Associations between Self-Perception of Health and Diet, and Awareness and Use of Calorie Labeling

by

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ABSTRACT

The increase in obesity since the 1980's has been associated with fast-food consumption. In hopes that calorie labeling will be an effective tool to combat obesity, congress included a provision in the Patient Protection and Affordable Care Act of 2010 (ACA) that will require all restaurants with twenty or more locations to post calorie information for each menu item. Current research has provided mixed results regarding the effectiveness of calorie labeling, but overall seems to suggest that calorie labeling may only be effective among certain populations. In September, 2012 McDonald's began to post calorie labels on their menu boards before it was federally mandated under the ACA. This policy provided the opportunity to study the impact of calorie labeling on the purchasing behavior of McDonald's patrons. This cross-sectional study was designed to determine if self-perception of diet, self-perception of health, smoking, physical activity, fruit and vegetable intake, or knowledge of daily calorie requirements is associated with the likelihood of noticing or using calorie labels, or total calories purchased. In addition, relationships between noticing or using calorie labels with total calories purchased were also examined. Receipts and survey responses were collected from 330 participants who purchased food and beverage items from 27 different McDonald's locations within a 20 mile radius of downtown Phoenix, Arizona. Results indicated that only 16.1% of the sample reported using calorie labels, and those who reported using calorie labels purchased an average of 136 fewer calories. Multivariate analysis indicated there were no statistically significant relationships between self-perception of diet, self-perception of health, smoking, physical activity, fruit and vegetable intake, or knowledge of daily calorie requirements with the likelihood of noticing or using calorie labels, or total

calories purchased. However, it is possible that the small sample size of participants using calorie labeling precluded any statistically significant relationships among these variables from emerging. Further research with larger sample sizes should be conducted, to investigate individual level factors that may be associated with use of calorie labeling.

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GLOSSARY

Term	Definition
Self-Perception of Diet	An individual's personal assessment of the overall quality of their diet.
Self-Perception of Health	An individual's personal assessment of the overall quality of their health.
Body Mass Index (BMI)	A mathematical calculation (weight in kilograms divided by height in centimeters squared) used to screen individuals for potential health risks by categorizing them as underweight (BMI <18.5), normal weight (BMI 18.5 – 24.9), overweight (BMI 25 – 29.9) or obese (BMI ≥ 30).

CHAPTER 1

INTRODUCTION

Obesity has drastically increased in the United States since the 1980's, with 35.7% of Americans now considered obese (Flegal, Carroll, Kit, & Ogden, 2012). If adult obesity continues to increase at its current rate, in the next 20 years it could reach or exceed 44% (Levi, Segal, St. Laurent, Lang, & Rayburn, 2012). Obesity has been directly associated with several preventable diseases including hypertension, diabetes mellitus, heart disease, respiratory disease, gastrointestinal problems, osteoarthritis, cancer, chronic kidney disease, dyslipidemia, and many other chronic diseases (Malnick & Knobler, 2006). If appropriate actions are not taken to curtail obesity trends, by 2030, the Unites States would have an additional 65 million obese adults, with the combined medical costs associated with the treatment of obesity-related diseases estimated to increase by $48-66 billion each year (Wang, McPherson, Marsh, Gortmaker, & Brown, 2011).

The number of fast-food restaurants in the United States has been growing rapidly over the past several decades, increasing from approximately 30,000 in 1970 to 233,000 by 2004 (Rosenheck, 2008). Previous studies have shown that frequency of fast-food consumption is associated with obesity and those who live in close proximity to fast-food restaurants are more likely to be obese (Anderson, Rafferty, Lyon-Callo, Fussman, & Imes, 2011; Garcia, Sunil, & Hinojosa, 2012; Maddock, 2004). Foods served at many fast-food restaurants are typically higher in energy density, which are likely to lead to excess calorie consumption and weight gain among patrons (Prentice & Jebb, 2003). Serving size increases at fast-food restaurants may also be contributing to obesity. For

example, by 2002, the average serving sizes of French fries, hamburgers, and sodas at McDonald's and Burger King had increased dramatically from their original serving sizes introduced in the 1950's (Young & Nestle, 2003). Mean serving sizes of French fries, hamburgers, and sodas served at fast-food restaurants in 2002 were also larger than those recommended by the USDA Food Guide Pyramid. Fast-food restaurants have also been associated with generally poor diets among adults including the consumption of significantly more calories, fat, cholesterol, and sodium (Paeratakul, Ferdinanad, Champagne, Ryan, & Bray, 2003; Bowman & Vinyard, 2004).

Some studies have indicated that both regular consumers and nutrition experts are poor judges of calorie estimation of food items. In one study, registered dietitians and other nutrition experts consistently underestimated the caloric content of five different meals presented to them by 28 to 48% (Backstrand, Wootan, Young, & Hurley, 1997). In another study, 193 participants who completed a mailed survey, significantly underestimated the caloric content of each category of meal presented to them (Burton, Creyer, Kees, & Huggins, 2006).

Prior to the implementation of any calorie labeling laws, some scientific evidence showed that there could be benefits to providing calorie information to customers of fast-food restaurants. For example, an experimental study demonstrated that providing calorie labels for different meals could alter purchase intentions among participants (Burton et al., 2006). A telephone survey reported that 43 to 66% of participants may use calorie labeling if it were available in restaurants (Krukowski, Harvey-Berino, Kolodinsky, Narsana, & DeSisto, 2006). A health impact assessment conducted in Los Angeles County indicated that even modest reductions in calorie consumption from fast-

food restaurants could dramatically curb annual weight gain (Kuo, Jarosz, Simon, & Fielding, 2009). For example, Kuo et al. determined if 10% of adult fast-food patrons in Los Angeles County were able to consume 100 fewer calories from fast-food restaurants, a total of 40% of the 6.75 million pound annual weight gain could be averted.

The first calorie labeling law took effect in New York City in 2008. Since then, California, Oregon, Maine and a dozen or more U.S. counties and cities have passed laws which require calorie labeling in restaurants (Nestle, 2010). In 2010, congress passed the Patient Protection and Affordable Care Act which requires all United States restaurant chains containing twenty or more locations to post calorie information for each menu item, along with a statement concerning suggested daily caloric intake (Public Law 111-148, 2010).

Prior to the implementation of the federal law, several studies have been conducted in cities where calorie labeling is mandatory. However, results from studies in these areas have provided inconsistent conclusions regarding the effectiveness of calorie labeling on fast-food purchasing behaviors. For example, one study in New York City compared consumer behavior among low-income communities both two weeks before and approximately four weeks after restaurant calorie labeling was introduced (Elbel, Kersh, Brescoll, & Dixon, 2009). Results indicated that 28% of fast-food restaurant patrons who noticed calorie labeling said that it influenced their choices, but there was no significant change in calories purchased when comparing data collected before and after the law's implementation. In a large study in New York City comparing consumer behavior one year before (spring 2007) and nine months after (spring 2009) calorie menu labeling took effect, the full sample measured showed no change in calories purchased

(Dumanovsky et al., 2011). However, among three of the restaurant chains measured, significant reductions in calories purchased were seen. When analyzing results from participants included in the 2009 sample, 15% reported using calorie labeling, resulting in an average decrease of 106 calories among these customers. In a study in Pierce County, Washington, analysis of sales data for 16,000 ordered entrées showed there was an average of 15 fewer calories per entrée purchased after calorie labeling took effect (Pulos & Leng, 2010). A study in King County, Washington showed no significant impact of calorie labeling on the amount of calories purchased by restaurant patrons of 14 Taco Time locations (Finkelstein, Strombotne, Chan, & Krieger, 2011).

Important research concerning calorie labeling has also taken place in the laboratory setting, but these studies have also provided inconsistent data regarding fast-food purchasing and consumption behavior. For example, a study conducted at two separate student cafeterias actually showed significantly higher amounts of calories purchased among those in the experimental group (exposed to calorie labels) when compared to those in the control group (not exposed to calorie labels) (Aaron, Evans, & Mela, 1995). Another study asked participants to order and consume a meal offered from one of three experimental menus (two contained calorie labels) or a control menu (Harnack et al., 2008). There were no significant differences between the amounts of calories ordered or consumed from the experimental menus when compared to the control menu. A quasi-experimental study also conducted in a student cafeteria analyzed the average calorie content of meals purchased before during and after a 13 day treatment period during which calorie labels were posted period (Chu, Frongillo, Jones, & Kaye, 2009). Results showed immediate and sustained decreases in the average calorie content

of meals purchased during the treatment period, and increases in average calorie content of meals purchased after the treatment. Another study asked participants to order food from a menu either with or without calorie labels (Roberto, Larsen, Agnew, Baik, & Brownell, 2010). Participants who ordered from menus with calorie labels consumed 14% fewer calories than those without access to calorie labels. One study compared the effects various types of calorie menu labeling on dieters vs. non-dieters (Girz , Polivy, Herman, & Lee, 2012). Results from this study indicated that dieters were more likely to purchase entrees that were labeled as low in calories, regardless as to how many calories the entrees actually contained.

There is some evidence to suggest that self-perception of health, self-perception of diet, knowledge of calorie requirements, smoking, fruit and vegetable intake, and physical activity are good indicators of a variety of health outcomes and health behaviors (Nielsen & Krasnik, 2009; Kaplan et al., 1996; Fylkesnes, 1993; Bihan et al. 2010, Lallukka, Lahti-Koski, & Ovaskainen, 2001; Hjartaker, Laake, & Lund, 2001; Duaso & Duncan, 2012; Padrao, Lunet, Santos, & Barros, 2007). However, prior to this study, no research had been conducted to specifically investigate if any of these variables are associated with health behaviors such as the awareness of calorie labels, use of calorie labels, or the total number of calories purchased. The recent implementation of McDonald's policy to post calorie labels in all of their restaurants provided the opportunity to examine these associations.

The aim of this cross-sectional study was to investigate if self-perception of health, self-perception of diet, physical activity, fruit and vegetable intake, smoking, or knowledge of calorie requirements were associated with patrons' likelihood of noticing

or using restaurant calorie labels or the total number of calories purchased. Furthermore, this study also investigated the relationship between the total number of calories purchased by restaurant patrons based on whether they reported noticing and using calorie labels. This study was approved by the Arizona State University Institutional Review Board.

Research Questions and Associated Hypotheses

Research Question 1: Are fast-food restaurant patrons' likelihood of noticing calorie labels associated with self-perception of health, self-perception of diet, reported health behaviors, or knowledge of calorie requirements?

Hypothesis 1.1: Restaurant patrons who perceive themselves as healthy are more likely to notice calorie labeling before ordering.

Hypothesis 1.2: Restaurant patrons who perceive their diet as healthy are more likely to notice calorie labeling before ordering.

Hypothesis 1.3: Restaurant patrons who engage in healthy behaviors such as meeting physical activity recommendations, meeting fruit and vegetable consumption recommendations, and non-smoking are more likely to notice calorie labeling before ordering.

Hypothesis 1.4: Restaurant patrons who correctly identify how many calories are needed each day by an average American are more likely to notice calorie labeling before ordering.

Research Question 2: Are fast-food restaurant patrons' likelihood of using calorie labels associated with their self-perception of health, self-perception of diet, reported health behaviors, or knowledge of calorie requirements?

Hypothesis 2.1: Restaurant patrons who perceive themselves as healthy are more likely to use calorie labeling when purchasing food or beverage items.

Hypothesis 2.2: Restaurant patrons who perceive their diet as healthy are more likely to use calorie labeling when purchasing food or beverage items.

Hypothesis 2.3: Restaurant patrons who engage in healthy behaviors such as meeting physical activity recommendations, meeting fruit and vegetable consumption recommendations, and non-smoking are more likely to use calorie menu labeling when purchasing food or beverage items.

Hypothesis 2.4: Restaurant patrons who correctly identify how many calories are needed each day by an average American are more likely to use calorie menu labeling when purchasing food or beverage items.

Research Question 3: Is there a relationship between fast-food restaurant patrons' total amount of calories purchased and whether they notice and use calorie labeling prior to ordering food?

Hypothesis 3.1: Restaurant patrons who notice calorie labeling prior to ordering are more likely to purchase fewer total calories.

Hypothesis 3.2: Restaurant patrons who use calorie labeling when purchasing food or beverage items are more likely to purchase fewer total calories.

Research Question 4: Is there a relationship between the total amount of calories purchased and restaurant patrons' self-perception of health, self-perception of diet, reported health behaviors, and knowledge of calorie requirements?

Hypothesis 4.1: Restaurant patrons who perceive themselves as healthy are more likely to purchase fewer total calories.

Hypothesis 4.2: Restaurant patrons who perceive their diet as healthy are more likely to purchase fewer total calories.

Hypothesis 4.3: Restaurant patrons who engage in healthy behaviors such as meeting physical activity recommendations, meeting fruit and vegetable consumption recommendations, and non-smoking are more likely to purchase fewer total calories.

Hypothesis 4.4: Restaurant patrons who correctly identify how many calories are needed each day by an average American are more likely to purchase fewer total calories.

