Juice		
	Fat Free Yogurt		Sweet Tea		
	Greek Yogurt		Vitamin Water Zero		
	100% Juice				
	Bottled Water				
	100% Whole Wheat Bread				
	Popcorn				
	Cheerios				
	Corn Flakes				
	Rice Krispies				
	Oatmeal Granola Bar				
	Instant Oatmeal				
	Raisins				

Data Collection

All purchasing data was recorded using the Point-of-Sale (POS) system of the Dietary Food Management (DFM) program. Baseline data of sales in the cafeteria was gathered for four weeks from November-December 2015, prior to implementing the traffic light labeling intervention. After intervention implementation POS data was collected for four additional weeks in January 2016. Customer opinion surveys were conducted one week before and one week immediately after the intervention implementation. Approximately three months after implementation of the intervention, the same survey conducted during the intervention period was conducted a second time to evaluate the possible long term effects of menu labeling.

Data collection for the survey occurred at three time points, before implementing the labeling intervention, immediately after the intervention and 3-months after the labeling intervention was implemented. The baseline survey consisted of three questions to assess the impact of nutrition on consumer purchases. The first question was “Do you consider the healthfulness of an item when making a food purchase?” The second question was “On a scale of very important to not important, please rate the following factors based on importance to your food purchases: taste, price, healthfulness, convenience?” The third question was “How often do you read nutrition labels when making food purchases?” Responses for the third question were always, sometimes, or never. A fourth question was added on the post-intervention survey, “Did you notice the green, yellow, and red labeling in the cafeteria today?” If participants answered yes, then an additional question was asked, “Did the labels influence your purchase today?” Surveys were collected by placing them near the exit of the cafeteria with a survey

collection box. The survey box was clearly labeled indicating that only cafeteria customers, that had made a purchase that day, were to complete the survey. The survey incorporated demographic data including gender and age. The surveys were available for response for one week during all three time periods of survey data collection. Cash register data was collected at two different time frames from the DFM POS system, four weeks prior to the intervention implementation (baseline) and four weeks after implementing the intervention. All items sold in the cafeteria were categorized into green, yellow, or red prior to beginning the study.

Data Analysis

Point-of-sale data and survey data were compiled in an Excel spreadsheet and analyzed using descriptive statistics. Survey responses were calculated and percentages were compared between baseline, immediately after the intervention, and three months after the intervention. Percentages were developed by calculating the total responses to each question and divided by the total number of surveys collected. These percentages were calculated for baseline, immediately after the intervention, and three months after the intervention to evaluate for changes in consumer opinion. Similarly, the POS data was compiled and percentages were compared from baseline to immediately after the intervention. A total number of to-go items sold was calculated using Excel for each time frame. The total number of green, yellow, and red items sold was also calculated individually using Excel for each time frame. From this, the total number of green, yellow, or red items was divided by the total number of to-go items sold for each time frame to calculate comparable percentages.

CHAPTER 4: RESULTS

A total of 43 surveys were completed by respondents at baseline (n=26), after the intervention (n=4) and at three-months post-intervention (n=13). Six surveys taken three months after the intervention had incomplete demographic information, but were still included in the data analysis due to the small amount of surveys taken. Two of the six incomplete surveys did not contain responses to demographic information. The demographics of survey respondents are displayed in Table 2. Overall, 23% of survey respondents were male and 65% were female. The age of survey respondents' varied, 12% were 18-30 years, 14% were 31-40 years, 35% were 41-55 years, and 33% were > 55 years. Race and ethnicity were not considered due to lack of diversity with the population studied primarily being white or Caucasian.

Table 2

Demographic Characteristics of Survey Respondents'

Characteristic	n=41	%
Gender		
Male	10	24%
Female	28	68%
Age (y)		
18-30	5	12%
31-40	6	15%
41-55	15	37%
>55	14	34%

Factors Impacting Consumer Purchases

Table 4 shows factors that effected survey respondents' food purchases. Prior to the intervention, 31% of respondents reported "yes" they considered if a food item was healthy or nutritious. After the intervention, 50% of respondents reported they considered

the healthfulness of their food purchases and three months after the intervention 38% reported considering the healthfulness of a food item. When rating the importance of taste, price, healthfulness, and convenience; taste appeared to be the most important factor in respondents' food choices with 92% rating taste as very important before the intervention and 100% initially after the intervention and three months after the intervention, as displayed in Table 4. Convenience also appeared to be an important factor in respondent's food purchases with 69%, 75%, and 54% rating it somewhat important before, after, and three months after, respectively. Additionally, price was an important factor indicated by respondents', similar to healthy or nutritious, about 50% of respondents found price to be either somewhat important or very important. While some factors varied, overall, it appeared that respondents' considered whether a food item is healthy or nutritious during all three time periods.

