A Consumer Survey of Use of Calorie-Posting in a Restaurant: An Analysis of Consumer Characteristics

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ABSTRACT

Obesity in the United States has been described as an epidemic increasing the risk of developing chronic medical diseases, placing a huge burden on the US economy in healthcare costs, and decreasing life expectancy. A recent strategy to combat the high rate of obesity in the US is the requirement of chain restaurants to post calorie information on menus/menu boards to encourage selection of lower calorie "healthier" menu items. A survey of 200 subjects was conducted at 4 Panera Bread outlets in Massachusetts to explore individual consumer characteristics such as Body Mass Index (BMI), nutrition knowledge, and exercise and diet status to identify any association with the use or non-use of posted calorie information. Descriptive statistics revealed no correlation between the characteristics of individual respondents and and the use of calorie information. Refinements to the calorie posting guidelines are suggested to improve the effectiveness of this approach to reduce the prevalence of obesity in the United States.

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INTRODUCTION

As of 2009, the United States had the highest prevalence of adult obesity amongst developed countries in the world.[1] The word “obese” originates from the Latin *obesitu*s meaning fat, stout, or plump. Esus is the past participle of *edere* (to eat) with *ob* (over) added to it.[2] Data from the most recent National Health and Nutrition Examination Survey (NHANES) conducted from 2007-2008 by the US Centers for Disease Control and Prevention (CDC), revealed that 33.8%, of the US adult (age 20 or older) population is obese with a higher prevalence for women (35.5%) than for men (32.2%).[3] Such a high rate of obesity in the US has often been referred to as an epidemic.[4,5]

Obesity rates are calculated based on weight and height measurements of the survey participants to yield a body mass index (BMI) (weight in kilograms divided by height in meters squared, or kg/m^2). Obesity is defined by the World Health Organization (WHO) and the CDC as a BMI of 30.0 or higher. Overweight is defined as a BMI between 25.0 and 29.9, however, these ranges may differ internationally which poses a problem for conducting global studies or evaluating results from investigations conducted in multiple international settings.[6,7]

The prevalence of obesity in the US has continued to increase since the 1970s. It has been postulated that the rise in obesity is correlated with changing trends in the US food supply in the 1970s[8,9] as characterized by rising increases in surpluses of corn. As cheap corn

replaced grass as cattle feed, and corn derivatives became a common ingredient in many foods, human consumption of these corn derivatives was a factor in increased caloric intake. Additionally, as the process of food production became increasingly mechanized, including the refinement of corn into a high fructose corn sweetener, “processed” foods contained higher percentages of refined carbohydrates and fats.[9] Increasing the availability of these low cost energy dense foods at fast food restaurants and supermarkets coupled with effective marketing strategies, such as “supersizing”, led to the creation of an “obesogenic environment”. This was a term coined by Boyd Swinburn whereby Americans began to consume more calories than they expended at least in part due to due to environmental influences.[8,10,11,12] Studies have indicated that people, when served larger portions at a restaurant, will eat the whole portion, resulting in increased calorie consumption.[12,13] Additionally, low physical activity levels contribute to decreased energy expenditure.[8] Americans are exercising less often, and are increasingly sedentary due to prolonged computer use at home and at work.[14,15]

Although the rate of increase of obesity in the US has slowed within the past 10 years[3], based on the current trend, simulation models project 65 million more obese adults will surpass the definining metric by 2030.[14] Obesity is not uniformly present in US adults. Adults 40 years of age or older are significantly more likely to be obese compared to adults aged 20-39 years. In addition, the prevalence of obesity among non-Hispanic

blacks and Mexican-American women is significantly higher compared to non-Hispanic whites.[3]

Numerous adverse health effects are associated with obesity including increased risks for type 2 diabetes, cardiovascular disease, and certain types of cancer[13,16,17,18] which, in turn, reduce life expectancy.[19,20,21,22] A study published in 2003 in the Journal of the American Medical Association (JAMA) estimated that 1 out of 3 children born in the US in 2000 (32.8% for males, and 38.5% for females) are expected to be diagnosed with diabetes during his/her lifetime.[23] Over the next 20 years, simulation models predict an excess of 6 million cases of diabetes, 5 million cases of coronary heart disease and stroke, and more than 400,000 cancer cases due to obesity.[16] An increase in BMI of 5 kg/m^2 increases the risk of esophageal cancer by 52% and colon cancer by 24% for US adult males; for women, the risk of endometrial or gallbladder cancer; and postmenopausal breast cancer increases by 59% and 12%, respectively.[16]

Obesity also takes a huge toll on the American economy. Thorpe et al,[24] estimate that the increase in the prevalence of obesity coupled with increases in obesity-related medical conditions accounted for 27% of the rise in US health care expenditures between 1987 and 2001. Wang et al,[25] estimate that health care costs related to obesity will double every decade comprising 16%-18% of total US health care expenses by 2030. According to the CDC, in 2008, medical costs associated with obesity was

estimated at $147 billion and the annual medical costs for obese people compared to normal weight people was $1429 higher.[26]

Although it is clear that obesity negatively impacts Americans' health and the US economy, obesity rates continue to rise. Recently, government, at all levels in the United States, has started to take a more active role in addressing the problem of obesity which now represents one of the most serious threats to US public health. At the federal level, Michelle Obama's 'Let's Move' campaign to promote physical activity[27] and the CDC's funding for state and local programs[28] represent just two examples of increased government involvement in addressing the obesity issue. In Boston, Massachusetts, the Boston Public Health Commission (BPHC) was awarded a grant by the CDC's Division of Community Health (DCH) to implement strategies to increase physical activity levels by providing more opportunities for walking and biking safely; and to improve nutrition via increased access to affordable fruits and vegetables and healthy beverages.[29]

It is widely recognized that no single intervention or "silver bullet" can successfully reverse the obesity trend in the US.[30,31,32] This is because obesity is the end result of an individual's eating behaviors and habits which, in turn, are shaped by a multitude of contributing factors on both an individual level (biological, taste preferences, family role models, income, education) as well as environmental and societal triggers.[33,34,35,36,37,38] The development of multiple interventions is

therefore required including the passage of a calorie posting law requiring the food industry to provide consumers with calorie information at point-of-purchase; funding programs to promote healthy eating behavior; promoting the awareness of daily caloric consumption, and physical activity; and conducting surveillance to monitor the obesity epidemic.[8]

In an effort to combat obesity, since the early 2000s, several cities and states including New York City, California, Oregon, and Seattle, have enacted regulations and laws requiring the posting of calories on restaurant menus. It is hoped that having calorie information available at the point-of-purchase will help the consumer to make a more informed decision when deciding which menu items to purchase and perhaps choose a meal with less calories relative to other menu items.

New York City's regulation, enacted in 2006, requiring calorie posting, was initially met with intense resistance by the New York State Restaurant Association (NYSRA) who posited that posting calorie information on menus and menu boards, and conducting laboratory testing to measure the caloric content of food items would be costly. A federal lawsuit was filed by the NYSRA alleging the regulation violated the First Amendment, which prevents the government from compelling people to say things they do not want to say, and was therefore unconstitutional. The court ruled in favor of NYC and the regulation requiring calorie posting became effective on March 31, 2008. During the NYC controversy, Georgia and California prohibited calorie posting in restaurants by

enacting preemption laws whereby local agencies could not require calorie posting.[39]

The percentage of meals consumed by Americans outside of the home continues to increase. According to a report published in October 2006 by the US Department of Agriculture (USDA),[40] between the late 1970s and mid-1990s, caloric intake from meals purchased and eaten away from home versus food prepared at home increased from 18% to 32%. By 2004, food that had been consumed away from home accounted for approximately half of daily caloric intake. Compared to home cooked meals, food consumed outside the home is often higher in calories and fat and portion sizes to be larger.[41,42,43,44,45] Furthermore, studies have indicated that most consumers underestimate the caloric count of restaurant meals[46] and, when exposed to increased portion sizes, the consumer increases their food intake.[12,13,45,47] Consumers have also expressed an interest in having calorie information available on menu boards.[48,49] A survey of over 400 chefs attending culinary meetings hosted in 6 US states indicated that the calories in restaurant menu items could be reduced by 10%-25% without the customer noticing any difference in taste.[50] For these reasons, the provision of calorie information via point-of-sale posting has enormous potential to be an effective intervention to combat obesity and has been endorsed by the Institute of Medicine's Committee on Accelerating Progress in Obesity Prevention.[51]

In March 2010, a federal law was passed requiring chain restaurants in the US with 20 or more sites to post calorie counts on their menus and menu boards.[52] The US Food and Drug Administration (FDA) was the regulatory agency tasked with developing the rules and regulations for implementation of this law. It is hoped that by providing calorie count information will influence consumer purchasing behavior and menu item selection, and specifically, that consumers will choose more healthy selections with a comparatively lower calorie content. The law will be implemented in December 2015 after four plus years of development during which the FDA grappled with the specific rules for implementation due to disagreement among the variety of special interests present in this discussion. According to FDA Commissioner Margaret Hamburg, “There are very, very strong opinions and powerful voices both on the consumer and public health side and on the industry side, and we have worked very hard to sort of figure out what really makes sense and also what is implementable.”[53]

Research conducted to date to assess the effectiveness of calorie posting has yielded mixed results. The studies can be grouped into two categories by setting type: experimental (lab) and real world (actual purchasing behavior).