CHAPTER 2

REVIEW OF LITERATURE

Increasing Prevalence of Obesity

The age-adjusted obesity rate calculated using Body Mass Index (BMI) among US adults aged 20-74 years has been increasing since the 1980's. According to data collected from the National Health and Nutrition Examination Surveys (NHANES), the obesity rate increased slowly from 13.4% (1960–1962) to 14.5% (1976-1980) (Flegal, Carroll, Kuczmarski, & Ogden, 2002). However, the following NHANES data showed the obesity rate increased more dramatically from 14.5% (1976-1980) to 23.3% (1988-1994) (Flegal et al., 2002). NHANES data collected during 1999-2000 showed significant increases in obesity with the rate growing from 23.3% (1988-1994) to 30.9% among adults aged 20-74 (Flegal et al., 2002). The most current NHANES obesity statistics collected during 2009-2010, indicate that 35.7% of American adults are obese, representing an all-time high (Flegal et al., 2012). If adult obesity continues to increase at its current rate, in the next 20 years it could reach or exceed 44% (Levi et al., 2012).

Negative Consequences of Obesity

Obesity has been directly associated with several diseases including hypertension, diabetes mellitus, heart disease, respiratory disease, gastrointestinal problems, osteoarthritis, cancer, chronic kidney disease, dyslipidemia, and many other important health risk factors (Malnick & Knobler, 2012). The medical costs associated with the treatment of these obesity related diseases have been rising dramatically. In 1998, medical costs associated with obesity were estimated at $78.5 billion, but by 2008 those costs had almost doubled to $147 billion (Finkelstein, Trogdon, Cohen, & Dietz,

2009). Per capita medical spending for obese patients is $1,429 (approximately 42%) higher per year compared to normal weight individuals (Finkelstein et al. 2009). Wang et al. (2011) warns that if appropriate actions are not taken to curtail obesity rates, by 2030, we would have an additional 65 million obese adults in the United States. Compared to current spending, the combined medical cost associated with the treatment of obesity-related diseases is estimated to increase by $48-66 billion per year by 2030. There would also be an additional 8 million cases of diabetes, 6.8 million cases of heart disease and stroke, and 500,000 cases of cancer by 2030. Obesity is not only responsible for direct costs such as medical spending, but also results in indirect costs associated with loss of productivity such as lost work days and absenteeism. Over the next 20 years, these obesity-caused productivity losses are expected to generate a loss of 1.7 to 3 million productive person years, and cost our economy between $390-580 billion.

Growth of Fast-Food Industry

The prolific expansion of fast-food restaurants has created an environment in which a much larger percentage of Americans spend more of their food dollars away from home and consume fast food more regularly. The number of fast-food restaurants has been growing rapidly over the past several decades in order to satisfy increasing demand (Paeratakul et al., 2003). For example, in 1970 there were approximately 30,000 fast-food restaurants, but by 2004 that number increased to 233,000 (Rosenheck et al., 2008). The amount of food dollars spent at fast-food restaurants increased from $6 billion in 1970 to an estimated $110 billion in 2000 (Schlosser, 2004). Americans consume 15% of their total daily energy intake at fast-food restaurants, and 37.4% of all

away from home meal and snack purchases in the U.S take place at limited service restaurants such as fast-food restaurants (Hearst et al., 2013).

Associations between Obesity and Fast Food

A number of studies have shown an association between fast-food consumption and increased body weight / obesity. One study analyzed data from the 2005 Michigan Behavioral Risk Factor Survey to determine if there was a relationship between obesity prevalence and fast-food consumption (Anderson et al., 2011). Results showed that obesity prevalence was consistently correlated with increases in fast-food consumption. The odds of being obese were approximately 50% higher among participants who consumed fast food two or more times per week when compared to participants who consumed fast food less than once per week. After adjusting for confounding variables such as demographic characteristics and health related variables, the odds of being obese were even higher among participants who consumed fast food more regularly. The adjusted odds of being obese were 60% higher among participants who consumed fast food two to three times per week, and 81% higher among participants who consumed fast food more than three times per week compared to participants who consumed fast food less than once per week.

Another study showed a strong association between fast-food consumption and the likelihood of becoming morbidly obese (Garcia et al., 2012). Medical staff in San Antonio, Texas collected surveys from 270 obese patients prior to receiving bariatric surgery from June 2009 to September 2010. Participants were classified as either being obese (BMI = 30.00-39.99 kg/m^2), morbidly obese (BMI = 40.00-49.99 kg/m^2), or super morbidly obese (BMI 50.00+ kg/m^2). Multiple behavioral variables were compared with

obesity rates in order to determine which lifestyle choices were most likely to result in the varying levels of obesity. Fast-food consumption was the most important factor in causing higher levels of obesity. Analysis revealed that for each additional time a participant consumed fast food per week, they had a 26% greater chance of being super morbidly obese compared to the combined designation of obese and morbidly obese.

Another cross-sectional study compared prevalence of fast-food restaurants with obesity rates among different states in the US (Maddock, 2004). The obesity rate for each state was determined by referencing self-reported BMI data from the Behavioral Risk Factor and Surveillance System which is conducted annually by the Centers for Disease Control and Prevention. The 2000 census provided population data, and the number of fast-food outlets was determined by examining the 2002 *U.S. Yellow Pages.* Only the two largest US fast-food chains were included in the study because of their large combined market share of fast-food restaurants and their existence in all 50 states. Results showed that the number of residents living in close proximity to fast-food restaurants was strongly correlated with state obesity rates.

A possible reason customers are more likely to become obese by eating fast food is due to high energy dense foods provided by fast-food restaurants. Research by Prentice and Jebb (2003) indicated that energy densities from each of the three fast-food restaurants studied were significantly higher than an average diet. They also suggest that humans possess a poor ability to distinguish between the energy densities of foods. They believe this phenomenon may be explained in the origin of our species which suggests that our ancestors evolved to consume large portions of food at one time in order to meet energy requirements. Unlike many of the energy-dense foods that are readily available

today, it can be assumed that the diets available to our ancestors were much lower in energy density. As a result, we do not appropriately down-regulate the bulk of food eaten (including energy-dense fast food), which leads to excessive calorie consumption and weight gain.

Not only do fast-food restaurants provide more energy dense foods, but large portion sizes available at many fast-food restaurants may also have fueled the increase in obesity prevalence. One study measured the portion sizes of four different fast-food restaurants chains to determine how the portion sizes of foods and beverages changed since they were originally introduced by their respective companies (Young & Nestle, 2003). Serving sizes for fast-food restaurants have increased dramatically over the past several decades. Notably, in 1955 McDonald's introduced its hamburger (1.6 ounces) fountain drink (7.0 fluid ounces) and French fries (2.4 ounces). Serving sizes at McDonald's increased dramatically by 2002, with hamburger sizes that ranged from 1.6 ounces to 8 ounces, fountain drinks that ranged from 12 fluid ounces to 42 fluid ounces, and French fries that ranged from 2.4 to 7.1 ounces. When compared to USDA recommendations, the serving sizes provided by the fast-food restaurants were significantly higher. For example, among the four fast-food restaurants measured, the mean serving size for French fries was 3.9 ounces (USDA recommendation equaled 2.5 ounces), and the mean serving size for fountain beverages was 23 fluid ounces (USDA recommendation equaled 12 fluid ounces).

To illustrate the point that customers consume more calories when their portion sizes are increased, an experimental study was conducted in a university cafeteria (Diliberti, Bordi, Conklin, Roe, & Rolls, 2004). The study was designed to compare the

amount of food eaten when participants were offered either a standard portion, or a portion 50% larger than the standard portion. Ten days were observed over the course of five months to covertly analyze the amount of food consumed depending on the portion being served. On five of the days, the portion size was the standard portion, while on the other five days the portion size was 50% larger than the standard portion. A total of 180 participants were recruited for this study with 89 participants who purchased the 100% portion and 91 participants who purchased the 150% portion. The parallel study was designed to have two unique groups by preventing subjects who participated on one data collection day from participating on future data collection days. Results indicated that those participants who purchased the larger portion size consumed 43% more calories than participants who purchased the standard portion size.

Associations between Fast Food and Unhealthy Diet

Several studies have shown that there is an association between eating fast food and a generally unhealthy diet. Two studies have made these associations by analyzing data from the U.S. Department of Agriculture's Continuing Survey of Food Intakes by Individuals (CSFII) (Paeratakul et al., 2003; Bowman & Vinyard, 2004). The survey was nationally-representative, and was administered by an interviewer who completed 24-hour dietary recalls for participants on two non-consecutive days which were three to ten days apart. Interviewers collected complete 24-hour dietary recall data from 16,103 adults between 1994 and 1996. Results from the survey indicated that 37% of adults consumed fast food during one of the two days. Adults who reported eating fast food also reported that they consumed significantly less bread, cereals, grains, milk, fruits, vegetables, legumes, protein, dietary fiber, vitamin A, vitamin C, and beta carotene

compared to adults who did not report consuming fast food. Adults who reported that they consumed fast food also reported that they consumed significantly more calories, fat, cholesterol, and sodium, as well as more than twice as many servings of fried potatoes and carbonated soft drinks.

Consideration to the healthfulness of diet among children and adolescents is also important due to the possible deleterious effects poor diet can have on growth and development. One survey was conducted specifically among children and adolescents to determine diet quality of fast food compared to food prepared at home (Bowman & Vinyard, 2004). Participants who reported eating at a fast-food restaurant during the week prior to their participation in the study had a 40% higher total energy intake among males and a 37% higher total energy intake among females. Males who consumed fast food three or more times during the week consumed 13% more fat and females consumed 9% more fat compared to those who did report consuming fast food. The study also demonstrated that frequent consumption of fast food was also associated with significantly lower intakes of fruits, vegetables, grains and milk, while also being associated with significantly larger intakes of soft drinks, cheeseburgers, pizza, and French fries.

In an attempt to understand more about the sources of energy intake among children eating away-from-home, one study analyzed eating away-from-home trends among children from 1977 to 2006 (Poti & Popkin, 2011). Results indicated that there was a 255 calorie per day increase in foods eaten away-from-home from 1977 to 2006. Calories consumed at fast-food restaurants also increased significantly and surpassed caloric intake from schools to become the largest contributor to calorie intake in foods

consumed away-from-home. Another recent study analyzed data provided by children and adolescents via NHANES which included two nonconsecutive 24-hour dietary recalls. Results revealed that children and adolescents who reported that they consumed fast food during one of two days had higher intakes of total calories, regular soda, total fat, saturated fat, sugar, and sodium. (Powell & Nguyen, 2013).

Lack of Calorie Awareness among Consumers

Some studies indicate that both regular consumers and nutrition experts consistently underestimate the number of calories in food items. For example, one study was conducted at an annual meeting of the American Dietetic Association in San Antonio, Texas in October, 1996. More than 200 registered dietitians and other nutrition professionals were included in the study. Approximately 80% of participants were registered dietitians, and 73% had at least some graduate training. Each participant was presented with five popular meals purchased from large, national restaurant chains, along with a glass of whole milk and asked to estimate the number of calories for each item. The average estimate for the glass of whole milk was remarkably accurate at 155 calories, with the actual value being 150 calories. However, the average calorie estimates for the "Lasagna," "Grilled Chicken Caesar Salad with Dressing," "Tuna Salad Sandwich," "Porterhouse Steak Dinner," and "Hamburger and Onion Rings" were underestimated by 28%, 33%, 48%, 33%, and 44% respectively (Backstrand et al., 1997).

Another study examined the ability of 193 participants to estimate calorie counts for nine restaurant entrees (Burton et al., 2006). Each of the nine entrees was categorized as being "more-healthful," "less-healthful," or "extremely unhealthful." Participants only slightly underestimated "more-healthful" items by an average of 43 calories. When

estimating “less-healthful” items, participants underestimated the number of calories by an average of 642 calories. The most shocking result was that when asked to estimate one “extremely unhealthful item” (cheese fries with ranch dressing) participants underestimated its caloric content by 2,141 calories.

Another recent study asked 1877 adults, 1180 adolescents, and 330 school-aged children in four New England cities to estimate calorie content of fast-food meals from six of the largest US fast-food chain restaurants: McDonald’s, Burger King, Wendy’s, KFC, and Subway and Dunkin’ Donuts (Block et al., 2013). When comparing the participant calorie estimates for their meals to the actual calorie content of each meal, adults, adolescents, and school-aged children underestimated calorie content of their meals by 175, 259, and 175 calories respectively. Overall, at least two thirds of participants underestimated the calorie content of their meals, with one quarter of participants underestimating caloric content by at least 500 calories.