Consumer Opinion on Nutrition Labels

In all three occurrences, about 50% of respondents reported that they considered if an item was healthy or nutritious to be either 'somewhat important' or 'very important'. The same survey found that most respondents always or sometimes look at nutrition labels when making food purchases. This finding was consistent at all three time points. After the initial intervention, 75% of participants reported noticing the green, yellow, and red labeling signs in the cafeteria and also reported using the labeling signs when making purchases. However, the survey conducted three months after the traffic light system was put into place found that only 46% of respondents reported noticing the labeling signs with only 23% indicating the labeling signs had an effect on their purchase.

Table 3

Respondents' Attitude Towards the Healthfulness of Food Items Before and After the Intervention

Survey Question	Baseline n=26	Post Labeling Intervention n=4	3 Months After Labeling Intervention n=13^a
Do you consider whether the food is “healthy” or “nutritious”?			
Yes	31%	50%	38%
No	8%	0%	8%
Sometimes	62%	50%	46%
How often do you read nutrition labels?			
Always	23%	50%	38%
Sometimes	62%	25%	54%
Never	15%	25%	8%
Did you notice the green, yellow, and red labeling in the cafeteria?			
Yes	-	75%	46%
No	-	25%	54%
If yes, did the labels influence your purchase today?			
Yes	-	75%	23%
No	-	25%	69%

^aPercentages may not add to 100 as one participant skipped one question.

Table 4

Importance of Factors Influencing Respondents' Food Purchases (n=43)

Factor	Very Important	Somewhat Important	Neutral	Not Important
Taste	95%	2%	2%	0%
Price	47%	37%	16%	0%
Healthy/Nutritious	37%	42%	12%	9%
Convenience	23%	65%	9%	0%

Note. Some percentages may not add up to 100 due to rounding. n= total number of surveys completed before, after the intervention, and three months after the intervention.

Transaction Data

The study included a total of 42 green food items, 33 yellow food items, and 32 red food items were coded and used in the transaction data collection. A total of 1,479 items were purchased prior to the labeling intervention and a total of 481 items purchased during the intervention period. Figure 1 displays the transaction data from purchases made before and immediately after the intervention. Prior to the intervention, approximately 818 (55%) of items purchased fell into the green category, followed by 363 (25%) from the yellow category, and 298 (20%) from the red category. After the intervention was put into place, approximately 227 (47%) of the green items, 162 (34%) of the yellow items, and 92 (19%) of the red items were purchased. Despite the inconsistencies in the transaction data before and after the intervention, it appears that overall participants were purchasing more green items than yellow or red individually in both scenarios. However, after the traffic light method was put into place, the total percentage of yellow and red items purchased was actually greater than the percentage of green items purchased.