Experimental studies have used menus which differed according to the type of information that is either included or excluded such as calorie counts; average daily calorie intake information; and value size pricing, a

marketing technique aimed at those "value conscious" consumers who want to get the most for their money via combination meals with higher energy intake due to increased portion size. In a study conducted by Harnack et al,[54] participants who reported eating at fast food restaurants on a regular basis ordered a meal from one of four possible menus: calories posted or not posted, and value pricing posted or not posted. No significant differences were found in the meals ordered or eaten with respect to number of calories. Comparatively, Roberto et al,[55] found that availability of calorie information on the menu did result in participants choosing meals with fewer calories. In this study, participants were randomly assigned to one of three menus: menu with/without calories, and menu with calories and the recommended daily caloric intake for an average adult. The group randomized to the latter group exhibited the most effect consuming an average of 250 fewer calories than the other groups. Based on these findings, the authors suggested that recommended daily caloric intake be included on menus in addition to the number of calories of individual items.

Studies based on actual purchasing behavior have also produced inconsistent findings regarding the effectiveness of calorie posting. In separate studies, Elbel,[56,57] Finkelstein,[58] and Vadiveloo[59] did not find a change in purchasing behavior when calories were posted on menus. However, several other studies [32,60,61,62,63] conducted in New York City and King County, Washington fast-food chains, and in university cafeterias, did

indicate a lower average number of calories purchased by the consumer. Possible factors contributing to these discrepant findings include different and noncomparable study samples (college educated vs all education levels), lack of a control group, varying degrees of controlling for confounding variables, and differences in study design, such as type of setting (number of eating establishments) and amount of time between the pre- and post- intervention periods.

Recently, in Massachusetts, several fast food restaurants and full service restaurants have listed calories on menus and menu boards. An analysis conducted by the Hudson Institute, a policy research organization, looked at 21 fast food and sit-down restaurant chains across the US between 2006 and 2011 and found that same-store sales increased for the 9 chains that offered an increased number of lower-calorie menu items.[64] These findings provide motivation for the restaurant industry to offer a higher number of menu items that are lower in calories and negates the initial argument by the industry that calorie posting is cost prohibitive.[39] Additionally, Urban et al,[65] used bomb calorimetry (measurement of the heat of combustion) to calculate the energy content of menu items of small-chain and independent restaurants within 15 miles of Boston that did not post calorie information. The authors concluded that small chain and independent establishments served meals which were just as high in calories, if not higher, than found in some of the large chain restaurants. Because non-chain restaurants account for approximately

half of the restaurants in the US, the authors recommended that national calorie posting legislation include all restaurants and not simply large chain outlets. Consumer familiarity with chain restaurants, along with the sheer number of outlets in the US, and the difficulties encountered in addressing the needs of all stakeholders may have been contributing factors to the decision to limit the legislation to chain restaurants.

This thesis focuses on the behavior of the individual consumer in contrast to the use of aggregate sales data in an effort to shed more light on consumer characteristics associated with the purchase of lower calorie menu items. It is possible that healthy-weight consumers account for the increased sales of lower calorie items. To date, few studies have collected and linked both BMI data and diet status (actively pursuing weight loss vs. not currently attempting to lose weight) simultaneously directly from study participants. A better understanding of the characteristics and motivations of the consumer is critical in evaluating the effectiveness of posting calorie counts and offering lower calorie menu options as an intervention in combating obesity. Such an examination may yield valuable insight into areas of possible improvements to the calorie posting initiative. As a result, this thesis will survey consumers as they exit a restaurant that posts caloric information for menu items.

METHODOLOGY

On March 24, 2010, Panera Bread became the first national chain restaurant to implement the posting of calorie information at all of its company-owned stores.[66] As a result, Panera Bread was selected as the national chain restaurant of interest to this Thesis. The relatively long duration of consumer access to such information, just over 5 years of elapsed time, is likely to reveal a more accurate depiction of consumer utilization of such information as compared to a chain restaurant for which calorie information at the point-of-purchase was only recently implemented.

Fifty adults were surveyed at four different Panera Bread outlets in four different towns/cities in Massachusetts for a total sample size of 200 subjects (Table 1). The study protocol was reviewed and approved by the Tufts University Medford Social, Behavioral, and Education Institutional Review Board (IRB). Consent forms were not used since the data was anonymized and the survey questions posed negligible risk to the subjects.

Table 1. Panera Bread Survey Locations

Site #	Street Address	City or Town
01	1684 Massachusetts Avenue	Lexington, MA
02	174 Alewife Brook Parkway	Cambridge, MA
03	841 Worcester Street	Natick, MA
04	120 Goldstar Boulevard	Worcester, MA

To optimize sample heterogeneity, towns/cities were chosen based on the population's socioeconomic status (annual median household

income) with preference given to restaurants located in cities with populations larger than 30,000 (Table 2). Additionally, only freestanding restaurants were selected due to the lack of obtaining approvals from mall property managers to conduct the survey.

Table 2. Survey Site Characteristics in the Ascertainment of the Utility of Point-of-Sale Caloric Information

Location	Annual Median Household Income*	Population*	Race* (%)
Lexington, MA	$139,462	31,394	White 73.8 Asian 20.0 Other 3.1 Hispanic 2.1 Black 1.1
Cambridge, MA	$67,866	106,471	White 61.4 Asian 16.6 Black 10.9 Hispanic 6.3 Other 4.8
Natick, MA	$94,304	33,006	White 85.4 Asian 7.2 Hispanic 3.0 Black 2.0 Other 3.4
Worcester, MA	$43,492	182,669	White 59.4 Hispanic 20.5 Black 11.8 Asian 6.1 Other 2.0

Source: www.city-data-com.city

Subjects were recruited as they exited the restaurant at which point they were asked if they would like to participate in a food survey being conducted by a graduate student at Tufts University. Approval from the restaurant managers of the four survey sites was not obtained since the survey was conducted on public property in the parking lot outside of the restaurant. To ensure that all survey participants had actually dined at the restaurant as opposed to simply purchasing food for takeout, any persons

exiting the restaurant carrying a bag from Panera Bread were asked if they had a sit-down meal. Prospective participants were informed that the survey would take approximately 5-10 minutes and were assured that the survey was completely anonymous and their survey responses were completely confidential. An incentive in the form of a $10 debit card was used. Studies have shown that incentives with guaranteed immediate reward are effective techniques for recruiting subjects as opposed to no incentive or chances to win a reward.[67,68] The prospective subjects were told that all survey questions had to be answered and that, upon immediate completion of the survey, they would be immediately provided with their choice of debit card for Starbucks, Whole Foods, or Stop and Shop, to appeal to varying preferences in food vendors.

If the subject agreed to complete the survey, a hard copy of the survey was given to them to complete. The survey consisted of 23 questions and included the site number and subject ID# were prefilled on each individual survey. All questions were multiple choice format except for weight, height, and number of calories consumed on a daily basis which were manually entered by the subject. Demographics collected self-reported age, race, income, and education level.

Once the subject completed the survey, it was reviewed on-site to ensure all questions had been answered and that the manual entries were legible. The subject was then asked to choose a particular debit card and was thanked for his/her participation in the survey.

Survey recruitment at each location continued until 50 surveys were completed. Subjects were recruited during the lunch interval as they exited the restaurant between Noon and 2:00 PM.

A log was maintained listing the individual debit card account numbers by vendor and the subject ID# the card was issued to as the survey progressed. A count of subject refusals by site was maintained to calculate response rate, however, reason for refusal was not collected.

The survey was tested by 5 individuals prior to the administration of the live survey and questions had been revised accordingly (refer to Appendix B for the Survey Instrument).

Descriptive statistics were used to characterize the sample which was divided into 2 groups. For purposes of this survey, the first group (Group 1) was defined as those subjects with a healthy weight (BMI <25.0) and the second group (Group 2) was composed of those subjects with a non-healthy weight (BMI >25.0). BMI was calculated using the CDC's online BMI calculation tool and was based on the subjects' self-reported weight and height obtained during survey completion.

The main objective of the survey was to determine whether the participants utilized the posted calorie information at the point-of-purchase at Panera Bread and whether the use of this information actually differed according to BMI (obese, non-obese), exercise level, and demographics (age, income, race, education). To assess whether awareness of Panera's practice of posting calorie counts on the menu influenced the person's

decision to eat at Panera Bread, subjects who responded they were aware of the policy were asked if the posting of caloric information had indeed influenced their decision to eat at the restaurant. Subjects who reported they were unaware of Panera Bread's calorie posting practice prior to dining at the restaurant could not assess whether this practice influenced their decision to dine at Panera Bread and were, therefore, not asked this question.

For those respondents who did not use calorie information at the point-of-purchase, the second objective of the survey was to determine the specific reason(s) for ignoring the information and whether these reasons differed between the obese and non-obese subjects.

Survey participants were asked to record the total number of calories an adult should consume each day based on recommendations by the USDA, in addition to how frequently they ate meals outside of the home over the previous 6 months. Lack of nutrition knowledge coupled with eating meals outside of the home environment on a frequent basis may contribute to obesity. An independent samples *t*-test was used for statistical analysis of mean differences between the obese and non-obese groups so as to display any differences and whether they were statistically significant at the $p<0.05$ level.

A subset of respondents who reported they have tried to lose weight in the past 6 months were asked to rank the effectiveness of posting calorie information in restaurants compared to several other

possible weight loss interventions. Respondents were also asked to assess whether lack of calorie information in restaurants was a contributing factor hampering weight loss relative to a list of other contributing factors such as frequently eating meals outside of the home, and eating the entire restaurant meal even if the portion size is big.