Nutrition Information in Restaurants and Purchase Intentions

There is some experimental scientific evidence to suggest that providing nutrition information regarding menu items can influence the purchase intentions of customers. One study examined the attitudes and purchase intentions of four restaurant entrees (Hamburger, Chef’s Salad, Chicken Breast Dinner, and Turkey Sandwich) to determine if participants would be more likely to modify their purchases when presented with nutrition information (Burton et al., 2006). Participants were also asked how likely they would be to gain weight or develop heart disease if they regularly ate the menu item. For each menu item, participants were either given no nutrition information, only calorie information, or nutrition information of calories, fat, saturated / trans-fat, and sodium

content. Results indicated that when nutrition information and calorie information were provided, purchase intentions and choice decreased for menu items which defied customers' expectations. The largest changes between the three groups of participants occurred for the Chef's Salad which had the largest deviations from what participants expected. Since the Chef's Salad contained more total fat and saturated fat compared to participant expectations, perceptions of weight gain and heart disease risk increased among participants who were provided nutrient information, leading to reductions in purchase intentions. Also, when participants were not provided with any nutrient information, their estimated risk for contracting heart disease was indistinguishable between the Chef's Salad, Chicken Breast Dinner, and Turkey Sandwich. However, participants provided nutrition information regarding these items produced large differences in perceived risk of heart disease. Results from this study indicate that providing nutrition information to consumers may create changes in perception of healthfulness of food items in restaurants, which may allow consumers to make more healthful food choices.

Potential Benefits of Calorie Labels

Calorie labeling was proposed as a method to curtail obesity rates by allowing customers to make healthier, more informed decisions regarding the number of calories purchased at restaurants. Before any calorie labeling law went into effect, several studies analyzed the potential impact of calorie labeling policies. For example, one study analyzed data from by two different telephone surveys: the 2004 Vermonter Poll Food and Agriculture Survey Center for Rural Studies (community sample) and a similar survey of Vermont college students (college sample) (Krukowski et al., 2006). There

were a total of 649 participants included in the community sample, and 316 participants in the college sample. Each sample was asked questions designed to determine if they used food labels, desired more calorie information from restaurants, and knew approximately how many calories adults should consume each day. Fifty two percent of the college sample and 33% of the community sample reported that they did not typically look at food labels. Over 76% of women in the community sample and 62.7% of women in the college sample reported using food labels, which was significantly higher than the 53.2% of men in the community sample and 29.9 % of men in the student sample. When participants were asked what the average amount of calories an adult should consume per day, 67% of respondents answered the question correctly even though any response between 1,500 and 2,500 calories was accepted as correct. When respondents were asked if they would be likely to use calorie information if it were available, 44 - 57% of the combined sample reported that they would not likely use calorie labels.

One study analyzed the impact of calorie labeling on consumer purchasing in restaurants in New York City before calorie labeling took effect (Bassett et al., 2008). A total of 7218 surveys were completed by participants across 275 restaurants from eleven different chains throughout New York City from March 27, 2007 to June 8, 2008. During that time, the only major restaurant chain to provide voluntary calorie information was Subway. Data collected from 1830 customers who frequented 47 Subway restaurants were especially useful in determining the potential impact that calorie labeling would have on consumer purchasing habits in New York City. Results showed that 32% of Subway customers reported that they noticed calorie information and those who

noticed calorie information purchased an average of 52 fewer calories compared to those who did not see the calorie information.

A health impact assessment of calorie labeling was conducted in Los Angeles County using data from the Los Angeles County Health Surveys (Kuo et al., 2009). These telephone surveys collected health data from 8004 adults in 1995 and 8648 adults in 2005. Results from the study estimated that if 10% of adult fast-food patrons in Los Angeles County were able to consume 100 fewer calories from fast-food restaurants, a total of 40% of the 6.75 million pound annual weight gain could be averted. Additionally the study showed that if 20% of fast-food patrons in Los Angeles County were able to consume 125 fewer calories from fast-food restaurants, a total of 101% of the annual weight gain could be averted, indicating a possible decline in overall adult obesity.

Calorie Menu Labeling Legislation

The first calorie labeling law took effect in New York City on July 19, 2008, which required all restaurant chains with 15 or more locations to post calorie information for each item on their menus (Vadiveloo et al. 2011). Since then, California, Oregon, Maine and a dozen or more U.S. counties and cities have passed laws which require calorie labeling in restaurants (Nestle, 2010). In 2010, congress passed the Patient Protection and Affordable Care Act. Section 4205 of the act requires all United States restaurant chains containing twenty or more locations to post calorie information for each menu item along with a statement noting the suggested daily caloric intake for adults (Public Law 111-148, 2010). This broad policy is expected to take effect soon and preempt, state, county, and city laws similar to those in areas such as New York City and King County, Washington. The Food and Drug Administration (FDA) is planning to

issue the final rules regarding calorie labels by the end of 2013, and is proposing that the final rules become effective six months after they are published (FDA, 2013).

Experimental Calorie Labeling Studies

Several pertinent studies have analyzed the effect of calorie labeling on consumer behavior in laboratory settings. Aaron et al. (1995) designed a study to determine the effect of calorie labeling on the amount of calories ordered and consumed. Sixty-Five participants were recruited into the experimental group, and 25 participants were recruited into the control group. All subjects were blinded, and data was collected over two consecutive weeks at a British university's cafeterias. The experimental group ordered and consumed food at the main cafeteria, which during the first week posted signs informing students of a new nutrition labeling program that would begin the following week. During the second week, nutrition labels including calorie information for each item appeared in the main cafeteria. The control group ordered and consumed food at an alternate cafeteria that provided no such nutrition information. Interestingly, the experimental group actually purchased significantly more calories, grams of fat, and grams of carbohydrate. The control group also purchased significantly fewer grams of protein than the control group. In the experimental group there were no significant differences in calorie intakes for women, but men significantly increased their intakes of total calories, fat and carbohydrate, while decreasing protein intake. In a debriefing questionnaire, participants in the experimental group were asked if they had noticed the nutrition labels during the second week, and 92% responded "yes." When the experimental group was asked if the labels influenced the items they chose, 73.3% responded "no, not at all."

Another study was designed to evaluate the effectiveness of calorie labeling and value-pricing menus on the number of calories purchased and the number of calories consumed (Harnack et al., 2008). Between the months of October 2005 and April 2006, data from 594 participants living in the Minneapolis / St. Paul, Minnesota metropolitan area were collected and used for analysis. Participants were blinded to the study's purpose, as well as the source of the meal they would choose (all meals were purchased from McDonald's). Participants were asked to order from one of four randomly assigned menus. The "Calorie Menu" contained both calorie information as well as a value pricing. The "Price Menu" contained neither calorie information nor value pricing. The "Calorie plus Price Menu" contained calorie information but did offer value pricing. The "Control Menu" did not contain calorie information but did offer value pricing. Fifty four percent of those in the Calorie Menu group and 59% of those in the Calorie plus Price group reported that they had noticed the calorie information printed on their menus. There were no significant differences when comparing the average number of calories ordered between the four groups, with 805 calories ordered by the Calorie Menu group, 813 calories ordered by the Price Menu group, 761 calories ordered by the Calorie Plus Price group, and 739 calories ordered by the Control Menu group. The average amount of calories consumed was also similar when controlling for different demographics characteristics such as age, education level, and body weight. However, men in each of the three experimental groups were more likely to consume more calories than men in the control group.

A quasi-experiment conducted at Ohio State University's dining center between October 25, 2004 and December 8, 2004 is also meaningful in terms of providing

information regarding the effect of calorie labeling on the number of calories purchased (Chu et al. 2009). Twelve hot entrees were created and used for this study which collected data from dining center patrons over three time periods: pretreatment, treatment, and post-treatment. During the two week pretreatment period, only descriptions of the entrees were posted on large, clearly-visible menu boards. During the two week treatment period, entrée descriptions along with nutrition information such as calories, serving size, grams of fat, grams of protein, and grams of carbohydrate were posted on large clearly-visible menu boards. During the 13 day post-treatment period, the nutrition information was removed, and only descriptions of the entrees were posted on regular pieces of paper, as was customary before the study began. The average amount of calories purchased by patrons did not change during the treatment period, but significantly decreased beginning on the first day of the treatment period. The calorie reductions remained constant during the treatment period, but steadily increased again during the post-treatment period. There was also a significant decrease in the sale of the entrées containing the highest amount of calories when comparing the pretreatment and treatment time periods; however the sales of those entrée items also steadily increased during the post-treatment period

Another study was designed to compare participant behavior when presented with various levels of calorie labeling (Roberto et al., 2009). More than 270 participants were recruited from the New Haven, Connecticut between August 2007 and August 2008. Participants were blinded and randomly assigned to either receive a menu that contained no calorie information (Group 1), a menu that only contained each item's caloric content (Group 2), or a menu that contained each item's caloric content as well as a disclaimer

indicating that the average adult should consume 2000 calories per day (Group 3). The amount of calories ordered, calories consumed during the meal, and calories consumed during the meal in addition to the total amount of calories consumed during the rest of the day were all recorded. Groups provided with calorie information (Groups 2 and 3) reduced the amount of calories ordered, the number of calories consumed during the meal, and the number of calories consumed during the rest of the day. When analyzing the number of calories ordered, Group 1 ordered an average of 2189 kcal which was significantly more calories compared to Groups 2 and 3. Group 2 ordered an average of 1862 kcal, and Group 3 ordered an average of 1860 kcal. Analyzing the calories consumed during the meal revealed that Group1 consumed the most calories (1459), Group 2 consumed fewer calories than Group 1 (1335), and Group 3 consumed the least number of calories (1256). When analyzing the number of calories consumed during the meal in addition to the rest of the day, Group 3 consumed significantly fewer calories (1380) compared to Group 1 (1630) and Group 2 (1625).

Recent calorie labeling research was presented as two companion studies (Girz et al., 2012). The first study was designed to determine the effect of varying calorie labels on item selection and to examine if all participants or only dieters would use calorie information. The subject pool was comprised of 149 female undergraduate students who were categorized as either restrained eaters or unrestrained eaters using the Restraint Scale. Two dishes were created for experimentation for the study: a salad containing 1200 calories, and a pasta dish containing 1200 calories. In the first experimental group, participants received a menu which labeled the salad as 600 calories and the pasta dish as 1200 calories. In the second experimental group, participants received a menu which

labeled the salad as 1200 calories and the pasta dish as 600 calories. The control group received a menu which presented no calorie information for the salad or the pasta. Results showed that the only participants more likely to choose the salad dish were restrained eaters in the first experimental group, with all other eaters being more likely to choose the pasta dish. When evaluating total calorie intake, those in the control group who chose pasta ate more than those who chose salad, but the amount of calories consumed in the two experimental groups did not differ regardless of what was ordered. When analyzing consumption among those who ordered salad, participants in the control group consumed more salad than those in the second experimental group.

The second study conducted by Girz et al. (2012) was designed to address limitations of the first study. One limitation in the first study was its inclusion of only women, which limited its generalizability. Another limitation was not including a statement regarding daily calorie recommendations, which may have provided a better context to participants regarding how many calories were present in the meal ordered in relation to the total amount of calories an individual should consume each day. Therefore, the second study included 138 female, and 116 male undergraduate students, and menus included a reference statement recommending that females should consume 2000 calories daily and males should consume 2400 calories daily. All other study designs were identical except the presentation of calorie information for the low-calorie dish was changed from 600 calories to 400 calories to better illustrate the low calorie option and a third experimental group was also included, which presented accurate calorie information for each dish (1200 calories for pasta and 1200 calories for pasta). Results were similar to the first study, revealing that female restrained eaters in the first

experimental group were the only participants who chose more salad that pasta. Participants in the third experimental group were 4.94 times more likely to choose the pasta rather than the salad. Analysis of calories consumed revealed that there was no difference found between men or between women when presented with calorie labels or not.

Calorie Labeling in Real World Studies

Before the federally mandated calorie labeling provision included in the Patient Protection and Affordable Care Act goes into effect, several researchers evaluated its potential impact by studying the effectiveness of regional calorie labeling laws. One such study collected information from participants both before and after the New York City calorie labeling law took effect on July 19, 2008 (Elbel et al. 2009). This study collected surveys and receipts from customers shopping at the four largest fast-food chains in New York City, and compared them with control data from the same chains in Newark, New Jersey. Using the same methodologies regarding times, compensation rates, survey instruments etc., these researchers collected data from the same fast-food locations in both cities two weeks before and four weeks after the calorie labeling was implemented in New York City. The study's findings indicated that New York City residents reported becoming much more aware of newly posted calorie information, with over 27% of respondents saying they used the new calorie information to influence their buying choices. Among participants who reported using calorie information, 88% of the sample reported they used the calorie information to purchase fewer calories. However, after analysis of actual receipt purchases both before and after implementation of the calorie

labeling law, it was determined that New York City residents actually purchased an average of 21 additional calories per meal after calorie labeling took effect.