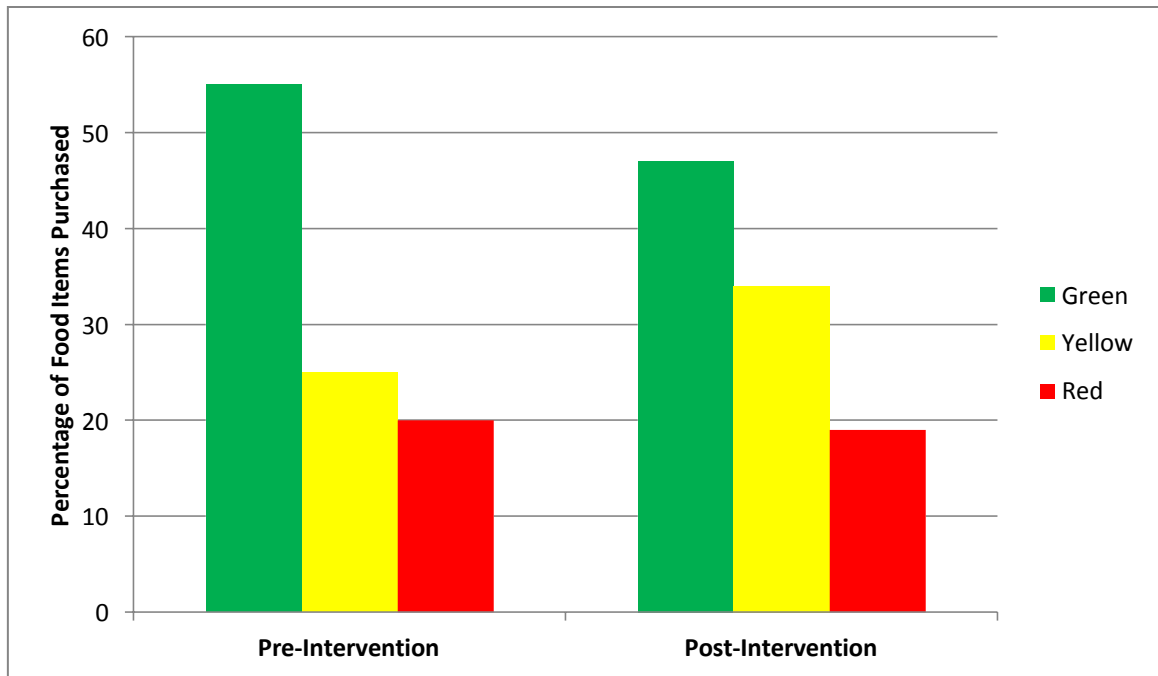


Figure 1. Percentage of food items purchased before and after the color labeling intervention.

CHAPTER 5: DISCUSSION

This study demonstrates that consumers find nutrition and the healthfulness of the items they purchase important; however, they are in need of an individual label or larger signage to have a larger and longer impact on their food purchases. Other studies have used individual colored labels, shapes, or calorie labeled menus or menu boards to provide consumers with nutrition information with the goal to positively impact their food purchases (Arsenault et al., 2014; Hwang & Lorenzen, 2008; Robert et al., 2010; Sonnenberg et al., 2013). This particular study used color coded signs that were distributed throughout the cafeteria for consumers to use as they were making their “grab and go” purchases. Based on the transaction results from this study, it appears that using a color coded sign instead of an individual label did not have a significant impact on consumer purchases. A previous study using a similar traffic light method where items were labeled individually has shown to have a significant impact on consumer purchases (Sonnenerg et. al., 2013).

Potential Influential Factors on Transaction Data

Despite the transaction results not showing any significant differences in consumer purchases, the transactions do show that consumers were already purchasing healthier items (green) than unhealthy items (yellow and red). However, after the intervention was put into place the combined percentage of yellow and red items purchased was actually greater than the percentage of green items purchased. Based on this, it is difficult to determine how much of an impact the labeling signs had on consumer purchases. Given the healthcare environment, it is possible that many of the

customers were already health conscious and therefore were previously making healthy choices. It should also be considered that consumers' purchases in the cafeteria did not reflect their overall diet. A red item could fit into an overall healthy diet if the consumer is eating healthier food options at other times throughout the day.

The transaction data may also have been influenced by availability of the items in the cafeteria. This is unable to be confirmed due to lack of inventory documentation on the amount stocked and sold daily in the cafeteria. While generally the cafeteria maintains the same "to go" items, it is possible that changes in items stocked in the cafeteria could have influenced the number of transactions and healthy items available.

The transaction data analysis was also likely impacted by significant difference in the number of to-go items sold from both data collection time frames. As displayed in the results, the baseline data collected for four weeks revealed a total of 1,479 to-go labeled items in comparison to only 481 items in the four weeks after the intervention was put into place. This large gap in the number of items sold could have been influenced by the amount of potential customers within the hospital. The hospital census tends to fluctuate which would impact how many patients, visitors and employees could potentially purchase items from the cafeteria. The large amount of to-go items sold at baseline may have skewed the data analysis and could have made the intervention look less effective than it may have actually been. If the two time frames had equal sales amounts, the results may have shown a different level of effectiveness of the traffic light labeling method.