MS Excel was used for data entry and data analysis, and to ensure the sample contained no duplicate subjects. To ensure the sample contained no duplicate subjects, Excel's duplicate check function was used to identify entries with the same gender, age group, race, weight, height, and education and income levels.

RESULTS

The survey was administered between May 11, 2014 and August 23, 2014. Recruitment rates for the four sites ranged from 49%-63%; overall recruitment rate was 57% (Table 3).

Table 3. Survey Recruitment Dates* and Rate by Site**

Site	Recruitment Dates*	Recruitment Rate (%)
01	June 30; July 5, 13, 20, 26; August 3, 4, 7, 8 ,9	49
02	May 20, 21; June 15; July 6, 12; August 16, 17, 23	62
03	May 11, 13, 15, 21, 26,31; June 7, 8	58
04	May 17, 18, 19; June 1	63

* Year=2014
** Total number of subjects who agreed to participate divided by total number of subjects approached

Of the 200 subjects, 119 (61%) were female (Table 4). BMI, categorized as either healthy (Group 1, BMI <25.0) or non-healthy (Group 2, BMI >25.0), was healthy for 61% of the females and 39% of the males. The 55-64 and the18-24 year age groups accounted for the two highest categories of subjects accounting for, respectively, 48 (24%) and 43 (22%) of the total sample. Only 4 subjects (2%) were aged 75 years or older. The majority of the subjects (n=144 or; 72%) completed the highest education level (4 years of college or more). Only 1 subject did not complete high school. Race for more than three quarters of the sample was reported as White (n=174, 87%). The remaining subjects included 16 Asian (8%), 7 Black/African American (4%), 7 of other race (4%), and 2 Native Hawaiian or Pacific Islander (1%). Of the 195 subjects who provided their total annual household income, 133 subjects (68%) reported income in one of

the four highest income levels (>$80,000). The income level with the greatest number of subjects (n=55) was also the highest income level (>$150,000). In contrast, the lowest income level (<$20,000) included the least number of subjects (n=10, 5%).

Table 4. Survey Sample Demographics: All Sites

	All Sites		Healthy Weight (Group 1)		Non-Healthy Weight (Group 2)	
Demographics	**n**	**%***	**n**	**%**	**n**	**%**
Total Number of Subjects	200	100	102	51	98	49
Gender						
Male	81	41	30	37	51	63
Female	119	59	72	61	47	39
Age (years)						
18-24	43	22	37	86	6	14
25-34	23	12	12	52	11	48
35-44	27	14	10	37	17	63
45-54	36	18	13	36	23	64
55-64	48	24	17	35	31	65
65-74	19	10	11	58	8	42
75 or older	4	2	2	50	2	50
Education						
Less than high school	2	1	0	0	2	100
High school (twelfth grade)	17	9	12	71	5	29
Some college	24	12	14	58	10	42
2-year college	13	7	7	54	6	46
4-year college or more	144	72	69	48	75	52
Race**						
White	174	87	87	50	87	50
Black or African American	7	4	0	0	7	100
Asian	16	8	12	75	4	25
Native Hawaiian or other Pacific Islander	2	1	2	100	0	0
Other	7	4	5	72	2	29
Income***						
Less than <$20,000	10	5	8	80	2	20
$20,000-39,999	16	8	7	44	9	56

Demographics	All Sites		Healthy Weight (Group 1)		Non-Healthy Weight (Group 2)	
	n	%*	n	%	n	%
$40,000-59,999	20	10	12	60	8	40
$60,000-79,999	16	8	7	44	9	56
$80,000-99,999	25	13	13	52	12	48
$100,000-124,999	31	16	18	58	13	42
$125,000-149,999	22	11	7	32	15	68
$150,000 or higher	55	28	29	53	26	47

** Race: n>200 due to 6 subjects of mixed race or other race
*** Income: n=195 (5 persons refused)

Demographics by site were consistent with the demographics for the entire sample (Tables 1-4, Appendix A). Female subjects outnumbered male subjects at all four sites. For each site, a higher percentage of female subjects fell within the healthy BMI range (Group 1) than did the male subjects; the majority of subjects were White and had completed four years of college or more. The highest income level ($150,000 or higher) was reported for the majority of the subjects for 3 of the 4 sites. For Site 04, 9 subjects reported an annual household income between $20,000-39,999; the second and third most frequently reported income level was the $80,000-99,999 and $150,000 or higher with 8 subjects each.

A total of 141 subjects (71%) responded that they were aware, prior to visiting Panera Bread, that the restaurant posts the number of calories next to each menu item on the menu board (Table 5). However, only 25 of the 141 subjects (18%), 8 subjects from sites 01 and 03, 5 subjects from site 02, and 4 subjects from site 04, responded that this practice of

posting calories was one of the reasons he/she had decided to eat at Panera Bread.

Table 5. Awareness of Calorie Posting as a Factor in Choosing to Eat at Restaurant

Site	Aware n (%)	Calorie Posting Was a Factor n (%)
01	39 (78)	8 (21)
02	35 (70)	5 (14)
03	33 (66)	8 (24)
04	34 (68)	4 (12)
Total	**141 (71)**	**25 (18)**

Eighty-five (43%) of the subjects reported that the posted calorie information influenced their menu selection versus 115 subjects for whom calorie information did not influence menu selection (Table 6). Of the 85 subjects who used the calorie information ("users"), slightly more than half (54%) were in the healthy weight cohort (Group 1). Site 03 was the only site for which the percentage, by BMI, was higher for Group 2 than it was for Group 1 (22% vs 18%, respectively, Table 7).

Table 6. Use of Calorie Information at Menu Selection by BMI Cohort Status (all Sites)

Used calorie information?	All n (%)	Healthy Weight (BMI<25.0) n (%)	Non-healthy Weight (BMI>25.0) n (%)
Yes	85 (43)	46 (54)	39 (46)
No	115 (58)	56 (49)	59 (51)
Total	200	102	98

Table 7. Use of Calorie Information by BMI, by Site

Used calorie info?	Site 01		Site 02		Site 03		Site 04	
	Group 1 n (%)	Group 2 n (%)	Group 1 n (%)	Group 2 n (%)	Group 1 n (%)	Group 2 n (%)	Group 1 n (%)	Group 2 n (%)
Yes	13 (26)	11 (22)	11 (22)	8 (16)	9 (18)	11 (22)	13 (26)	9 (18)
No	12 (24)	14 (28)	13 (26)	18 (36)	16 (32)	14 (28)	15 (30)	13 (26)

Of the 115 "non-users", the percentage of subjects who were of healthy weight (Group 1) versus non-healthy weight (Group 2) was almost equal (49% vs 51%, respectively, Table 6). For Sites 03 and 04, Group1 outnumbered Group 2 (32% vs 28%; and 30% vs 26%), respectively. However, for Sites 01 and 02, more non-healthy weight subjects (28% and 36%, respectively) than healthy weight subjects (24% and 26%, respectively) did not use the information.

Among the non-users, the most frequently reported reason for not being influenced by posted calorie information, irrespective of BMI, was that they did not keep track of calories consumed (29%). The second most frequently reported reason was the subject did not notice the posted calorie information when looking over the menu (21%) for which the frequency was almost the same for both groups (21% vs 22%).The third most frequently reported reason for not noticing information posted regarding caloric content was the subject was not trying to lose weight (17%), Table 8. Ten of the non-users reported that they had not been influenced by the posted calorie information for reasons other than those listed on the survey. The other reason was manually recorded at the bottom of the survey instrument by the principal investigator to identify any

patterns (Table 9). In fact, six of the ten non-users reported they knew what they wanted to order (regardless of posted calorie information); a different reason was reported by each of the remaining 4 subjects.

Table 8. Reasons Calorie Information Did Not Influence Menu Item Selection, by BMI

Reason	All non-users n (%)	Healthy Weight (Group 1) n (%)	Non-healthy Weight (Group 2) n (%)
Don't keep track of how many calories I consume	59 (29)	32 (28)	27 (30)
Didn't notice the calorie information	43 (21)	21 (18)	22 (25)
Not trying to lose weight	34 (17)	25 (22)	9 (10)
Ruins the experience	29 (14)	16 (14)	13 (15)
Hard / unable to read calorie information	12 (6)	6 (5)	6 (7)
Other	10 (5)	3 (3)	7 (8)
Won't affect health	9 (4)	6 (5)	3 (3)
Too time consuming to consult the calorie counts	8 (4)	6 (5)	2 (2)
Total	**204***	**115**	**89**

* Total reasons >115 since non-user may have more than one reason for not using calorie information.

Table 9. Other Reasons Calorie Information Did Not Influence Menu Item Selection, by BMI (n=10)

Reason	Healthy Weight (Group 1) n	Non-healthy Weight (Group 2) n
I make choices based on what's in the dish (fats, carbs, salt)	1	0
I knew what I wanted to order	0	6
Wanted to try new healthy looking flatbread sandwich	1	0
Looked on-line prior to lunching at Panera	0	1
Trying to gain weight	1	0
Total	**3**	**7**

Survey Questions #5 and #6 asked the subject if he/she had ordered a dessert, and to record the main reason if a dessert item was not ordered. Restaurant desserts are notoriously high in calories and can therefore be a significant factor leading to excess caloric intake.