Another large study in New York City also compared consumer purchasing behavior both before and after the calorie labeling took effect (Dumanovsky et al., 2011). One hundred sixty eight fast-food restaurants were included in data analysis from the top 11 fast-food chains in New York City. There were 7309 adult customers surveyed in 2007, and 8489 in 2009. The full sample showed no change in the number of calories purchased. However, among three of the restaurant chains measured (McDonalds, Au Bon Pain, and KFC), significant reductions in calories purchased were seen. Interestingly, one restaurant chain (Subway) showed significant increases in calories purchased post-legislation. However, researchers in this study speculated that the increase in calories purchased at Subway may have been due to the introduction of their "$5 foot-long" promotion which began in 2008. When analyzing results from participants included in the 2009 sample, 15% reported using calorie labeling. Those who reported using calorie labels in the 2009 sample purchased an average 106 fewer calories compared to participants from the full 2007 sample.

A study conducted in Pierce County, Washington collected data both before and after a pilot calorie labeling program took effect (Pulos et al., 2010). The study was conducted from January 2007 to December 2008, and analyzed sales data and surveys from six full-service restaurants who volunteered to participate in the study. Approximately 16,000 entrées were purchased and analyzed in 30 days before and after calorie labeling took effect. Analyzing sales data for the entire sample showed there was an average of 15 fewer calories per entrée purchased after calorie labeling took effect.

Survey data indicated that 20% of the sample reported that they used calorie labels to purchase fewer calories. Researchers calculated that the 20% of the sample who reported using calorie labels would need to have consumed an average of 75 fewer calories per entrée to be responsible for the mean 15 calorie reduction per entrée seen among the entire sample.

A study conducted in King County, Washington evaluated the number of calories purchased by patrons by comparing sales data both before and after the implementation of a calorie labeling law which required restaurants to disclose calorie information no later than January 1, 2009 (Finkelstein et al. 2011). Instead of relying on customers surveys, researchers collected sales data directly from a large northwest restaurant chain (Taco Time) from January 2008 to January 2010. Results showed that there was no significant difference in the amount of calories purchased over the analyzed timeframe for any of the restaurants included in the study.

Another study in King County, Washington also analyzed the effect of calorie labeling on food and beverage purchases at two Starbucks locations in Seattle, Washington both before and after the calorie labeling law was implemented (Bollinger, Leslie, & Sorensen, 2010). Surveys were collected from these experimental locations along with data collected from control Starbucks locations in San Francisco, California (Starbucks without calorie labeling information) during the same times. A total of 792 surveys were completed and results indicated that there was a 6% decrease in the amount of calories purchased by patrons who purchased items from the Seattle, Washington locations. This effect was almost entirely attributable to reductions in the amount of

calories purchased from foods, with almost no change witnessed in the amount of calories purchased from beverages.

One study specifically examined the effects of calorie labels on beverage purchases among low-income black adolescents (Bleich, Herring, Flagg, & Gary-Webb., 2012). Sales data were collected from four convenience stores in Baltimore City, Maryland both before and after the temporary implementation of calorie labels. This study also analyzed the effects of three different types of randomly posted calorie labels: 1 - providing an absolute calorie count, 2 - providing a percentage of total recommended daily caloric intake, 3 - providing a physical activity equivalent (number of minutes spent jogging to burn the calories contained in the beverage). Results indicated that the amount of sugar sweetened beverages were lower among those who received relative calorie information (calorie label types 2 and 3) compared to those who received absolute calorie information (calorie label type 1). Results also indicated that providing the physical activity equivalent information was the most effective way of reducing the amount of sugar sweetened beverages purchased. Also noteworthy was the significant increase in the number of bottled water purchases after any kind of calorie information had been posted.

Self-Perception of Health

There is some evidence to suggest that self-perception of health is an indicator of health outcomes and behaviors (Nielsen & Krasnik, 2009). Results from the Kuopio Ischaemic Heart Disease Risk Factor Study indicated that there were statistically significant associations between the level of perceived health and all-cause mortality (Kaplan et al., 1996). Results from this study also showed significant associations

between perceived health and several disease indicators. Self-perception of health has also consistently been associated with a person's likelihood of utilizing various healthcare services (Fylkesnes, 2003). While these findings indicate that self-perception of health is linked with health outcomes and the likelihood of performing healthy behaviors, no prior studies have investigated the potential association of self-perception of health with the likelihood of noticing or using calorie labels.

Self-Perception of Diet

A small amount of research indicates that self-perception of diet is also associated with healthy behaviors. One study conducted in France between 2007 and 2008 found participants who perceived their diets to be unhealthy were more likely consume low quantities of fruits and vegetables (Bihan et al. 2010). Another study conducted in Finland collected surveys from 666 Finnish adults also found that self-perception of diet was significantly associated with total fruit and vegetable intake (Lallukka et al., 2001). A study that collected questionnaires from 10,249 Norwegian women aged 45-69 years indicated that women who had a better perception of their diet were more likely to try to lose weight (Hjartaker et al., 2001). Clearly, more research is necessary to better understand possible associations between self-perception of diet and other health behaviors. Also, no prior research has been conducted to determine if there is a relationship between self-perception of diet and awareness or use of calorie labels.

Knowledge of Calorie Requirements

There have been several studies to indicate that many people are unaware of the daily calorie recommendations for adults. For example, one study that sampled a total of 965 adult participants found that 33% were unable to identify the correct number of

calories an average healthy adults needs each day (based upon the liberal correct response being between 1,500 and 2,500 calories per day) (Krukowski et al. 2006). Another study involving 349 children and adolescents found that only about one quarter of participants provided a correct response (between 1500 and 2500 calories per day) when asked how many calories an adult should consume to maintain a normal weight (Elbel, Gyamfi, & Kersh, 2011). There is also a small body of evidence to indicate that by providing daily calorie recommendations, participants are more likely to purchase fewer total calories (Roberto et al., 2010, Girz et al., 2012). These preliminary studies indicate that while knowledge of calorie requirements are still unknown by many people, when calorie requirement information is provided to participants, it may play an important role in helping participants to decide which items to purchase. More research is required to confirm these conclusions.

Health Behaviors: Smoking, Physical Activity, Fruit and Vegetable Consumption

Smoking, physical inactivity, and poor diet are major contributors to chronic disease. For example, smoking has been associated with poor health outcomes including respiratory disease, cardiovascular disease, cancer, negative reproductive effects, poor post-surgical outcomes, and low bone density (Duaso & Duncan, 2012). Padrao et al. (2007) analyzed surveys collected from 38,225 Portuguese men and women to study how smoking is associated with fruit and vegetable intake. Results indicated that fruit and vegetable intake decreased progressively lower as the frequency of smoking increased. Low levels of physical activity have been associated with many unfavorable health outcomes including early mortality, coronary heart disease, stroke, cancer, type 2 diabetes, osteoporosis, depression, hypercholesterolemia, hypertension, and myocardial

infarction (Physical Activity Guidelines Advisory Committee, 2008). Evidence also indicates that there is a strong association between increased fruit and vegetable intake and decreased risks of cancer, heart disease, and stroke along with emerging evidence indicating lower risks for chronic obstructive pulmonary disease, cataracts, diverticulosis, and hypertension (Van Duyn & Pivonka, 2000). Although these previous studies showed clear associations between these health behaviors (smoking, physical activity, fruit and vegetable consumption) and various health outcomes, no previous studies have explored the association between these health behaviors and the likelihood of noticing or using calorie labels.

Summary of Previous Research and Identified Gaps

Overall, current research regarding the effectiveness of calorie labeling has provided mixed results. Some of the aforementioned studies have indicated that calorie labeling is a useful tool that restaurant patrons use to reduce the total amount of calories purchased, while others indicated that calorie labeling usage has no effect, or may actually increase total calories purchased. Other studies have indicated that only certain groups of people (women and dieters) are likely change their purchasing habits when exposed to calorie labels. Some prior research has indicated that variables such as self-perception of health, self-perception of diet, knowledge of calorie requirements, smoking, physical activity, and fruit and vegetable intake are associated with favorable health outcomes, or other healthy behaviors. However, no prior research has been conducted in order to determine if any of these variables are associated with the likelihood of noticing or using calorie labels, or total calories purchased.

CHAPTER 3

METHODS

Restaurant Sampling

This cross-sectional study provided data from participants who purchased food and/or beverages from McDonald's establishments located in the Greater Phoenix Metropolitan Area. The restaurant locator on McDonald's website was used to compile a complete list of all 160 McDonald's located within a 20 mile radius of downtown Phoenix. In order to select only free-standing, dine-in locations, all McDonald's located in department stores, gas stations, shopping malls, and drive through only locations were eliminated, leaving a total of 123 locations in the sampling frame. This study was conducted in association with a companion study that investigated the role of restaurant patron demographics (including home zip code) on awareness and use of calorie menu labeling. In order to get a representative sample of McDonald's from low-income and high-income areas, only locations that met income guidelines based upon 2010 Census economic data were allowed into the low-income and high-income sample pools. Eight McDonald's locations were randomly selected from twenty two locations within low-income zip codes with average household incomes no greater than 185% of the poverty line for a family of four ($42,643), and eight McDonald's were randomly selected from nine possible locations within high-income zip codes with average household incomes above $80,000. The original methodology included plans to collect 20 surveys from each of the 16 chosen locations. After management refused to allow data collection from one of the high income zip codes, it was replaced with the final high income location. Later, due to refusal from management at another high-income McDonald's location to allow

for the collection of data from their restaurant, along with mounting difficulty in collecting sufficient data from other locations, the research methodology had to be modified to allow for the inclusion of more locations. Twelve new locations were included in the high-income sample pool by adding locations with zip codes which had average household incomes above $70,000. Six additional locations were randomly chosen from these twelve new high-income locations and six more locations were randomly chosen from the remaining fourteen low-income zip codes. Of the twenty nine randomly chosen locations, one was excluded because management asked the researcher to leave before any surveys could be collected, and another because it was deemed unsafe, leaving a total of 27 locations from which data were collected. In order to get a representative sample of different times of the day as well as days of the week, surveys were administered during both lunchtime (11am – 2pm) and dinnertime (5pm – 8pm) on both weekdays (Monday – Thursday) and weekends (Saturdays). This study was approved by the Arizona State University Institutional Review Board.

Participants

Surveys and register receipts were collected at 27 separate McDonald's locations from a total of 330 participants from February 2013 through April 2013. Overall, 1159 McDonald's patrons were offered the opportunity to participate in the study, yielding a response rate of 28.5%. Elbel et al., (2009) and Bassett et al., (2007) reported a higher response rate of approximately 55%. Data presented in three previously conducted studies were used for calculating the necessary sample size for this study (Roberto et al., 2010, Elbel et al., 2009, and Harnack et al., 2008). The following assumptions were used for deriving the sample size for the present study: 1 - Standard deviations reported in the

three aforementioned studies (937.29, 334, 439.1), 2 - 80% power to detect a 100 calorie reduction in calories purchased, 3 - a two-sided 0.05 significance level. Based on these assumptions it was calculated that a minimum of 312 participants would be required for this study.

Data Collection

Using street intercept surveys, researchers administered surveys outside of each McDonald's location. Researchers approached all customers who appeared to meet the inclusion criteria of being at least 18 years of age and who did not appear to be McDonald's employees. In order to obtain consent, and to maintain ambiguity regarding the specific hypotheses being tested, potential participants were simply asked "Would you like to participate in a study examining the effects of fast-food consumption?" Customers were excluded from the study if they were under the age of 18, were McDonald's employees, didn't speak English, didn't purchase a food or beverage item for their consumption, or were unable provide a receipt of their current transaction. Also, when two more eligible participants arrived as part of the same group and more than one patron expressed interest in participating in the study, only the first volunteer or the patron with next closest birthday was invited to participate. Researchers confirmed the eligibility of participants and informed them of specific instructions outside of each McDonald's location prior to the patron purchasing their food and/or beverage items. Eligible participants were informed that if they desired to participate, they would be required to enter the restaurant, purchase food and/or beverages as they had planned, save their receipt, provide their receipt to the researcher upon exiting the restaurant, and complete a five minute survey. Consenting participants were then asked that if they were

making purchases for other people, to conduct more than one transaction, only including the items which they purchased for themselves on a separate receipt. Participants then entered the restaurant and purchased their food and/or beverage items. After participants had exited the restaurant, provided their receipt, indicated which items on the receipt they purchased for themselves, and completed the survey, they were given $5 in cash as a token of appreciation for their participation in the survey.

Data Entry

Survey data was collected using tablet computers which connected wirelessly to the internet via either Wi-Fi connectivity provided at most McDonald's locations, or a mobile hotspot device. The survey was created with original questions, questions from previous research studies (Elbel et al., 2009; Dumanovsky et al., 2011), and questions from validated surveys (Behavioral Risk Factor Surveillance System Questionnaire, 2012; Youth Risk Behavior Survey, 2011). The survey was built as an online survey using Qualtrics, a web-based tool. Researchers implemented the survey in an interview format using the tablet device for entering responses. Each time a participant consented to participate in the study, a blank survey was accessed through the online Qualtrics system. Survey questions were set up using appropriate logic such that participants were asked only applicable questions. Qualtrics also allowed for data to be seamlessly downloaded into the statistical analysis software, minimizing the potential for human error when transferring data. In the rare absence of an adequate internet connection, paper surveys were initially used to collect participant responses, but then manually transferred to an online Qualtrics survey at a later time.