Potential Influential Factors on Survey Data

Survey results showed that most respondents did find the healthfulness or nutrition of an item important when making a food purchase. However, they also felt that the taste and convenience were just as important if not more important than the healthfulness or nutrition. This is inconsistent with the findings from a previous study, which revealed that participants identified health and nutrition as more important factors in food or beverage choice than taste, price, and convenience (Sonnenberg, 2013). We were also able to see that respondents were reading nutrition labels but we were unable to determine if this made a significant impact on their food purchases directly. This finding is also inconsistent with the survey results from the Sonnenberg study that found a significant increase in the number of participants that reviewed nutrition information following a traffic light labeling system. Generally, most consumers are unable to decipher whether the nutrition information provided indicates whether the item is healthy or unhealthy. Therefore, labeling items with easy to interpret colors or symbols this may have a more significant impact on consumer purchases. This was demonstrated in a previous study where 57% of participants reported noticing calorie labels while only 16% reported to actually use the calorie labels (Green et al., 2015). Another study that used color coded labels appeared to have better results in effecting purchasing behavior. Participants that reported using the colored labels tended to purchase healthier items more often than unhealthy items ($p < 0.001$) (Sonnenberg et al., 2013). It appears that consumers want to know the nutritional value of the items they are choosing; however, they need an easy way to interpret the information. Given that the survey respondents indicated convenience as a factor to their food purchases, they are likely quickly making

food decisions and will not take the time to read a full nutrition label. Providing them with a color or symbol directly on the packaging would likely have a larger impact on their decision than a nearby sign.

Limitations and Strengths

There are a few limitations with the current study. The first limitation is the potential that the amount of green, yellow, or red items stocked in the cafeteria may have varied throughout the study. This was unable to be confirmed due to lack of inventory tracking on the amount stocked and sold each day in the cafeteria. There was also a lack of surveys completed immediately after the intervention and three months after the intervention. The lack of surveys completed decreased the impact of survey results indicating how consumers were impacted by the colored labeling intervention. The survey respondents may also have been regular hospital customers and therefore could result in a lack of variety in survey participants.

Despite this, there are a few strengths associated with this study. One was the addition of the survey three months after the intervention was implemented. Previous studies have not assessed long term effects of nutrition labeling on consumer purchases (Sonnenberg et al., 2013; Green et al., 2015). Adding an additional survey three months after the initial intervention provided an additional measuring component to assess the long term effectiveness of the traffic light labeling method. The study also brought increased awareness of the nutritional value of different to-go food items. This is in line with planned wellness initiatives within the hospital cafeteria including the reduction of sugar sweetened beverages and providing daily wellness meals. Additionally, the use of

the colors to indicate nutritional value instead of specific calories was a strength to this study. The use of a color label or shape has shown in previous studies to have a more significant impact on consumer purchases than studies using just calorie labels (Arsenault et al., 2014; Hwang & Lorenzen, 2008; Robert et al., 2010; Sonnenberg et al., 2013).

Barriers and Challenges to Conducting Community Research

This community based research study presented some challenges and barriers to obtaining transaction and survey data. In this particular setting, there was no ability to control for certain aspects that likely influenced the study results. One challenge was the inability to track the amount of green, yellow, and red items stocked throughout the data collection time frames. Without this information, it is difficult to conclude the level of significance the transaction results display. Additionally, conducting an optional survey in the community setting requires reliance on individual motivation and interest in completing the survey limited the survey audience. This particular barrier could inhibit survey results by not accounting for individuals who may not have been interested in nutrition. This could have potentially skewed the results into appearing that consumers were more interested in nutrition information than they actually were.

Conclusion

The results of this study using the “traffic light” labeling signs did not reveal any significant changes in consumer purchases. Based on the results and comparison to previously completed studies that have shown to be effective, individual colored labels would likely be a more effective method at impacting consumer purchases. The usage of the color labeled sign was not likely not obvious enough and did not make it easy for

consumers to make a quick decision, which is the expected reason behind poor usage of nutrition facts label information. The color coded signs were used in place of individual stickers due to lack of staffing to place the individual colored stickers on to the individual food items. With appropriate support from staff, the use of the individual color labels on food items would be recommended. Previous studies using the traffic light labeling method have shown the colored labels to be an effective method when items are labeled individually (Arsenault et al., 2014; Sonnenberg et al., 2013).

Overall this study provided further insight on menu labeling and consumer thoughts on their food purchases. Although the transaction data did not reveal any significant differences, it can be determined that a more direct method of labeling, such as individual labels, would likely be more effective based on previous studies results using individual labels. In addition, it can be concluded that consumers do read nutrition labels and find how healthy an item is to be important. The results from this study suggest that “traffic light” labeling may be an effective method at communicating nutrition information to consumers; however, it likely needs to be more obvious to have a larger and potential long term impact on consumer purchases. This study validates the importance of retail food establishments needing a nutrition labeling method outside of standard nutrition labels and that these labels need to be obvious to the consumer so they are able to make quick decisions at the time of purchase. Further research comparing different ways to use the traffic light method individually such as individually labeled items or color coded signs should be conducted to determine the most effective method for impacting consumer purchases.