Only twenty-six subjects (13%) of the 200 surveyed had ordered dessert; the number of subjects who ordered a dessert item was fairly consistent across all sites ranging between 5 and 9 subjects per site (Table 10). The most frequently reported reason amongst the 174 (87%) subjects who did not order dessert was other than the listed reasons (n=54, 31%). The second most frequently reported reason was the subject was too full (n=53, 30%), followed by trying to lose weight (n=31,18%), too many calories (n=30, 17%), and, did not like the selections (n=6, 3%), Tables 11 and 12.

Table 10. Subjects Who Ordered / Did Not Order Dessert, by Site

Site	Ate Dessert n (%)	Did Not Eat Dessert n (%)
01	9 (18)	41 (82)
02	7 (14)	43 (86)
03	5 (10)	45 (90)
04	5 (10)	45 (90)
Total	**26 (13%)**	**174 (87%)**

Table 11. Reason Subject Did Not Order Dessert (n = 174)

Site	Too full n (%)	Too many calories n (%)	Didn't like selections n (%)	Trying to lose weight n (%)	Other n (%)	Total n (%)
01	10 (19)	8 (27)	0 (0)	6 (19)	17 (31)	41 (24)
02	10 (19)	9 (30)	1 (17)	7 (23)	16 (30)	43 (25)
03	18 (34)	7 (23)	2 (33)	9 (29)	9 (17)	45 (26)
04	15 (28)	6 (20)	3 (50)	9 (29)	12 (22)	45 (26)
Total	**53 (30)**	**30 (17)**	**6 (3)**	**31 (18)**	**54 (31)**	**174 (101)***

* % >100 due to rounding

Table 12. Other Reasons Subject Did Not Order Dessert (n=54)

Other Reason	n (%)
Don't eat dessert, not a dessert person, don't usually get desserts at restaurants, don't like desserts	17 (31)
Not dessert time, too early in the day, don't eat dessert after lunch	11 (20)
Don't like or eat sweets, too sweet	6 (11)
Didn't want it or feel like it, not in the mood	4 (7)
No gluten free options, allergies to gluten and dairy, can't eat wheat, am vegan	3 (6)
Didn't want to pay for it, didn't want to spend the money	3 (6)
Will eat dessert at home	3 (6)
Desserts are not healthy	1 (2)
Keep the sugars down	1 (2)
Don't need the calories	1 (2)
I am diabetic. I don't eat desserts.	1 (2)
Dessert wasn't included in main meal	1 (2)
Just had wisdom teeth out	1 (2)
Don't eat desserts more than once or twice a week	1 (2)
Total	**54 (101)***

* % >100 due to rounding

Subjects were asked, on average, how many days a week in the past 6 months they had eaten out for breakfast, lunch, and dinner (survey Questions #7, 8, 9). For the entire sample, mean frequency for eating out breakfast, lunch, and dinner on a weekly basis was 1, 2.6, and 2.4 days, respectively. Frequency of eating out was consistent across all sites and

with the entire sample averaging on a weekly basis between <1 and 1.3 for breakfast; 2.4 and 2.8 for lunch; and 2.1 and 2.8 for dinner (Table 13). For the entire sample and for each site, frequency of eating out did not differ between the subjects who used the calorie information versus those who did not use the information (Table 14).

Table 13. Frequency of Eating Out (# Days/Week)

	All sites	Site 01	Site 02	Site 03	Site 04
Breakfast	1.0	<1.0	1.3	1.2	<1.0
Lunch	2.6	2.4	2.8	2.7	2.5
Dinner	2.4	2.1	2.5	2.1	2.8

Table 14. Frequency of Eating Out (# Days/Week) by Use of Calorie Information (User/Non-user)

	All sites		Site 01		Site 02		Site 03		Site 04	
	User	Non-user	User	Non-user	User	Non-user	User	Non-user	User	Non-user
Breakfast	0.8	1.1	0.3	0.8	0.9	1.5	1.3	1.1	1.0	0.9
Lunch	2.6	2.6	2.8	2.1	2.6	2.9	2.8	2.6	2.4	2.6
Dinner	2.3	2.4	2.1	2.1	2.3	2.6	2.4	2.0	2.5	3.0

For the survey question, “In the last 6 months, how often did you choose to eat at a particular restaurant because the restaurant posts calories on the menu / menu board?”, only 5 subjects reported the frequency to be ’always’, versus 61 subjects who reported ‘sometimes’, and 134 subjects reporting they never chose to eat at a particular restaurant because it posts calories on the menu (Table 15). Results, by site, were consistent with the entire sample with the majority of the subjects reporting they never eat at a restaurant specifically because it posts calories on the menu.

Table 15. Frequency of Choosing a Restaurant That Posts Calories on the Menu within the Past 6 Months, by Site and BMI (n=200)

Site	Always (n=5)		Sometimes (n=61)		Never (n=134)	
	Healthy Weight (Group 1)	Non-healthy Weight (Group 2)	Healthy Weight (Group 1)	Non-healthy Weight (Group 2)	Healthy Weight (Group 1)	Non-healthy Weight (Group 2)
01	0	1	5	7	20	17
02	1	0	7	5	16	21
03	0	0	9	13	16	12
04	2	1	7	8	19	13
Total	**3**	**2**	**28**	**33**	**71**	**63**

In response to survey Question #11, “In the past 6 months, have you been trying to lose weight?” over half of the sample (n=127, 64%) reported they were trying to lose weight. Ranking the effectiveness of the listed weight loss interventions, exercise was most frequently reported (n=59) as the most effective weight loss intervention, followed by diet (n=51) which included self-administered diet and formal weight loss program. Eating at restaurants that post calories was ranked as the most effective weight loss intervention for only 2 subjects, and was most often ranked as the least effective intervention relative to the other weight loss interventions used by the subject (Table 16). Additionally, eating at restaurants that post calories was the most frequently reported intervention the subjects did not use at all to lose weight (Table 17). Although calorie posting is just one of many possible interventions to combat obesity, the relatively low ranking of its effectiveness is important to note.

Table 16. Weight Loss Interventions Ranked by Effectiveness

Weight Loss Intervention	Ranking by Effectiveness of Intervention*					Total
	1	2	3	4	5	
Exercise more often	59	47	7	4	3	**120**
Diet**	51	35	14	8	4	**112**
Eat out less often	9	22	38	22	14	**105**
Don't eat entire meal when eating out	5	13	24	35	21	**98**
Eat at restaurants that post calories	2	3	21	23	40	**89**

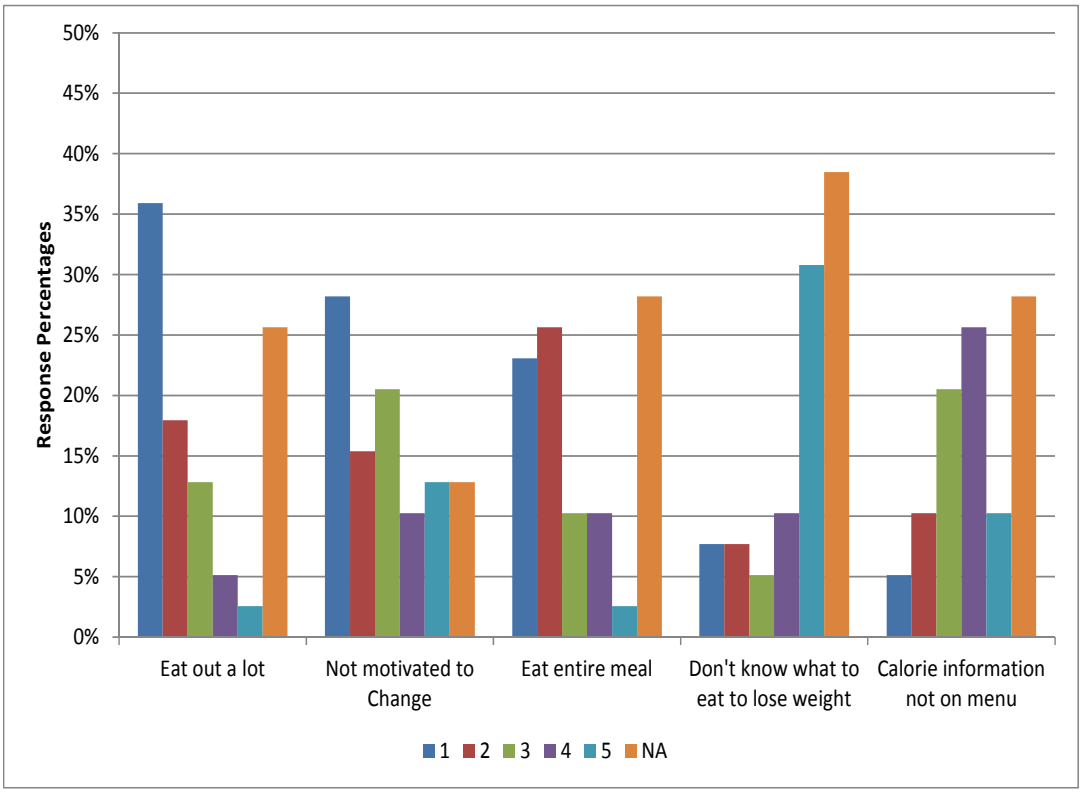
1=most effective, 5=least effective
**Self-administered or weight loss program

Table 17. Weight Loss Interventions Not Used (n=110)

Weight Loss Intervention	Intervention Not Used n (%)
Eat at restaurants that post calories	38 (35)
Don't eat entire meal when eating out	29 (26)
Eat out less often	22 (20)
Diet	14 (13)
Exercise more often	7 (6)
Total	**110 (100)**

Of the 127 subjects who had tried to lose weight within the past 6 months, 39 subjects reported they were unsuccessful. In response to survey Question #14 asking participants to rank the contributing factors hampering weight loss, ‘eating out a lot’ (n=14) and ‘not being motivated enough to change eating habits’ (n=11) were ranked as the two most important factors preventing weight loss, followed by ‘eating the entire meal’ (n=9), ‘not knowing what to eat to lose weight’ (n=3), and ‘calories not being listed on menu’ (n=2), as shown in Figure 1.