Measures

Explanatory Variables

Self-perception of Health

Participants were asked, "Would you say your health is…", and responses were captured on a 5-point Likert Scale with answers ranging from "Excellent" to "Poor". The responses "Excellent", "Very Good", and "Good" were coded as 1 – (In Good Health). The responses "Fair" and "Poor" were coded as 0 – (Not in Good Health).

Self-perception of Diet

Participants were presented with the question: "Do you agree or disagree with the following statement: In general, I eat healthy." Responses were captured on a 4-point Likert Scale with answers ranging from "Strongly agree" to "Strongly disagree". Responses "Strongly Agree" and "Somewhat Agree" were coded as 1 – (Good Diet). The responses "Strongly Disagree" and "Somewhat Disagree" were coded as 0 - (Not Good Diet).

Fruit and Vegetable Intake

Participants were asked "On average, how many servings of fruits and vegetables do you consume each day?" This question was designed as a continuous variable so participants were able to respond with any positive integer. Responses greater than or equal to five were coded as 1 – (Meets Recommendations). Responses less than five were coded as 0 – (Does not Meet Recommendations).

Smoking

Participants were asked "Do you currently smoke or chew tobacco?" The responses "Yes" or "No" were the only acceptable valid answers. Respondents who

answered “Yes” were coded as 1 – (Smokers). Respondents who answered “No” were coded as 0 – (Non-Smokers).

Physical Activity

Participants were asked “In the last seven days, how many days were you physically active at work and at home for a total of at least thirty minutes doing activities that made you breathe hard?” This question was designed as a continuous variable so participants were able to respond with any positive integer ranging from zero to seven. Responses ranging from zero to four were coded as 0 – (Does not Meet Recommendations). Responses ranging from five to seven were coded as 1 – (Meets Recommendations).

Knowledge of Calorie Requirements

Participants were presented with the question, “What do you think is the recommended daily calorie intake for an average American?” This question was designed as a continuous variable, so participants were able respond with any positive integer. Responses ranging from 1600 to 2800 were coded as 1 – (Correct Response). All other responses were coded as 0 – (Incorrect Response).

Outcome Variables

Notice Calorie Label before Ordering

Participants were asked “Did you notice any calorie information listed for menu items at the restaurant today?” The four potential responses were “Yes, prior to placing my order,” “Yes, after placing my order,” “I saw it during a previous visit,” and “No, I did not notice any calorie information.” Responses “Yes, prior to placing my order,” and “I saw it during a previous visit” were coded as a “Yes.” The responses “Yes, after

placing my order," and "No, I did not notice any calorie information" were coded as a "No".

Use Calorie Label for Food / Beverage Purchase

*P*articipants who responded that they did notice calorie information before ordering were asked two questions to determine if they used the calorie information. The first question was "Did the calorie information affect your beverage purchase today?" The second question was "Did the calorie information affect your food purchase today?" For both questions, responses were captured using "Yes" or "No" as the only valid answers.

Total calories purchased

Each participant's itemized receipt was analyzed to determine the exact number of calories purchased based upon calorie information provided on McDonald's website. In the rare event that a participant indicated that they purchased an item with the intent of sharing it, the number of calories in the item was divided by the number of individuals the participant was planning to share it with.

Statistical Analysis

Data was analyzed using SPSS 20.0 Statistical Analysis software. Frequencies and crosstabs were used to describe the data. Bivariate analysis was used to find possible associations between explanatory variables and outcome variables. Bivariate analysis was conducted using chi-square tests when comparing categorical explanatory variables (self-perception of health, self-perception of diet, fruit and vegetable intake, smoking, and physical activity level) with categorical outcome variables (notice calorie label before ordering and or use calorie label for food or beverage purchase). Bivariate

analysis of interval data was conducted using independent t-tests to compare the continuous outcome variable (total calories purchased) with other dichotomous explanatory variables. Multivariate analysis was used to find possible associations between outcome variables and explanatory variables after controlling for effects of confounding variables (income, gender, has children, race / ethnicity, education, age, total price paid). Multivariate logistic regression analysis was used to find associations between categorical explanatory and outcome variables. Multivariate ordinary least squares regression was used to find potential associations between the continuous outcome variable (total calories purchased) and explanatory variables.

CHAPTER 4

RESULTS

Data was collected from a total of 27 restaurants, 14 of which were low income locations (Table 1). There were a total of 330 participants who were recruited for this study and 196 of them were recruited from low income locations.

Table 1: Description of participant recruitment from low-income and high income restaurant locations

	Restaurant Collection Sites [a]	Participants Recruited	Participant Recruitment Range	Mean number of participants
Low Income	14	196	1 - 22	14.0
High Income	13	134	2 - 20	10.3
Total	27	330	1 - 22	12.2

a – Two of the 29 randomly chosen collection sites were excluded because no data was collected from them.

The self-reported demographic characteristics of the study sample are summarized in Table 2. Data collected from participants indicated that the majority of the sample was male (63.6%), and more than half of the participants (54.3%) identified themselves as being Non-Hispanic White. Participants who identified themselves as Hispanic made up 26.7% of the sample, and 11.7% of the sample identified themselves as Non-Hispanic Black. A small portion of the sample identified themselves as Asian (2.8%), and the "Other" race category comprised the remaining 4.3% of the sample. Over one quarter of the sample (25.5%) was aged 18-25, 20.6% of the sample was aged 26-35, 19.1% of the sample was aged 36-49, 23.3% of the sample was aged 50-64, and the remaining 11.5% of the sample was aged 65 or older. BMI calculations derived from self-reported height and weight measurements indicated that the largest portion of the sample (42.1%) was of normal weight, while 33.0% were overweight, and 22.4% were obese. Only 1.8% of the sample was classified as underweight based on self-reported

heights and weights data. The majority of the sample (50.6%) reported annual household incomes less than $50,000, while 39.1% of the sample reported an annual income between and $50,000 and $99,999, and the remaining 15.5% reported an annual income of $100,000 or more. More than one third of the sample (35.2%) had a high school or less education, while the largest portion of the sample reported "some college" education (39.1%), and the remaining 24.8% of the sample had a Bachelor's degree or higher.

Table 2: Demographic characteristics of the study sample

	n=330[a]	%[b]
Gender		
Male	210	63.6%
Female	120	36.4%
Age		
18-25 years old	84	25.5%
26-35 years old	68	20.6%
36-49 years old	63	19.1%
50-64 years old	77	23.3%
65 years or older	38	11.5%
Race / Ethnicity		
Hispanic	88	26.7%
Non-Hispanic Black	38	11.7%
Non-Hispanic White	177	54.3%
Asian	9	2.8%
Other	14	4.3%
Body Mass Index		
≤ 18.5	6	1.8%
18.5 – 24.9	139	42.1%
25 - 29.9	109	33.0%
≥ 30	74	22.4%
Income		
Under $20,000	70	21.2%
$20,000 to $49,999	97	29.4%
$50,000 to $74,999	61	18.5%
$75,000 - $99,999	40	12.1%
$100,000 and above	51	15.5%
Education		
High School or Less	116	35.2%
Some College[c]	129	39.1%
College Degree or Higher	82	24.8%

a Sample size in each cell may not add up to 330 due to missing values.
b Some percentages may not equal 100 due to rounding
c Includes trade schools and associates degrees

Table 3 presents the results describing participant self-perception of health and diet, self-reported health behaviors, and knowledge of calorie requirements. The vast majority of the 330 participants (81.8%) perceived themselves as being in good health, and 63.6% of participants also reported that they perceived that they had a good diet. More than half of the participants (53.3%) correctly identified how many calories an average American should consume each day (categorizing any response between 1600 to 2600 calories as correct). Most participants (86.7%) reported not meeting the government's recommendation of consuming at least five servings of fruits and vegetables daily, and 71.2% of participants reported being non-smokers. Just over half of participants (52.4%) reported meeting the government's recommendation of 150 minutes of moderate physical activity each week.

Table 3: Frequencies of perception of health and diet, self-reported health behaviors, and knowledge of calorie requirements

	n=330[a]	%[b]
Self-Perception of Health and Diet		
Self-perception of health		
In Good Health	270	81.8%
Not in Good Health	60	18.2%
Self-perception of Diet		
Good Diet	209	63.3%
Not Good Diet	121	36.7%
Self-Reported Health Behaviors		
Fruit and Vegetable Intake [d]		
Meets Recommendations	41	12.4%
Does not Meet Recommendations	286	86.7%
Smoking		
Smokers	94	28.5%
Non-smokers	235	71.2%
Physical Activity [e]		
Meets Recommendations	156	47.3%
Does not Meet Recommendations	173	52.4%
Knowledge of Calorie Requirements [c]		
Correct Response	154	46.7%
Incorrect Response	176	53.3%

a Sample size in each cell may not add up to 330 due to missing values.
b Some percentages may not equal 100% due to rounding
c Correct calorie requirement response based upon USDA recommendations ranging from sedentary males aged 19-20 to sedentary females aged 65 or older
d Participants met adequate fruit and vegetable intake requirements if they reported consuming five or more servings per day
e Participants met physical activity recommendations by reporting at least 30 minutes of moderate physical activity for at least five of the last seven days

More than half (57.3%) of all the study participants reported noticing a calorie label before placing their order at the fast-food restaurant (Table 4). However, only 53 study participants (28.0% of those who reported noticing calorie labels; 16.1% of the total sample) reported using a calorie label to assist them in purchasing food or beverage items. A slightly higher percentage of participants (12.7%) reported using a calorie label to purchase food items compared to those who reported using a calorie label to purchase a beverage item (7.0%).

Table 4: Frequencies of categorical outcome variables: notice calorie label before ordering, use calorie label for food purchase, use calorie label for beverage purchase, and use calorie label for food or beverage purchase

	n=330	%
Notice Calorie Label Before Ordering		
Noticed Calorie Information	189	57.3%
Did not Notice Calorie Information	141	42.7%
Use Calorie Label for Food Purchase		
Used Calorie Label For Food Purchase	42	12.7%
Did Not Use Calorie Label for Food Purchase [a]	249	75.5%
Did Not Purchase Food Item	39	11.8%
Use Calorie Label for Beverage Purchase		
Used Calorie Label For Beverage Purchase	23	7.0%
Did Not Use Calorie Label for Beverage Purchase [a]	200	60.6%
Did Not Purchase Beverage Item	107	32.4%
Use Calorie Label for Food or Beverage Purchase		
Used Calorie Label for Food or Beverage Purchase	53	16.1%
Did Not Use Calorie Label for Food or Beverage Purchase [a]	277	83.9%
Use Calorie Label for Food or Beverage Purchase Among Those Who Reported Noticing Calorie Label		
Used Calorie Label for Food or Beverage Purchase	53	28.0%
Did Not Use Calorie Label for Food or Beverage Purchase	136	72.0%

a Includes participants who did not report noticing calorie label

Table 5 shows the mean number of total calories, total entrée calories, total side calories, total food calories, and total beverage calories purchased along with the range and standard deviation of each. The total number of mean calories purchased by study participants ranged from 0 to 2240, with the mean calorie purchase being 784 calories per participant (SD=453).

Table 5: Ranges, means, and standard deviations of total calories, total entrée calories, total side calories, total food calories, and total beverage calories purchased by study participants

	Minimum Calories Purchased	Maximum Calories Purchased	Mean Calories Purchased	Standard Deviation of Calories Purchased
Total Calories	0	2240	784	453
Total Entrée Calories	190	1930	565	258
Total Side Calories	30	810	361	136
Total Food Calories	30	1930	721	364
Total Beverage Calories	0	870	219	158

Bivariate Analysis

The bivariate associations between noticing a calorie label before ordering and self-perception of health and diet, reported health behaviors, and knowledge of calorie requirements are outlined in Table 6. Participants who perceived themselves as being in good health were significantly more likely to notice a calorie label before ordering ($p=0.043$). Those participants who correctly identified an average American's daily calorie requirements were also significantly more likely to notice a calorie label before ordering ($p=0.005$). No other associations were statistically significant, but there was an overall trend that more participants noticed a label if they reported practicing a healthy behavior (with the exception of meeting physical activity requirements), or reported having a higher self-perception of diet.

Table 6: Bivariate associations between noticing a calorie label before ordering and self-perception of health and diet, reported health behaviors, and knowledge of calorie requirements.