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Appendix A

Pre and Post Survey Sample

Pre Survey

1. When making food purchases, do you consider whether the food is “healthy” or “nutritious”?
Yes / No / Sometimes

2. How would you rate the importance of the following factors when making a food purchase?

	Very Important	Somewhat Important	Neutral	Not Important
Taste				
Price				
Healthy/Nutritious				
Convenience				

3. How often do you read nutrition labels when making food purchases?
Always / Sometimes / Never

Post Survey

1. When making food purchases, do you consider whether the food is “healthy” or “nutritious”?
Yes / No / Sometimes

2. How would you rate the importance of the following factors when making a food purchase?

	Very Important	Somewhat Important	Neutral	Not Important
Taste				
Price				
Healthy/Nutritious				
Convenience				

3. How often do you read nutrition labels when making food purchases?
Always / Sometimes / Never

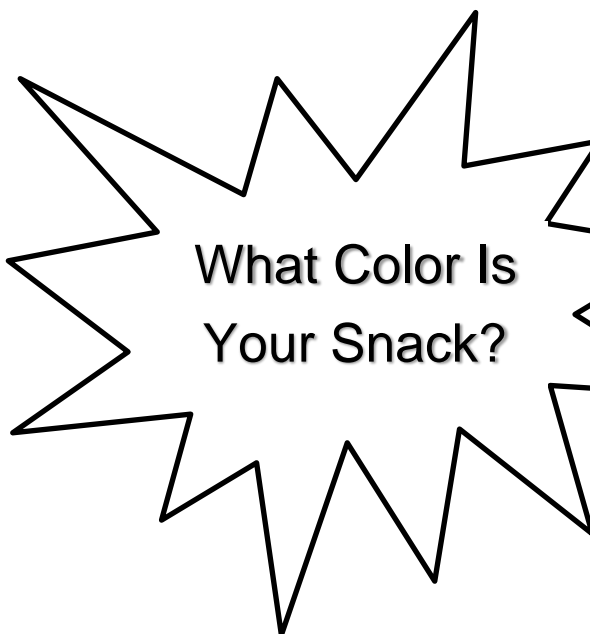
4. Did you notice the green, yellow, and red labeling in the cafeteria today?
Yes / No / Sometimes

5. If yes, did the labels influence your purchase today?
Yes / No

Appendix B

Green, Yellow, Red Food Item Sign Sample

Skim Milk Carton	Apple or Apple Slices
1% Milk Carton	Fruit Dip
2% Milk Carton	Autumn Apple Salad
Chocolate Milk Carton	Banana
Chocolate Soy Milk	Berry Fruit Salad
Vanilla Soy Milk	Cantaloupe
V8 Juice	Watermelon
V8 Juice Low Sodium	Pineapple
Regular Coffee	Grapes
Decaf Coffee	Orange
Black Tea Bag	Strawberries
Black Tea Bag Decaf	Tangy Poppy Seed Fruit Salad
Chamomile Herbal Tea Bag	Fresh Veggies
Green Tea Bag	Vegetable Dip
Green Tea Bag Decaf	Bakery Donuts
Cappuccino	Banana Cream Pie Slice
Crystal Light Lemonade Packet	Boston Cream Pie Slice
Crystal Light Raspberry Packet	Chocolate Cream Pie Slice
Crystal Light Sunrise Orange Packet	Chocolate Mint Cream Pie Slice
Nestle & Swiss Miss Hot Chocolate Packet	Chocolate Peanut Butter Pie Slice
	Coconut Crème Pie Slice
	French Silk Pie Slice
	Lemon Meringue Pie Slice
	Peanut Butter Pie Slice
	Pecan Pie Slice
	Chocolate Chip Cookie
	M&M Cookie
	Oatmeal Raisin Cookie
	Peanut Butter Cookie
	Sugar Cookie
	White Chocolate Macadamia Nut Cookie
	Chicken Salad Wrap
	Egg Salad Sandwich
	Tuna Salad Sandwich
	Turkey Wrap
	Strawberry Applesauce
	Applesauce
	Butterscotch Pudding
	Chocolate Pudding
	Vanilla Pudding
	Berry Yogurt Parfait



Appendix C

Explanation of Green, Yellow, Red Educational Sign

Color Matters!

Find the Healthiest Snacks in the Café!

It is as simple as **green**, **yellow**, or **red**!



Nutrient Dense



Calorie Dense