Figure 1. Factors Hampering Weight Loss Ranked by Importance



1=Most important, 5=Least important, NA=Not a Contributing Factor

Survey Question #15 asked the subject to estimate the average number of days a week he/she exercised within the past 6 months. For subjects who did not exercise at all, non-users of calorie information outnumbered subjects who used calorie information by a ratio of more than 3 to 1: n=11 (10%) vs n=3 (4%), Table 18. However, the percentage of subjects who exercised 7 days a week was slightly higher for the non-users compared to the users of calorie information at 10% (n=11) vs 8% (n=7). For both groups, the frequency of exercise most often reported ranged between 2 and 5 days a week, accounting for 70% (n=59) and 68% (n=78) of the subjects who used versus did not use calorie information, respectively.

Table 18. Use of Calorie Information by Frequency of Exercise

# Days Exercise / Week	Use of Calorie Information	
	Yes n (%)	No n (%)
0	3 (4)	11 (10)
1	6 (7)	9 (8)
2	15 (18)	24 (21)
3	14 (16)	24 (21)
4	15 (18)	13 (11)
5	15 (18)	17 (15)
6	10 (12)	6 (5)
7	7 (8)	11 (10)
TOTAL	**85 (101*)**	**115 (101*)**

Total % >100 due to rounding

Survey Question #16 assessed nutrition knowledge by asking the subject to record what they believed to be the approximate total number of calories an adult should consume on a daily basis according to the USDA. The mean estimate of the number of calories for the healthy weight subjects versus the non-healthy weight subjects was very close: 1862 and 1804, respectively. An independent samples *t*-test indicated this difference was not statistically significant ($p = 0.42$, Table 19). Comparison of the standard deviations for the two groups indicated less variance from the mean for the non-healthy group. The range of calorie estimates by the non-healthy group was not as wide compared to the estimates for subjects in the healthy group.

Table 19. Subject's Estimate of Recommended Number of Calories Consumed Daily by BMI

	Healthy Weight (Group 1)	Non-Healthy Weight (Group 2)
n*	102	96
Mean	1862	1804
Standard Deviation	535	477
Lower CI (95%)	1758	1710
Upper CI (95%)	1966	1899
P-value	0.42	

n=198, 2 subjects did not answer the question
CI=confidence interval

For the entire sample and for 3 of the 4 sites, a higher percentage of female subjects than male subjects (45% vs 38%) used the posted calorie information consistent with the findings of separate studies conducted by Krieger[32] and Breck[69]. For Site 03, 47% of the male subjects used the calorie information as compared to 35% of the female subjects (Table 20).

Table 20. Use of Calorie Information by Gender

	Male (n=81)		Female (n=119)	
Site	User n (%)	Non-user n (%)	User n (%)	Non-user n (%)
01	9 (47)	10 (53)	15 (48)	16 (52)
02	6 (25)	18 (75)	13 (50)	13 (50)
03	9 (47)	10 (53)	11 (35)	20 (65)
04	7 (37)	12 (63)	15 (48)	16 (52)
Total Counts	**31**	**50**	**54**	**65**
Total %	**38**	**62**	**45**	**55**

The age groups with the highest use of posted calorie information were 35-44 (59%), followed by 45-54 (50%), and 55-64 (46%), Table 21. Of those subjects who did not use the calorie information, the two oldest age groups accounted for the highest percentages (75% and 74%);

however, only 17 subjects were included in these two age groups combined. For the two youngest age groups: [25-34 (70%) and 18-24 (63%)], a total of 43 subjects did not use the calorie information.

Table 21. Use of Calorie Information by Age (n=200)

Age (years)	n	Use of Calorie Information	
		Yes n (%)	No n (%)
18-24	43	16 (37)	27 (63)
25-34	23	7 (30)	16 (70)
35-44	27	16 (59)	11 (41)
45-54	36	18 (50)	18 (50)
55-64	48	22 (46)	26 (54)
65-74	19	5 (26)	14 (74)
75 or older	4	1 (25)	3 (75)
Total	**200**	**85**	**115**

Subjects with the highest reported annual household income used the calorie information most often (55%) followed by the third and second highest income categories (48% and 41%, respectively), Table 22. Use of calorie information for the remaining income categories ranged from 25%-40%. Of the non-users, the low income category of $20,000-39,999 accounted for the highest proportion of subjects (75%). The percentage of subjects who did not use calorie information tended to decrease as income level rose.

Table 22. Use of Calorie Information by Income

Income	n	Use of Calorie Information	
		Yes n (%)	No n (%)
<$20,000	10	4 (40)	6 (60)
$20,000-$39,999	16	4 (25)	12 (75)
$40,000-$59,999	20	8 (40)	12 (60)
$60,000-$79,999	16	5 (31)	11 (69)
$80,000-$99,999	25	8 (32)	17 (68)
$100,000-$124,999	31	15 (48)	16 (52)
$125,000-$149,999	22	9 (41)	13 (59)
$150,000 or higher	55	30 (55)	25 (45)
Total*	**195**	**83**	**112**

*n <200 due to 5 subjects that refused to answer question.

More than half (58%) of the White subjects used the calorie information. Similarly, 56% of the Asian subjects and 43% of subjects of mixed-race also used the posted calorie information. Twenty-nine percent of the Black subjects and none of the Native-Hawaiian subjects used the calorie information; however, the number of subjects for these race categories was quite low at 7 and 2, respectively, Table 23.

Table 23. Use of Calorie Information by Self-Declared Race

Race	n	Use of Calorie Information	
		Yes n (%)	No n (%)
White	174	101 (58)	73 (42)
Black	7	2 (29)	5 (71)
Asian	16	9 (56)	7 (44)
Hawaiian-Pacific Islander	2	0 (0)	2 (100)
Other	7	3 (43)	4 (57)
Total*	**206**	**115**	**91**

*Total >200 since some subjects were of mixed-race

Calorie information was used most often by subjects with less than high school education (50%); however, there were only 2 subjects at this

education level. For the remaining groups, the use of calorie information increased with each higher level of education, however, less than half (47%) of the subjects with the highest level of education used the calorie information. Conversely, of the non-users, a higher proportion of less educated subjects (76%, 67%, and 62%) did not use the calorie information (Table 24).

Table 24. Use of Calorie Information by Self-Reported Education Level

Education Level	n	Use of Calorie Information	
		Yes n (%)	No n (%)
Less than high school	2	1 (50)	1 (50)
High school	17	4 (24)	13 (76)
Some college	24	8 (33)	16 (67)
2-year college	13	5 (38)	8 (62)
4-year college or more	144	67 (47)	77 (53)
Total	**200**	**85**	**115**

Overall, results indicated the sample to be predominately White, female, college-educated, and a relatively high annual household income. Based on these characteristics, the sample could not be considered heterogeneous. Use of calorie information was not correlated with BMI, frequency of eating meals outside the home, exercise habits, or higher income levels. Subjects with annual income levels under $100,000 tended not to use calorie information. With respect to age, younger subjects (<35 years) did not use calorie information but use increased with age up to 55. For the whole sample, a lower percentage of male subjects used calorie information; Site 03 was the only site for which more males than females used calorie information.

DISCUSSION

For those subjects who were aware of Panera Bread's practice of calorie posting (n=141, 71%) prior to their visit to the restaurant, calorie posting was cited as a factor for choosing to eat at Panera Bread for a relatively small percentage of subjects (18%). However, during the actual visit to the restaurant, a larger percentage of subjects (43%) reported that the posted calorie information did influence the meal item selected at point-of-purchase. This disparity may indicate that food purchasing behavior is, to some extent, affected by having calorie information available. Results from prior studies are inconsistent.

Studies by Roberto,[55] Bassett,[63] Breck,[69] and Chen[70] indicated a positive association between the use of posted calorie information and the menu item selected. Chen reported a significant increase in awareness and use of calorie information post implementation of mandatory menu labeling in restaurants in King County, Washington.[70] Breck found that the percentage of consumers' choice of "healthier" menu items increased after Philadelphia implemented calorie labeling legislation in June 2010. Alternatively, in separate studies conducted by Harnack,[54] Vadiveloo,[59] Dumanovsky,[61] and Schornack[71], the presence of posted calorie information did not impact consumer choices. Furthermore, recent experimental studies conducted by Sun[72], James[73], and Pang and Hammond[74] indicated that the type of information provided at point-of-purchase plays an important role in choice of menu item. Qualitative

information (describing ingredients and important nutrients, listing amount of brisk walking needed to work off the calories of the menu item) as opposed to quantitative information (calorie counts, percentage of fats, protein, carbohydrates) was positively associated with choices of healthier menu items, whereas a similar association was not observed when calorie information alone was presented.