	Total Sample[a] n = 330	Notice Calorie Label Before n (%)		*p* value[b,c,d]
		No n = 141	Yes n = 189	
Self-Perception of Health and Diet				
Self-Perception of Health				
Not in Good Health	60	33 (55.0%)	27 (45.0%)	0.043*
In Good Health	270	108 (40.0%)	162 (60.0%)	
Self-Perception of Diet				
Not Good Diet	121	58 (47.9%)	63 (52.1%)	0.166
Good Diet	209	83 (39.7%)	126 (60.3%)	
Self-Reported Health Behaviors				
Fruit and Vegetable Intake				
Does not Meet Recommendations	286	125 (43.7%)	161 (56.3%)	0.405
Meets Recommendations	41	15 (36.6%)	26 (63.4%)	
Smoking				
Smokers	94	45 (47.9%)	49 (52.1%)	0.268
Non-Smokers	235	96 (40.9%)	139 (59.1%)	
Physical Activity				
Does not Meet Recommendations	173	72 (41.6%)	101 (58.4%)	0.657
Meets Recommendations	156	69 (44.2%)	87 (55.8%)	
Knowledge of Calorie Requirements				
Incorrect Response	176	88 (50.0%)	88 (50.0%)	0.005*
Correct Response	154	53 (34.4%)	101 (65.6%)	

a Sample size in each cell may not add up to 330 due to missing values.
b Significance is determined at the 0.05 level (2-tailed).
c P value = difference between patrons who notice menu labels before vs. those who do not
d Statistical analysis performed using chi-square test for independence crosstabulation tables.
* p= less than 0.05

Table 7 summarizes the results of bivariate associations between those who reported using a calorie label to purchase a food or beverage item with each explanatory variable. Associations between using a calorie label for food or beverage purchases and two explanatory variables, self-perception of health and self-perception of diet, approached significance (p=0.081, p=0.061). There was also an overall trend that more participants used a calorie label if they reported practicing a healthy behavior or had knowledge of calorie requirements, but none of these trends was statistically significant.

Table 7: Bivariate associations between using a calorie label for a food or beverage purchase and self-perception of health and diet, and health behaviors

	Total Sample[a] n = 330	Use Calorie Label for Food or Beverage Purchase n (% of each explanatory variable)		*p* value[b,c,d,e]
		No n = 277	Yes n = 53	
Self-Perception of Health and Diet				
Self-Perception of Health				
Not in Good Health	60	55 (91.7%)	5 (8.3%)	0.081
In Good Health	270	222 (82.2%)	48 (17.8%)	
Self-Perception of Diet				
Not Good Diet	121	108 (89.3%)	13 (10.7%)	0.061
Good Diet	209	169 (80.9%)	40 (19.1%)	
Self-Reported Health Behaviors				
Fruit and Vegetable Intake				
Does not Meet Recommendations	286	242 (84.6%)	44 (15.4%)	0.496
Meets Recommendations	41	33 (80.5%)	8 (19.5%)	
Smoking				
Smokers	94	83 (88.3%)	11 (11.7%)	0.242
Non-Smokers	235	194 (82.6%)	41 (17.4%)	
Physical Activity				
Does not Meet Recommendations	173	149 (86.1%)	24 (13.9%)	0.364
Meets Recommendations	156	128 (82.1%)	28 (17.9%)	
Knowledge of Calorie Requirements				
Incorrect Response	176	153 (86.9%)	23 (13.1%)	0.133
Correct Response	154	124 (80.5%)	30 (19.5%)	

a Sample size in each cell may not add up to 330 due to missing values.
b Significance is determined at the 0.05 level (2-tailed).
c P value = difference between patrons who use calorie labels for food or beverage purchase vs. those who do not
d Statistical analysis performed using chi-square test for independence crosstabulation tables.

Bivariate associations between the mean number of calories purchased and the likelihood of noticing a calorie label, using a calorie label, self-perception of health and diet, reported health behaviors, and knowledge of calorie requirements have been summarized in Table 8. T-tests revealed no significant associations between the likelihood of noticing calorie labels before ordering, self-perception of health, smoking, physical activity, and knowledge of calorie requirements with total calories purchased.

However, a significant association was found between total calories purchased and using a calorie label (p=0.010), with participants who reported using calorie labels buying an average of 173 fewer calories compared to those who did not report using calorie labels. Also, those who reported having a good diet purchased an average of 111 fewer calories than those who reported not having a good diet (p=0.029), and those who reported meeting fruit and vegetable intake requirements purchased an average of 167 fewer calories than participants who did not report meeting fruit and vegetable requirements (p=0.024).

Table 8: Bivariate associations between participant calorie label awareness and use, self-perception of health and diet, and health related behaviors, and total calories purchased at fast-food restaurants

Explanatory Variables	Total Mean Calories Purchased	Std. Deviation of Calories Purchased	Std. Error Mean	*p* value[b]
Notice Calorie Label				
No (n=140)	780	455	38	0.981
Yes (n=189)	779	442	32	
Use Calorie Label				
No (n=276)	807	445	27	0.010*
Yes (n=53)	634	432	59	
Self-Perception of Health and Diet				
Self-Perception of Health				
Not In Good Health (n=59)	783	457	59	0.948
In Good Health (n=270)	779	445	27	
Self-Perception of Diet				
Not Good Diet (n=120)	850	472	43	0.029*
Good Diet (n=209)	739	428	30	
Self-Reported Health Behaviors				
Fruit and Vegetable Intake				
Does not Meet Recommendations (n=285)	799	447	26	0.024*
Meets Recommendations (n=41)	632	409	64	
Smoking				
Non-Smokers (n=235)	784	451	29	0.807
Smokers (n=93)	771	437	45	
Physical Activity (PA)				
Does not Meet PA Recommendations (n=173)	816	438	33	0.126
Meets PA Recommendations (n=155)	741	454	36	
Knowledge of Calorie Requirements				
Incorrect Response (n=175)	788	435	33	0.722
Correct Response (n=154)	770	461	37	

a Sample size in each cell may not add up to 330 due to missing values.
b Significance is determined at the 0.05 level (2-tailed).

Multivariate Analysis

Table 9 shows the results from a multivariate logistic regression analysis performed to determine which variables were associated with the likelihood of noticing a calorie label before ordering, controlling for self-perception of health and diet, self-reported health behaviors, knowledge of calorie requirements and other covariates

(income, gender, has children, race/ethnicity, education, age). No significant associations were found between self-perception of health, self-perception of diet, any of the self-reported health behaviors (non-smoking was marginally significant, $p = 0.093$), or knowledge of calorie requirements and the likelihood of noticing a calorie label before ordering. The only covariate to show an association with the likelihood of noticing a calorie label before ordering was among participants who reported higher household incomes. Participants who reported annual household incomes greater than or equal to $50,000 had nearly two times the odds of noticing calorie labels compared to participants who reported annual household incomes less than $50,000 ($p<0.048$, OR = 1.74, 95% CI: 1.00 to 3.01).

Table 9: Results of multivariate logistic regression assessing the associations between noticing a calorie label before ordering and self-perception of health and diet, reported health behaviors, knowledge of calorie requirements, and demographic variables

	Notice Calorie Label Before Food Or Drink Purchase (n=290)	
Predictors	**OR (95% CI)[a]**	**p value**
Self-Perception of Health and Diet		
Self-Perception of Health		
Not In Good Health (ref)		0.265
In Good Health	1.47 (0.75 to 2.89)	
Self-Perception of Diet		
Not Good Diet (ref)		0.608
Good Diet	1.16 (0.67 to 2.00)	
Self-Reported Health Behaviors		
Fruit and Vegetable Intake		
Does not Meet Recommendations (ref)		0.821
Meets Recommendations	1.09 (0.51 to 2.36)	
Smoking		
Smokers (Ref)		0.093
Non-Smokers	1.64 (0.92 to 2.93)	
Physical Activity		
Does not Meet Recommendations (ref)		0.355
Meets Recommendations	0.78 (0.47 to 1.32)	
Calorie Knowledge		
Incorrect Response (ref)		0.105
Correct Response	1.54 (0.91 to 2.61)	
Income		
Household Income < $50,000 (ref)		0.048*
Household Income ≥ $50,000	1.74 (1.00 to 3.01)	
Gender		
Male (ref)		0.462
Female	1.22 (0.72 to 2.07)	
Has Children		
No (ref)		0.510
Yes	1.24 (0.66 to 2.32)	
Race / Ethnicity [a]		
White non-Hispanic (ref)		
Hispanic	0.59 (0.31 to 1.15)	0.120
Non-Hispanic Black	0.94 (0.43 to 2.05)	0.866
Education		
High School or Less (ref)		
Some College	0.73 (0.40 to 1.33)	0.308
College Degree or Higher	0.99 (0.45 to 2.17)	0.970
Age		
Aged 18-25 (ref)		
Aged 26 – 35	1.05 (0.47 to 2.31)	0.911
Aged 36 – 49	0.93 (0.38 to 2.28)	0.876
Aged 50 – 64	1.06 (0.43 to 2.65)	0.895
Aged 65 or older	0.46 (0.16 to 1.33)	0.151

* p= less than 0.05

a - Asians and "Other" race were omitted from analysis due to small cell counts

b – The odds ratios represented here are from regression analyses that controlled for all predictors included in the table

Table 10 shows the results from a multivariate logistic regression analysis which was performed to determine which variables were associated with the likelihood of using a calorie label to purchase a food or beverage item, while controlling for self-perception of health and diet, self-reported health behaviors, knowledge of calorie requirements and other covariates (income, gender, has children, race/ethnicity, education, age). No associations were found between self-perception of health, self-perception of diet, or any of the health behaviors and the likelihood of using a calorie label for a food or beverage purchase. Although self-perception of health and self-perception of diet approach significance in bivariate analysis, after controlling for other covariates, the correlations disappeared (p=0.544, p=0.598). However, two of the covariates analyzed did show statically significant associations with the likelihood of using a calorie label for a food or beverage purchase. Compared to participants with annual household incomes below $50,000 per year, participants with annual household incomes greater than or equal to $50,000 per year had three times the odds of using a calorie label to purchase a food or beverage item (p=0.008, OR = 3.08, 95% CI: 1.34 to 7.06). Also, adults aged 36-49 were also found to have less odds of using a calorie label to purchase food or beverage items compared to the reference group aged 18-25, (p=0.047, OR = 0.18, 95% CI: 0.03 to 0.98). Having a college degree or higher was also marginally associated with using a calorie label for a food or beverage purchase, compared to the reference group of those with a high school or less education (p=0.080).

Table 10: Results of multivariate logistic regression assessing the associations between use of a calorie label for a food or beverage purchase and self-perception of health and diet, reported health behaviors, knowledge of calorie requirements, and demographic variables

	Used Calorie Label for Food or Beverage Purchase (n=290)	
Predictors	**OR (95% CI)**	**p value**
Self-Perception of Health and Diet		
Self-Perception of Health		
Not In Good Health (ref)		0.544
In Good Health	1.46 (0.43 to 5.00)	
Self-Perception of Diet		
Not Good Diet (ref)		0.598
Good Diet	1.26 (0.54 to 2.94)	
Self-Reported Health Behaviors		
Fruit and Vegetable Intake		
Does not Meet Recommendations (ref)		
Meets Recommendations	0.73 (0.26 to 2.05)	0.553
Smoking		
Smokers (Ref)		0.281
Non-Smokers	1.66 (0.66 to 4.19)	
Physical Activity		
Does not Meet Recommendations (ref)		0.649
Meets Recommendations	1.19 (0.56 to 2.51)	
Calorie Knowledge		
Incorrect Response (ref)		0.957
Correct Response	1.02 (0.48 to 2.17)	
Income		
Household Income < $50,000 (ref)		0.008*
Household Income ≥ $50,000	3.08 (1.34 to 7.06)	
Gender		
Male (ref)		0.104
Female	1.86 (0.88 to 3.93)	
Has Children		
No (ref)		0.269
Yes	1.67 (0.67 to 4.14)	
Race / Ethnicity [a]		
White non-Hispanic (ref)		
Hispanic	0.45 (0.16 to 1.31)	0.145
Non-Hispanic Black	0.91 (0.29 to 2.89)	0.874
Education		
High School or Less (ref)		
Some College	0.90 (0.35 to 2.35)	0.831
College Degree or Higher	2.53 (0.90 to 7.15)	0.080
Age		
Aged 18-25 (ref)		
Aged 26 – 35	1.13 (0.34 to 3.69)	0.845
Aged 36 – 49	0.18 (0.03 to 0.98)	0.047*
Aged 50 – 64	0.75 (0.20 to 2.84)	0.666
Aged 65 or older	1.36 (0.33 to 5.64)	0.673

* p= less than 0.05

a - Asians and "Other" race were omitted from analysis due to small cell counts

b – The odds ratios represented here are from regression analyses that controlled for all predictors included in the table

Table 11 shows the results from a multivariate regression analysis used to determine which variables were associated with total calories purchased. Noticing a calorie label before ordering was the primary explanatory variable of interest, while controlling for self-perception of health and diet, self-reported health behaviors, knowledge of calorie requirements and other covariates (income, gender, has children, race/ethnicity, education, age, total price paid). Total amount of money spent on meals was highly correlated ($r = 0.835$) with the total amount of calories purchased. We therefore controlled for the price paid for the meal in both regression analyses with total calories purchased as the outcome variable (Tables 11-12). The model indicates that among the covariates, gender was significantly associated with total calories purchased with women purchasing 84 fewer total calories than men ($p= 0.014$, 95% CI: -142.62 to -8.91). Participants aged 65 or older purchased 255 fewer total calories compared to the reference group aged 18-25 ($p<0.001$, 95% CI: -353.59 to -98.59). Total price paid was also highly associated with total calories purchased, indicating that for every additional dollar spent, 139 more calories were purchased. ($p<0.001$, 95% CI: 126.38 to 152.94). Noticing calorie labeling, self-perception of health, self-perception of diet, self-reported health behaviors, and knowledge of calorie requirements were not associated with the total amount of calories purchased.