For the subjects influenced by the calorie information (43% of sample), the number of subjects with a healthy BMI (Group 1) outnumbered those with a non-healthy BMI (Group 2) for 3 of the 4 sites. However, the difference in percentage for the 2 groups was small; 54% vs 46%, respectively, for the entire sample. Based on this finding, BMI was not a significant factor in the use of calorie information for the sample. Similarly, for those subjects (57%) who were not influenced by the posted calorie information, the number of subjects with a healthy BMI outnumbered those with a non-healthy BMI for 2 of the 4 sites; but the number of subjects with a non-healthy BMI outnumbered those subjects with a healthy BMI for the other 2 sites, thus, revealing no correlation between BMI and non-use of the calorie information. These findings were not supported in a recent study conducted by Breck et al,[69] which also utilized a point-of-purchase survey to explore consumer characteristics including BMI; results indicated that subjects who were overweight or obese as opposed to healthy weight were more likely to use calorie information. It should be noted that valid comparison of these two studies

is tempered to a certain degree due to differences in sample size (n=669 vs n=200) and number of different restaurant chains surveyed: 3 (McDonald's, Burger King, KFC) as opposed to 1 (Panera Bread) with potentially different customer profiles.

A relatively high percentage (71%) of the 85 subjects who used the calorie information at Panera reported they were trying to lose weight over the preceding 6 months suggesting that the posted calorie information may have been a factor in their choice of menu item. However, in contrast, over half (57%) of the 115 subjects who were not influenced by the posted calorie information reported they were trying to lose weight. The most commonly reported reason for not using the posted calorie information was that the subject did not keep track of how many calories he/she consumes. This finding illustrates the importance of efforts to shift the consumer's eating habits from one of passive consumption to a more conscious awareness of daily food choices. As discussed by author Wendell Berry,[75] the food industry has successfully marketed the consumption of highly processed food that is tasty and cheap to the point that the consumer has become disassociated with the agricultural origin of the food; Berry argues that the consumer needs to take a more active role in the food selection process including seeking out locally grown food and preparing meals from scratch.

The second most frequently reported reason (21%) for not using the posted calorie information was the subject did not notice the posted

calorie information when looking over the menu. Studies by Krieger[32], Elbel,[56,57] and Dumanovsky[61] reported similar findings; percentages of consumers who did not notice the calorie information ranged between 40%-46%. Interestingly, the FDA guidelines for calorie posting for chain restaurants with at least 20 locations in the US, finalized on December 1, 2014, and required to be in use by December 1, 2015, mandate that the type size of the calorie information be at least the same size of the smallest type of the menu item or price displayed on the menu / menu board; that the calorie information be the same color, or a color "at least as conspicuous as the name of the associated standard menu item, and with the same contrasting background as the name of the associated standard menu item."[52] The fact that 21% of the subjects reported not noticing the calorie information suggests the need to make the calorie information more conspicuous, perhaps, by posting the calorie information in a different color from the menu item and price. As pointed out by Liu et al,[76] to optimize the effectiveness of menu labeling intervention, other cues on menus such as the traffic light symbols utilized by the United Kingdom, may increase use of calorie information by making it easier to identify more healthful menu items. Bassett et al,[63] found that customers at Subway restaurants where calorie counts were prominently displayed were more likely to purchase menu items with significantly lower calories. However, Elbel et al,[56,57] found that about half of the subjects surveyed did not notice the posted calorie counts despite being "prominently displayed".

A possible contributing factor for this finding was the survey location which was restricted to poor neighborhoods in New York City prompting an official of the Center of Public Interest, a non-profit agency in Washington, DC to remark "Nutrition is not the top concern of low-income people, who are probably the least amenable to calorie labeling".[77]

For the 174 subjects who reported not ordering dessert, 17% reported the main reason for not ordering dessert was that the dessert contained too many calories. Although this is a relatively low percentage, it may illustrate that the calorie information was used consciously to control the number of calories consumed at lunch. However, since the survey did not specifically ask if the posted calorie count was the reason for not ordering dessert, the possibility that the subject did not intend to order dessert prior to visiting the restaurant cannot be eliminated. It is unknown whether these same subjects would have ordered dessert if the number of calories were not displayed.

Mean frequency of eating out breakfast, lunch, and dinner was very similar for subjects who used the calorie information compared to the non-users. With the implementation of the calorie posting guidelines in December 2015, it would be interesting to study whether increased exposure to calorie information adversely affects restaurant patronage and profits as some in the restaurant industry have argued.[31,39] If sales of high-calorie high-profit menu items decrease due to changes in purchasing behavior, profit margins may be negatively affected.

The majority of the sample (n=134) reported that they never chose to eat at a particular restaurant within the past 6 months specifically because the restaurant posts calories on its menu. Given that chain restaurants, at the time this survey was conducted, were not yet required by the federal government to post calories on the menu, this question may have been of limited value since only a handful of chain restaurants elected to post calories before it was mandated by law. However, once the calorie posting guidelines are mandatory on December 1, 2015, future surveys may include this question to assess whether exposure to calorie information played a role in the consumer's decision to eat at a particular chain restaurant.

Of the 127 subjects who were trying to lose weight in the last 6 months, the majority of the subjects (n=89, or 70%) did use calorie posting as an intervention to lose weight. However, for this subset, the intervention was ranked as the least effective intervention by almost half of the subjects (n=40) and was reported as the most effective intervention by only 2 subjects. Of the 39 subjects who unsuccessfully tried to lose weight over the past 6 months, the lack of calorie information on the menu was ranked as the least important factor hampering weight loss. These results are consistent with the finding that 134 of the 200 subjects never choose to eat a restaurant because it may post calories on the menu. Again, given that the number of restaurants voluntarily posting calories prior to the law taking effect on December 1, 2015 was limited when the survey was

administered, this issue may be more relevant once the calorie posting guidelines are mandatory. Over time, the provision of calorie information at chain restaurants may affect the consumer's choice of restaurant if he/she is trying to lose weight and is using the calorie information to track daily food intake. It is well documented that changing people's eating habits, or any behavior, is a gradual and complex process due to the interplay of conscious factors such as food choice based on convenience and cost, unconscious factors involving emotional reactions to food stimuli, and environmental cues.[54,57,77,78,79] Continual reinforcement from a variety of environmental sources is therefore needed to promote healthier food choices. As Kahan points out, any initiative to change people's behavior must be well thought out and rooted in behavior theory to be effective.[80] Merely posting calorie information on a menu cannot be expected to instantly change people's behavior if the individual is not motivated or ready to change his/her behavior. The finding that eating out a lot was ranked as the most important factor hampering weight loss suggests the potential for posted calorie information to be an effective tool for weight loss in tandem with other environmental changes. Once calorie posting is mandatory for chain restaurants, future surveys may explore whether the calorie information on menus in restaurants is actually being used; if the information is not used, identifying the specific reasons may lead to refinements of the calorie posting guidelines to increase consumer use of the information. The three most frequently reported reasons cited

by subjects in this survey were "I don't keep track of how many calories I consume", "I didn't notice the calorie counts when I looked over the menu selections", and "I am not trying to lose weight". Based on these findings, in addition to ensuring the calorie information is noticeable, public health campaigns should be implemented to emphasize the importance of healthy eating habits, regardless of weight; and to encourage consumer awareness of daily caloric intake.

For those subjects who exercised, there was no correlation between subjects who used versus did not use the calorie information and frequency of exercise in the past 6 months. Both the users and non-users exercised between 2 and 5 days per week. However, subjects who did not exercise at all (average number of days per week = 0) were more likely not to use the calorie information suggestive of a pattern of lifestyle.

No correlation was seen between nutrition knowledge and BMI. The estimate for the average number of calories an adult should consume on a daily basis reported by the healthy group and the non-healthy group were both close to the 2000 calorie recommended daily intake. This finding suggests that nutrition knowledge alone does not necessarily translate into healthy eating habits. Many factors, at the individual level, and in the built environment contribute to an individual's eating habits including motivational factors, family eating patterns, and living in communities with a high proportion of fast food restaurants.[76,78]

Of the 200 subjects, more females than males (45% vs 38%) used the calorie information. However, since this survey used a convenience sample, it is not possible to generalize this finding to the population at large.

The age group with the highest use of caloric information included subjects who were middle-aged (range 35–64 years), which may indicate an increased awareness of calorie consumption of this age group consistent with the challenge of maintaining one's weight as metabolic rate and muscle mass decreases with age. An individual must expend more energy just to maintain the same weight.[81,82,83,84] As such, the usefulness of calorie posting for this age group is obvious. The two youngest age groups, 18–24 and 25-34, together accounted for 37% (n=43) of the 115 subjects who did not use the posted calorie information; the most common reasons reported among these age groups was that they did not keep track of how many calories they consumed (n=31) and they were not trying to lose weight. The reason why the subjects did not keep track of the number of calories consumed or why they were not trying to lose weight was not explored. These findings may be indicative of a passive attitude regarding food choices and may increase the likelihood of gaining weight with age.

Although subjects with a higher annual income and education level were more likely to use the calorie information at point-of-purchase compared to those subjects with a lower income and less education, it is

interesting to note that less than half (47%) of the subjects with the highest education level used the information. This finding is consistent with previous studies which indicated that eating habits are influenced by multiple factors in the environment and at the individual level.[8,33-38,70,80]

Since the vast majority (87%) of the sample were White, it is not possible to state whether there is an association between other races and the use of calorie information. The fact that only 58% of the White subjects used the calorie information suggests that race may not play a role in the use or non-use of calorie information. However, additional studies are needed with a more diverse sample with respect to race.

Study strengths included highly reliable BMI data. Although height and weight were self-reported and not measured, questionable responses were readily identified through observation since the survey responses were immediately reviewed by the researcher on-site upon completion of the survey. The debit card was an effective incentive resulting in a relatively high recruitment rate. As a result, the degree to which the sample was subject to self-selection was reduced.

Another strength of the survey methodology was the elimination of recall bias. Since the subject had just eaten at Panera Bread, there was no time delay between the meal and administration of the survey thereby maximizing accurate responses to the food choice questions.

Limitations of the survey included the use of a convenience sample. It is possible that health conscious consumers were more likely to

participate thereby introducing some degree of bias. However, the relatively low refusal rate suggests self-selection bias was minimal. Reasons for refusal were not collected. Additionally, since the survey was conducted mostly on the weekends, the menu item selected by the subjects may or may not have been representative of his/her usual eating habits in general. Repeated surveys during the work week at preset intervals over a long period of time are therefore needed to accurately identify eating habits.[80]

Only one restaurant chain was surveyed. Therefore, survey responses may not be generalizable to other chains with a different customer profile. Likewise, the 4 Panera Bread locations surveyed may not be representative of the Panera Bread customer base as a whole. Because the survey was a street intercept survey, the number of questions was limited to minimize rate of refusal and to ensure a reasonable amount of time to complete the survey.

The survey question "Have you been successful in losing weight in the past 6 months?" did not include a definition of "successful", therefore, different interpretations of successful could have led to different responses thereby negatively affecting the validity of the question. Likewise, for the contributing factor hampering weight loss, “I eat out a lot”, a "lot" was not quantified and may have degraded the question's validity.

CONCLUSIONS

A multitude of studies measuring the effectiveness of posted calorie information over the past 10 years have yielded conflicting results in part due to different methodologies and sample size. This survey revealed that less than half of the sample used the posted calorie information at Panera Bread at point-of-purchase. Furthermore, no particular patterns emerged regarding the personal characteristics of those consumers who used the information compared to those who did not.

Government at all levels and the private sector need to take a more active role to promote the use of calorie information posted on menus and menu boards to increase consumer use of this information. Offering financial incentives to the restaurant industry, for example, for participation in long term monitoring programs to assess the effectiveness of calorie posting may lead to a more collaborative and less antagonistic relationship between government and private industry.

Multiple strategies need to be developed and implemented to address the obesity epidemic due to the complex nature of the problem. Public health campaigns via mass media to educate Americans regarding the serious health risks associated with obesity are needed. These campaigns should be long term initiatives to try to gradually change consumers' eating habits. The public health campaign to reduce the prevalence of cigarette smoking via graphic television messages was one of the initiatives that lead to the decreased prevalence of cigarette

smoking in the US and provides evidence of the ability of mass media to change consumer behavior. Schools have started initiatives to improve the quality of the meals served by offering more nutritious menu items which are lower in calories; this is an important initiative to try to develop healthier eating habits prior to adulthood and needs to continue. Other possible strategies include increased availability of healthier food, especially in low income neighborhoods, to help offset the high calorie fast food served by the ubiquitous chain restaurants; lower prices for healthier food sold in supermarkets; and taxes on high calorie menu items served in company and school cafeterias.

Once the calorie posting regulations are in effect, currently slated for December 2015, the federal government should commit to funding periodic surveillance activities to assess the efficacy of the menu labeling initiative and to revise the calorie posting guidelines as needed. Without such an organized approach by the federal government, the efficacy of the new calorie posting initiative as an intervention to help reduce the prevalence of obesity in the US will be compromised.

APPENDIX A

Table 1. Survey Sample Demographics: Lexington (Site 01)

Demographics	Site 01		Healthy Weight (Group 1)		Non-Healthy Weight (Group 2)	
	n	%	n	%	n	%
Total Number of Subjects	50	100	25	50	25	50
Gender						
Male	19	38	7	37	12	63
Female	31	62	19	61	12	39
Age (years)						
18-24	6	12	5	83	1	17
25-34	3	6	2	67	1	33
35-44	8	16	2	25	6	75
45-54	10	20	6	60	4	40
55-64	16	32	6	38	10	63
65-74	6	12	3	50	3	50
75 or older	1	2	1	100	0	0
Education						
Less than high school	1	2	0	0	1	100
High school (twelfth grade)	2	4	1	50	1	50
Some college	6	12	3	50	3	50
2-year college	1	2	1	100	0	0
4-year college or more	40	80	20	50	20	50
Race*						
White	45	90	22	49	23	51
Black or African American	1	2	0	0	1	100
Asian	4	8	2	50	2	50
Native Hawaiian or other Pacific Islander	2	4	2	100	0	0
Other	0	0	0	0	0	0
Income**						
Less than <$20,000	2	4	1	50	1	50
$20,000-39,999	5	11	3	60	2	40
$40,000-59,999	3	7	0	0	1	100
$60,000-79,999	1	2	0	0	1	100
$80,000-99,999	6	13	3	50	3	50
$100,000-124,999	9	20	5	56	4	44
$125,000-149,999	3	7	0	0	3	100
$150,000 or higher	17	37	10	59	7	41

* Race: n>50 due to 2 subjects being of mixed race
** Income: n=46 (4 subjects refused to answer)

Table 2. Survey Sample Demographics: Cambridge (Site 02)

Demographics	Site 02		Healthy Weight (Group 1)		Non-Healthy Weight (Group 2)	
	n	%	n	%	n	%
Total Number of Subjects	50	100	24	48	26	52
Gender						
Male	24	48	10	42	14	58
Female	26	52	14	54	12	46
Age (years)						
18-24	9	18	8	89	1	11
25-34	10	20	4	40	6	60
35-44	11	22	5	45	6	55
45-54	7	14	1	14	6	86
55-64	9	18	4	44	5	56
65-74	4	8	2	50	2	50
75 or older	0	0	0	0	0	0
Education						
Less than high school	1	2	0	0	1	100
High school (twelfth grade)	4	8	4	100	0	0
Some college	3	6	1	33	2	67
2-year college	1	2	0	0	1	100
4-year college or more	41	82	20	49	21	51
Race*						
White	43	81	21	49	22	51
Black or African American	2	4	0	0	2	100
Asian	6	11	5	83	1	17
Native Hawaiian or other Pacific Islander	0	0	0	0	0	0
Other	2	4	0	0	2	100
Income						
Less than <$20,000	2	4	2	100	0	0
$20,000-39,999	2	4	1	50	1	50
$40,000-59,999	6	12	4	67	2	33
$60,000-79,999	6	12	2	33	4	67
$80,000-99,999	7	14	2	29	5	71
$100,000-124,999	6	12	3	50	3	50
$125,000-149,999	10	20	4	40	6	60
$150,000 or higher	11	22	7	64	4	36

*Race: n>50 due to 3 subjects being of mixed race

Table 3. Survey Sample Demographics: Natick (Site 03)

Demographics	Site 03		Healthy Weight (Group 1)		Non-Healthy Weight (Group 2)	
	n	%	n	%	n	%
Total Number of Subjects	50	100	25	50	25	50
Gender						
Male	19	38	5	26	14	74
Female	31	62	20	65	11	35
Age (years)						
18-24	12	24	10	83	2	17
25-34	7	14	4	57	3	43
35-44	6	12	2	33	4	67
45-54	10	20	3	30	7	70
55-64	10	20	3	30	7	70
65-74	4	8	3	75	1	25
75 or older	1	2	0	0	1	100
Education						
Less than high school	0	0	0	0	0	0
High school (twelfth grade)	6	12	5	83	1	17
Some college	5	10	4	80	1	20
2-year college	4	8	2	50	2	50
4-year college or more	35	70	14	40	21	60
Race						
White	43	86	21	49	22	51
Black or African American	3	6	0	0	3	100
Asian	3	6	3	100	0	0
Native Hawaiian or other Pacific Islander	0	0	0	0	0	0
Other	1	2	1	100	0	0
Income						
Less than <$20,000	2	4	2	100	0	0
$20,000-39,999	0	0	0	0	0	0
$40,000-59,999	8	16	3	38	5	63
$60,000-79,999	4	8	1	25	3	75
$80,000-99,999	4	8	3	75	1	25
$100,000-124,999	11	22	5	45	6	55
$125,000-149,999	2	4	1	50	1	50
$150,000 or higher	19	38	9	47	10	53

Table 4. Survey Sample Demographics: Worcester (Site 04)

Demographics	Site 04		Healthy Weight (Group 1)		Non-Healthy Weight (Group 2)	
	n	%	n	%	n	%
Total Number of Subjects	50	100	28	56	22	44
Gender						
Male	19	38	9	47	10	53
Female	31	62	19	61	12	39
Age (years)						
18-24	16	32	14	88	2	13
25-34	3	6	2	67	1	33
35-44	2	4	1	50	1	50
45-54	9	18	3	33	6	67
55-64	13	26	4	31	9	69
65-74	5	10	3	60	2	40
75 or older	2	4	1	50	1	50
Education						
Less than high school	0	0	0	0	0	0
High school (twelfth grade)	5	10	2	40	3	60
Some college	10	20	6	60	4	40
2-year college	7	14	4	57	3	43
4-year college or more	28	56	16	57	12	43
Race*						
White	43	84	23	53	20	47
Black or African American	1	2	0	0	1	100
Asian	3	6	2	67	1	33
Native Hawaiian or other Pacific Islander	0	0	0	0	0	0
Other	4	8	4	100	0	0
Income**						
Less than <$20,000	4	8	3	75	1	25
$20,000-39,999	9	18	3	33	6	67
$40,000-59,999	3	6	2	67	1	33
$60,000-79,999	5	10	3	60	2	40
$80,000-99,999	8	16	5	63	3	38
$100,000-124,999	5	10	5	100	0	0
$125,000-149,999	7	14	3	43	4	57
$150,000 or higher	8	16	3	38	5	63

* Race: n>50 due to being of mixed race;
** Income: n=49 (1 subject refused to answer)

APPENDIX B: SURVEY INSTRUMENT

INTRODUCTION

Hello. I am a graduate student at Tufts University. Did you just eat lunch at Panera Bread? *If response is yes, continue script*. I am conducting a brief survey on the use of calorie information posted on restaurant menus / menu boards. The survey should take about 10 minutes and you will be immediately rewarded with your choice of a $10 debit card to Stop & Shop, Whole Foods, or Starbucks upon completion. The survey is anonymous and no personal identifying information is collected. Your responses will be pooled with all survey participants.