Table 11: Results of multivariate ordinary least squares regression assessing the associations between total calories purchased and predictor variables with notice calorie label before ordering as the primary variable of interest

	Total Calories Purchased (n=289)	
Predictors	**B Coefficient (95% CI)**	**p value**
Notice Calorie Label Before Ordering		
Noticed Calorie Information (ref)		0.157
Did not Notice Calorie Information	-46.43 (-225.66 to -45.64)	
Self-Perception of Health and Diet		
Self-Perception of Health		
Not In Good Health (ref)		0.882
In Good Health	6.53 (-78.01 to 92.45)	
Self-Perception of Diet		
Not Good Diet (ref)		0.167
Good Diet	-48.92 (-118.30 to 18.99)	
Self-Reported Health Behaviors		
Fruit and Vegetable Intake		
Does not Meet Recommendations (ref)		0.909
Meets Recommendations	-5.58 (-106.79 to 86.09)	
Smoking		
Smokers (Ref)		0.877
Non-Smokers	5.80 (-65.17 to 80.17)	
Physical Activity		
Does not Meet Recommendations (ref)		
Meets Recommendations	-23.48 (-80.71 to 48.21)	0.479
Calorie Knowledge		
Incorrect Response (ref)		0.629
Correct Response	-16.41 (-85.81 to 45.70)	
Income		
Household Income < $50,000 (ref)		0.246
Household Income ≥ $50,000	-42.79 (-105.58 to 37.97)	
Gender		
Male (ref)		0.014*
Female	-84.84 (-142.62 to -8.91)	
Has Children		
No (ref)		0.589
Yes	-21.54 (-93.18 to 62.00)	
Race / Ethnicity [a]		
White non-Hispanic (ref)		
Hispanic	16.44 (-69.56 to 97.23)	0.702
Non-Hispanic Black	26.10 (-71.65 to 124.60)	0.605
Education		
High School or Less (ref)		
Some College	27.66 (-43.92 to 104.27)	0.469
College Degree or Higher	-52.17 (-130.04 to 63.48)	0.291
Age		
Aged 18-25 (ref)		
Aged 26 – 35	-31.48 (-127.55 to 70.42)	0.537
Aged 36 – 49	-79.38 (-207.29 to 16.76)	0.167
Aged 50 – 64	-78.48 (-192.02 to 32.92)	0.176
Aged 65 or older	-254.61 (-353.59 to -98.59)	<0.001*
Total Price Paid	139.02 (126.38 to 152.94)	<0.001*

* p= less than 0.05

a - Asians and "Other" race were omitted from analysis due to small cell counts

b – The odds ratios represented here are from regression analyses that controlled for all predictors included in the table

Table 12 shows the results from a multivariate regression analysis used to determine which variables were associated with total calories purchased. Use of a calorie label before food or beverage purchase was the primary variable of interest, while controlling for self-perception of health and diet, self-reported health behaviors, knowledge of calorie requirements and other covariates (income, gender, has children, race/ethnicity, education, age, total price paid). Results from the regression model indicate that after adjusting for covariates, there was a significant relationship between the total number of calories purchased and use of a calorie label for food or beverage purchase ($p=0.003$). Participants who reported using a calorie label for a food or beverage purchase bought an average of 136 fewer calories compared to those who did not report using a calorie label (95% CI: -225.66 to -45.64). Among the covariates, gender was significantly associated with total calories purchased with women purchasing 76 fewer total calories than men ($p=0.026$, 95% CI: -142.62 to -8.91). Participants aged 65 or older purchased 232 fewer total calories compared to the reference group aged 18-25 ($p<0.01$, 95% CI: -353.59 to -98.59). Total price paid was also highly associated with total calories purchased, indicating that for every additional dollar spent, 140 more calories were purchased. ($p<0.001$, 95% CI: 126.38 to 152.94).

Table 12: Results of multivariate ordinary least squares regression assessing the associations between total calories purchased and predictor variables with use calorie label for food or beverage purchase as the primary variable of interest

	Total Calories Purchased (n=289)	
Predictors	**B Coefficient (95% CI)**	**p value**
Use Calorie Label for Food or Beverage Purchase		
Did Not Use Label (ref)		0.003*
Did Use Label	-135.65 (-225.66 to -45.64)	
Self-Perception of Health and Diet		
Self-Perception of Health		
Not In Good Health (ref)		0.868
In Good Health	7.22 (-78.01 to 92.45)	
Self-Perception of Diet		
Not Good Diet (ref)		0.156
Good Diet	-49.66 (-118.30 to 18.99)	
Self-Reported Health Behaviors		
Fruit and Vegetable Intake		
Does not Meet Recommendations (ref)		0.806
Meets Recommendations	-11.85 (-106.79 to 86.09)	
Smoking		
Smokers (Ref)		0.839
Non-Smokers	7.50 (-65.17 to 80.17)	
Physical Activity		
Does not Meet Recommendations (ref)		0.620
Meets Recommendations	-16.25 (-80.71 to 48.21)	
Calorie Knowledge		
Incorrect Response (ref)		0.549
Correct Response	-20.06 (-85.81 to 45.70)	
Income		
Household Income < $50,000 (ref)		
Household Income ≥ $50,000	-33.80 (-105.58 to 37.97)	0.355
Gender		
Male (ref)		
Female	-75.76 (-142.62 to -8.91)	0.026*
Has Children		
No (ref)		0.693
Yes	-15.59 (-93.18 to 62.00)	
Race / Ethnicity [a]		
White non-Hispanic (ref)		
Hispanic	13.83 (-69.56 to 97.23)	0.744
Non-Hispanic Black	26.48 (-71.65 to 124.60)	0.596
Education		
High School or Less (ref)		
Some College	30.18 (-43.92 to 104.27)	0.423
College Degree or Higher	-33.28 (-130.04 to 63.48)	0.499
Age		
Aged 18-25 (ref)		
Aged 26 – 35	-28.57 (-127.55 to 70.42)	0.570
Aged 36 – 49	-96.25 (-207.29 to 16.76)	0.095
Aged 50 – 64	-79.55 (-192.02 to 32.92)	0.165
Aged 65 or older	-232.09 (-353.59 to -98.59)	0.001*
Total Price Paid	139.66 (126.38 to 152.94)	<0.001*

* p= less than 0.05

a - Asians and "Other" race were omitted from analysis due to small cell counts

b – The odds ratios represented here are from regression analyses that controlled for all predictors included in the table

CHAPTER 5

DISCUSSION

The purpose of this study was to investigate if self-perception of health, self-perception of diet, self-reported health behaviors, or knowledge of calorie requirements were associated with patrons' likelihood of noticing or using restaurant calorie labels, or the total number of calories purchased. This study also examined the relationship between the total number of calories purchased by restaurant patrons based on whether they reported noticing and using calorie labels.

Results from this study indicate that 57.3% of study participants noticed a calorie label before ordering, and of those who noticed, only 28.0% of them actually reported using the label when purchasing a food or beverage item. Elbel et al. (2009) reported very similar findings, indicating 54% of 1,156 participants noticed calorie labeling and 27.7% of those who noticed a calorie label reported that it influenced their choices. This study also revealed that 16.1% of the total sample reported that they used calorie labels. Dumanovsky et al. (2011) similarly reported that only 15.2% of 8489 participants used calorie labels. These findings indicate that calorie information is infrequently used by restaurant patrons, even among those who notice the information. It is possible that usage of menu labels may increase over time as restaurant patrons are continually exposed to calorie information. However, it is also possible that restaurant patrons are unwilling or unable to utilize calorie information to guide them when ordering food or beverage items. If the latter is true, qualitative research should be conducted in order to determine what is preventing more patrons from utilizing calorie information as well as possible interventions that may improve usage of calorie labels.

Results from bivariate analyses in our study indicated a significant association between participants' likelihood of noticing calorie labels and self-perception of health and knowledge of calorie requirements. While no statistically significant bivariate associations were observed when examining use of calorie labels, there was an overall trend where participants who reported higher self-perceptions of health or diet, reported practicing a healthy behavior, and had knowledge of calorie requirements were somewhat more likely to report using calorie labels. None of the aforementioned bivariate associations or trends remained in multivariate analysis after adjusting for the effects of confounders. Based on these findings, this study does not provide evidence to support the hypotheses that individuals who perceive themselves or their diets to be healthy, or those who report practicing healthy behaviors are more likely to notice or use calorie labels.

No association was observed during bivariate or multivariate analysis between noticing a calorie label before ordering and the total number of calories purchased. These findings suggest that simply noticing a calorie label does not have an impact on the total number of calories a patron purchases. However, there was a strong association in both bivariate and multivariate analysis between using a calorie label for a food or beverage purchase and total calories purchased. After adjusting for covariates, those who claimed to use a calorie label purchased an average of 136 fewer calories. These findings are similar to those of Dumanovsky et al. (2011) who reported a 106 calorie reduction among those who reported using calorie labels. However, Elbel et al. (2009) reported contrary results, showing non-significant calorie purchase increase among participants who reported that they used a calorie label to purchase a lower calorie food item compared to

those who did not notice a label. It is possible that Elbel et al. (2009) received a different result regarding total calorie purchases among those who reported using calorie labels because their study was limited to only low-income communities while our study and that of Dumanovsky et al. (2011) included a broader range of income communities. Previous studies have shown that attempts to change behavior in low-income groups is difficult without addressing underlying causes of behavior, or utilizing multifaceted interventions (Nestle & Cromwell, 1990; Tilford, 2000; Kerner, Dusenbury, & Mandelblatt, 1993). For example, health and wellness are often not high-priorities for low-income communities due to other hardships such as crime, inadequate housing, and unemployment. In order for public health campaigns to be more effective they must design interventions which link health to overall socio-economic wellbeing of individuals and communities. This broad perspective should be considered during the development and implementation of future calorie labeling policies, especially among low-income communities.

Findings from this study indicate that calorie labeling was an effective tool to reduce the amount of calories purchased, but only among the minority of people used the labels. It is possible that simply posting calorie labels may not be the most effective means of encouraging customers to purchase fewer calories. A handful of studies have explored alternative label interventions in order to determine the most effective means of reducing total calories ordered. Bleich et al. (2012) reported the most effective means of reducing the total amount of calories purchased (via sugar sweetened beverages) was to post the equivalent amount of physical activity required to burn the number of calories contained in the item. Another menu label intervention tested by researchers studying the effect of a color-coded labeling intervention (red = unhealthy, yellow = less healthy,

green = healthy) on sales of food and beverage items found that sales of healthy items increased significantly (Thorndike et al., 2012). Although posting physical activity equivalents and color-coded labels on restaurant menus present possible effective means to improve menu label usage, they are not necessarily practical interventions. For example, requiring restaurants to calculate physical activity equivalents for each of their menu items would be expensive and would also be difficult to post on menu boards considering the high premium of menu space. Designing a standardized color-coding system for menu items and convincing major restaurant chains to conform to such as system would be difficult and would likely be met with resistance. Even though these types of interventions are likely more difficult to implement than simply posting the caloric content of each menu item, it is possible that the additional effort required in their implementation may result in increased calorie labeling usage. More research should be conducted in order to determine what are the most feasible and effective menu labels to increase usage and reduce the amount of total calories purchased.

Study Strengths

This study was conducted in a real-world environment, as opposed to a laboratory setting, which allows for the conclusions to be more generalizable to real purchasing behaviors. The generalizability of this study was increased by randomly drawing multiple locations from both high income and low income locations throughout the Greater Phoenix Metropolitan Area. The methodology of collecting data during lunch and dinner times, on both weekends and weekdays also increased the generalizability of this study. The collection of both receipts and surveys from each participant also allowed for more thorough statistical analysis.

Study Limitations

This study was conducted within a large urban city so the conclusions drawn from this study are only generalizable to similar demographic areas. During the time data was collected, McDonald's was the only major fast-food restaurant in Phoenix to post calorie labels in all of their restaurants. As a result, data was only collected from McDonald's locations, and was not compared to data from any other restaurants. Since this study was conducted only using adult participants, no conclusions can be drawn for the effects of calorie labeling on children or adolescents. Also, this study only collected information about the number of calories purchased so we were unable to draw any conclusions regarding the number of calories actually consumed. Due to the cross-sectional nature of this study, the results from this study are unable to predict changes in the purchasing behaviors of participants over time. Selecting participants for this study using a street-intercept methodology may have been a source of bias by only attracting patrons for whom participation was convenient. The street-intercept methodology of this study also required that the time in which the survey was administered be as brief as possible. As a result, each of the health behaviors included in this study were determined by asking only one survey question related to each. This method of variable construction reduced the confidence in conclusions related to each health behavior analyzed. Finally, this study originally aimed to explore the relationship between the total number of calories purchased and self-perception of health, self-perception of diet, reported health behaviors and knowledge of calorie requirements specifically among those who reported using calorie labels. Unfortunately, the small sample size among those who reported using calorie labels prevented specific subgroup analysis from being conducted. It is possible

that among participants who report using calorie labels, the total number of calories purchased may be affected by one or more of the explanatory variables examined in this study. Therefore, future studies with larger sample sizes should be conducted in order to determine if the total number of calories purchased is associated with self-perception of health, self-perception of diet, reported health behaviors, or knowledge of calorie requirements specifically among those who report using calorie labels.

Conclusion

Results from this study indicated patrons who reported using calorie labels purchased significantly fewer total calories compared to those who did not report using calorie labels. This result adds to the current body of evidence which suggests that calorie labeling helps those who use it to purchase fewer calories. Results from this study found no associations between self-perception of health, self-perception of diet, reported health behaviors, or knowledge of calorie requirements with the likelihood of noticing or using calorie labeling, or the total number of calories purchased. This study was the first to examine possible relationships between these variables, and although no associations were found, it is possible that the small sample size among those who reported using calorie labels prevented adequate investigation of potential associations. Future large, well-controlled studies should be performed to identify what are the most effective types of labels and, what health related behaviors may be associated with calorie labeling use. Such associations could be used to help design interventions to help promote calorie labeling use among different segments of the population.

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APPENDIX A

IRB APPROVAL

To:	Punam Ohri-Vachaspati
From:	Mark Roosa, Chair Soc Beh IRB
Date:	01/22/2013
Committee Action:	**Exemption Granted**
IRB Action Date:	01/22/2013
IRB Protocol #:	1301008705
Study Title:	Awareness and Use of Fast Food Menu Labeling

The above-referenced protocol is considered exempt after review by the Institutional Review Board pursuant to
Federal regulations, 45 CFR Part 46.101(b)(2) .

This part of the federal regulations requires that the information be recorded by investigators in such a manner that subjects cannot be identified, directly or through identifiers linked to the subjects. It is necessary that the information obtained not be such that if disclosed outside the research, it could reasonably place the subjects at risk of criminal or civil liability, or be damaging to the subjects' financial standing, employability, or reputation.

You should retain a copy of this letter for your records.

APPENDIX B

PARTICIPATION CRITERIA AND INSTRUCTIONS

Screening Questions
Would you like to participate in a research study about fast food restaurants in the Phoenix metropolitan area and surrounding suburbs? Participation includes completing a brief 5-minute-survey and donating your itemized receipt of today's purchases in exchange for $5.00 compensation.

If yes:

Are you at least 18 years old?

Are you purchasing food or beverages for yourself at this restaurant today?

Do you speak English? (if needed)

Participation instructions
- Participants must be 18 years of age
- Order food items as you normally would
- Please ask for/keep your itemized receipt that lists today's purchases
- If ordering for others, please place your order separately so that we can have a copy of the receipt with only the food items you purchased for yourself
- After you purchase your food and/or beverage items we will have a brief survey (5 minutes) for you to complete along with a $5 compensation
- Participation is completely voluntary
- All survey responses will be kept anonymous
- You may withdraw from the study at any time
- Your agreeing to answer the survey will be considered your consent to participate

APPENDIX C

SURVEY INSTRUMENT

Q1 What is the name of the primary researcher who collected this survey? (Do not read, for research team only)

- ❍ Jessie
- ❍ Alan

Q2 What is the PARTICIPANT's identification number? (Do not read, for research team only)

Q3 Did the participant order food items, beverage items or both? (Do not read, for research team only)

- ❍ Food Items ONLY
- ❍ Beverage Items ONLY
- ❍ BOTH food and beverage items

Q4 Were the food and / or beverage items ordered and purchased from the drive thru or from inside the restaurant? (Do not read, for research team only)

- ❍ Inside the restaurant
- ❍ Drive thru

Now I will now ask you a several questions about yourself, your health and about the food and/or beverage items you purchased today. If at any time you would rather answer a question confidentially, let me know and I can show you the question on the tablet device and you can select from the options yourself. This survey should take about 5 minutes.

Q5 In an average week, how many times do you go to fast food restaurants? (Do not read options, if they answer zero or monthly verify by asking "so less than weekly?")

- ❍ number of times per week _____
- ❍ less than weekly
- ❍ don't know
- ❍ refused

Q6 Did you notice any calorie information listed for menu items at the restaurant today? (Do not read options, if they answer "YES"; probe with "did you see the calorie information before or after you placed your order?"

- ❍ yes, prior to placing my order today
- ❍ yes, after placing my order today
- ❍ I saw it during a previous visit
- ❍ no, I did not notice calorie information
- ❍ don't know
- ❍ refused
- ❍ other (specify) _____

Q6a Where did you notice calorie information (choose all that apply)? (Do not read options, after response prompt with "anywhere else?")

- ❑ posted on the menu board (behind / above the register)
- ❑ on a counter mat display at the register
- ❑ in a brochure at the register
- ❑ in an advertisement at the register
- ❑ in an advertisement in a location other than the register (ex: window advertisement)
- ❑ printed on the food / beverage packaging
- ❑ printed on menu liners
- ❑ remember from a previous visit
- ❑ remember from website
- ❑ did not notice calorie information
- ❑ don't know
- ❑ refused
- ❑ other (specify) _____

Q6b Did the calorie information affect your beverage purchases today? (Do not read options)

- ❍ yes
- ❍ no
- ❍ don't know
- ❍ refused
- ❍ did not purchase beverage items
- ❍ other (specify) _____

Q6bi How did the calorie information affect your beverage purchases? (Do not read options unless necessary)

- ❑ purchased items with fewer calories
- ❑ purchased items with more calories
- ❑ purchased items with smaller portion size
- ❑ purchased items with larger portion size
- ❑ Substituted beverage item
- ❑ Decided not to order beverage
- ❑ no difference
- ❑ don't know
- ❑ refused
- ❑ other (specify) _____

Q6c Did the calorie information affect your food purchases today? (Do not read options)

- ❍ yes
- ❍ no
- ❍ don't know
- ❍ refused
- ❍ did not purchase food items
- ❍ other (specify) _____

Q6ci How did the calorie information affect your food purchases? (Do not read options unless necessary)

- ❑ purchased items with fewer calories
- ❑ purchased items with more calories
- ❑ purchased items with smaller portion size
- ❑ purchased items with larger portion size
- ❑ Substituted entree item
- ❑ Substituted side item
- ❑ Decided not to order food item
- ❑ no difference
- ❑ don't know
- ❑ refused
- ❑ other (specify) _____

Q7 How tall are you without shoes?

- ❑ feet _____
- ❑ inches _____
- ❑ don't know
- ❑ refused

Q8 How much do you weigh? (may need to prompt with, "if you would like to answer the question confidentially let me know and I can show you the tablet device and you can make your own selection.")

- ❍ pounds _____
- ❍ don't know
- ❍ refused

Q9 Would you say your health is: (Read options)

- ❍ excellent
- ❍ very good
- ❍ good
- ❍ fair
- ❍ poor
- ❍ don't know
- ❍ refused

Q10 Do you agree or disagree with the following statement: In general, I eat healthy. (Do not read options, after response prompt with "do you strongly agree/disagree or somewhat agree/disagree?")

- ❍ strongly agree
- ❍ somewhat agree
- ❍ somewhat disagree
- ❍ strongly disagree
- ❍ don't know
- ❍ refused

Q11 Compared to what you would like to be, would you say you are underweight, at about the right weight, or overweight? (Do not read options, after response prompt with "do you feel you are slightly or very overweight/underweight?")

- ❍ very underweight
- ❍ slightly underweight
- ❍ about the right weight
- ❍ slightly overweight
- ❍ very overweight
- ❍ don't know
- ❍ refused

Q12 Are you currently trying to eat differently for health or weight reasons? (Do not read options)

- ❍ yes
- ❍ no
- ❍ don't know
- ❍ refused

Q13 How many servings of fruits and vegetables do you eat each day? (If needed, provide the following information: 1 serving of vegetables is 1/2 cup cooked or 1 cup uncooked and 1 serving of fruit is one medium sized piece of fruit)

- ❍ servings _____
- ❍ don't know
- ❍ refused

Q14 What do you think is the recommended daily calorie intake for an average American? (If they say "don't know" prompt with "what is your best estimate?")

- ❍ calories _____
- ❍ don't know
- ❍ refused

Q15 Do you think you need the same, more, or less calories than an average American? (Do not read options unless necessary)

- ❍ need the same
- ❍ need less
- ❍ need more
- ❍ don't know
- ❍ refused

Q16 Do you currently smoke or chew tobacco? (Do not read options)

- ❍ yes
- ❍ no
- ❍ refused

Q17 In the last 7 days how many days were you physically active at work and at home for a total of at least 30 minutes doing activities that made you breathe hard?

- ❍ days _____
- ❍ don't know
- ❍ refused

Q18 How old are you? (Do not read options, might need to prompt with "are you between…")

- ❍ 18-25 years old
- ❍ 26-35 years old
- ❍ 36-49 years old
- ❍ 50-64 years old
- ❍ 65 years and over
- ❍ refused

Q19 Do you have children?

- ❍ yes
- ❍ no
- ❍ refused

Q19a Do you have children who are: (read options)

- ❑ under 5 years of age
- ❑ between 5-12 years of age
- ❑ between 13-18 years of age
- ❑ older than 18 years of age
- ❑ don't know
- ❑ refused

Q20 What is the highest grade or level of school that you have completed? (read options)

- ❍ some high school
- ❍ 12th grade, GED or high school diploma
- ❍ some college / no degree
- ❍ associate's degree
- ❍ bachelor's degree
- ❍ some graduate / professional school / no degree
- ❍ graduate / professional degree
- ❍ don't know
- ❍ refused

Q21 What is the zip code of your residence? (Enter name of city of residence if respondent does not know zip code)

- ❑ zip code _____
- ❑ city _____

Q22 What is the primary language spoken in your home? (Do not read options)

- ❍ English
- ❍ Spanish
- ❍ other (specify) _____
- ❍ don't know
- ❍ refused

Q23 Are you of Spanish, Hispanic, or Latino origin of descent? (Do not read options)

- ❍ yes
- ❍ no
- ❍ don't know
- ❍ refused

Q24 What race would you most closely identify yourself as? (Do not read options)

- ❍ Black / African American
- ❍ White
- ❍ American Indian / Native American / Aleutian or Eskimo
- ❍ Asian / Pacific Islander
- ❍ Hispanic
- ❍ Multiple race
- ❍ don't know
- ❍ refused
- ❍ other (specify) _____

Q25 What is your average household income before taxes? (may need to prompt with "if you would like to answer the question confidentially let me know and I can show you the tablet device and you can make your own selection"; or "is your income between..."

- ❍ under $20,000
- ❍ $20,000 to $49,999
- ❍ $50,000 to $74,999
- ❍ $75,000 to $99,999
- ❍ $100,000 and above
- ❍ don't know
- ❍ refused

Q26 Did the beverage items you purchased today represent a typical purchase for you at this type of restaurant? (Read options)

- ❍ yes
- ❍ somewhat
- ❍ no
- ❍ don't know
- ❍ refused
- ❍ other (specify) _____

Q27 Did the food items you purchased today represent a typical purchase for you at this type of restaurant? (Read options)

- ❍ yes
- ❍ somewhat
- ❍ no
- ❍ don't know
- ❍ refused
- ❍ other (specify) _____

Q28 Please tell me if you agree or disagree with the following statement: Calorie menu labeling helps me make healthy choices at McDonald's restaurants. (Do not read options, after response prompt with "do you strongly agree/disagree or somewhat agree/disagree?")

- ❍ strongly agree
- ❍ somewhat agree
- ❍ somewhat disagree
- ❍ strongly disagree
- ❍ don't know
- ❍ refused

Q29 What is the participant's gender? (Do not read, for research team only)

- ❍ Male
- ❍ Female
- ❍ don't know

Q30 Verbal review of receipt? (Do not read, for research team only)

- ❍ yes
- ❍ no

Q31 Receipt collected? (Do not read, for research team only)

- ❍ yes
- ❍ no

Q32 Money Exchange? (Do not read, for research team only)

- ❍ yes
- ❍ no

Q33 Was the patron dining alone or as part of a group?

- ❍ Alone
- ❍ Group (enter number of members in group if applicable) _____
- ❍ Do not know

Q33a How was participant selected?

- ❍ Volunteer
- ❍ Randomly by date of birth
- ❍ Other (specify) _____

Q34 Was it easy for the participant to understand the survey language? (Do not read, for research team only)

- ❍ yes
- ❍ no

Q35 Time survey was collected?

- ❍ Lunch
- ❍ Dinner

Q36 Day of week survey was collected?

- ❍ Weekday
- ❍ Weekend