CONSUMER SURVEY: POSTING CALORIES IN RESTAURANTS

Site #: _____ ID#: ____ ____ ____

INSTRUCTIONS: Unless otherwise indicated, please choose one response for each question by placing an 'X' on the appropriate line. ALL RESPONSES ARE ANONYMOUS.

1. *Prior* to visiting Panera Bread, were you aware that Panera Bread posts the number of calories next to each menu item on the menu board?

   ____Yes ____No > Go to #3

2. Was Panera Bread's practice of posting the number of calories next to each menu item on the menu board one of the reasons you decided to eat at Panera Bread?

   ____Yes ____No

3. Did the posted calorie counts influence your menu selection for lunch; in other words, did you select the item because it was lower in calories than some of the other menu items?

   ____Yes > Go to #5 ____No

4. What were the reason(s) the posted calorie counts did NOT influence your menu selection? Please place an 'X' for all that apply.
   ____When I eat out, I don't like to think of calories; it ruins the experience.
   ____I don't believe choosing a "lower" calorie item will make a difference in my health.
   ____I couldn't see the calorie counts; the size of the posted calorie information was too small.
   ____I didn't notice the calorie counts when I looked over the menu selections.
   ____Too time consuming to consult the calorie counts.
   ____I don't keep track of how many calories I consume.
   ____I am not trying to lose weight.

5. Did you also order dessert?

   ____Yes > Go to #7 ____No

CONSUMER SURVEY: POSTING CALORIES IN RESTAURANTS

Site #: _____ ID#:____ ____ ____

6. What was the *main* reason you did not eat dessert?

____I was too full.
____The dessert contained too many calories.
____I didn't like any of the selections.
____I am trying to lose weight.
____Other

7. In the last 6 months, *on the average*, how many days a week have you eaten **dinner** out?

____0 days ____4 days
____1 day ____5 days
____2 days ____6 days
____3 days ____7 days

8. In the last 6 months, *on the average*, how many days a week have you eaten **lunch** out?

____0 days ____4 days
____1 day ____5 days
____2 days ____6 days
____3 days ____7 days

9. In the last 6 months, on the average, how many days a week have you eaten **breakfast** out?

____0 days ____4 days
____1 day ____5 days
____2 days ____6 days
____3 days ____7 days

10. In the last 6 months, how often did you choose to eat at a particular restaurant because the restaurant posts calories on the menu/menu board?

____All the time ____Sometimes ____Never

11. In the last 6 months, have you been trying to lose weight?

____Yes ____No > Go to #15

CONSUMER SURVEY: POSTING CALORIES IN RESTAURANTS

Site #: _____ ID#: ____ ____ ____

12. Listed below are 5 weight loss interventions. Please rank the effectiveness of the interventions *for you personally* with 1 being the most effective intervention, 2 being the second most effective intervention, etc., and 5 being the least effective intervention. **Enter N/A for any intervention you do not personally use and do not enter a number.**

____Diet (self-administered or weight loss program such as Weight Watchers)
____Exercise more often
____Eat out less often
____I eat out at restaurants that posts calorie counts on the menu
____When I eat out, I don't eat the entire meal and/or I take a "doggie bag" home

13. Have you been successful in losing weight in the past 6 months?

____Yes > Go to #15 ____No

14. Many factors can hamper a person's efforts to lose weight. Of the 5 contributing factors listed below, please rank them in order of importance *for you personally* with 1 being the main contributing factor that prevents you from losing weight, 2 being the next most important factor, etc., and 5 being the least important factor. **If the contributing factor does not apply to you personally, enter N/A and do not enter a number.**

____When I eat out, I usually eat the entire meal even if the portion size is big.
____I eat out a lot.
____I don't know how many calories I am consuming when I eat out because the menu does not list the calorie count.
____I don't know what I should eat to lose weight.
____I am not motivated enough to change my eating habits.

15. In the past 6 months, on the average, how many days a week did you exercise for at least 30 minutes?

____0 days ____4 days
____1 day ____5 days
____2 days ____6 days
____3 days ____7 days

CONSUMER SURVEY: POSTING CALORIES IN RESTAURANTS

Site #: _____ ID #: ____ ____ ____

16. According to the US Department of Agriculture, what is the approximate total number of calories an adult should consume on a daily basis? Please record in the space below.

    _____ calories

17. Are you male or female?

    ____Male ____Female

19. How tall are you in inches? For example, 5 feet 6 inches = 66 inches (1 foot=12 inches). Please record in the space below.

    Number of inches: _____

20. What is your current weight? Please record in the space below (whole number only).

    Number of pounds: _____

21. What is the highest level of education you have completed?

    ____Less than high school
    ____High School (twelfth grade)
    ____Some College
    ____2-year College
    ____4-year College or more

22. What is your race?

    ____White
    ____Black or African American
    ____Asian
    ____Native Hawaiian or other Pacific Islander
    ____Other

23. What is your total annual household income before taxes?

    ____Less than $20,000
    ____$20,000–39,999
    ____$40,000–59,999
    ____$60,000−79,999
    ____$80,000–99,999
    ____$100,000–124,999
    ____$125,000–149,999
    ____$150,000 or higher

CONSUMER SURVEY: POSTING CALORIES IN RESTAURANTS

Site#: _____ ID #: ____ ____ ____

THIS IS THE END OF THE SURVEY.

THANK YOU FOR YOUR PARTICIPATION IN THE SURVEY.
FOR A COPY OF THE SURVEY RESULTS, PLEASE SEND AN EMAIL TO: KAREN.LEVINE@TUFTS.EDU

Debit Card #: _____

____Starbucks ____Whole Foods ____Stop & Shop

BIBLIOGRAPHY

[1] Franco Sassi, "Obesity Update 2012," *OECD,* Accessed January 27, 2013, http://www.oecd.org/els/healthpoliciesanddata/49716427.pdf.

[2] *Wikipedia*, "Obesity," http://en.wikipedia.org/wiki/Obesity. Accessed 01 May 2012.

[3] Katherine M Flegal, PhD and Margaret D Carroll, MSPH, "Prevalence and Trends in Obesity among US Adults, 1999-2008", *Journal of the American Medical Association* 303 no. 3 (2011):235.

[4] World Health Organization, "Obesity: Preventing and managing the global epidemic", *Report of a WHO Consultation (WHO Technical Report Series 894)* (2000).

[5]http://www.cdc.gov/cdctv/ObesityEpidemic/, accessed January 27, 2013.

[6] http://en.wikipedia.org/wiki/Body_mass_index/, accessed June 14, 2015.

[7] http://www.who.int/mediacentre/factsheets/fs311/en/, accessed June 14, 2015.

[8] Boyd A Swinburn and Gary Sacks, "The global obesity pandemic: shaped by global drivers and local environments," *The Lancet* 378 no. 9793 (2011): 804, DOI: http://dx.doi.org/10.1016/S0140-6736(11)60813-1.

[9] Michael Pollan, *The Omnivore's Dilemma* (New York: Penguin Books Ltd, 2006), 102, 103.

[10] Gary Egger and Boyd A Swinburn, "An 'ecological' approach to the obesity pandemic," *British Medical Journal* 315 (1997): 477, doi: http://dx.doi.org/10.1136/bmj.315.7106.477.

[11] Boyd A Swinburn and Gary Egger, "Dissecting obesogenic environments: The weight and overweight men and women," *Preventive Medicine* 29 (1999): 563.

[12] Barbara J Rollsand Erin Morris, "Portion size of food affects energy intake in normal-weight and overweight men and women," *The American Journal of Clinical Nutrition*, 76, no. 6 (2002):1207.

[13] Nicole Diliberti and Peter L Bordi, "Increased Portion Size Leads to Increased Energy Intake in a Restaurant Meal," *Obesity Research Journal* 12, no. 3 (2004):562, DOI: 10.1038/oby.2004.64.

[14] Corneel Vandelanotteand Takemi Sugiyama, "Associations of leisure-time internet and computer use with overweight and obesity, physical activity and sedentary behaviors: cross-sectional study," *Journal of Medical Internet Research* 11, no. 3 (2009):e28, http://dx.doi.org/10.2196/jmir.1084.

[15] Timothy Church and Diana Thomas, "Over 5 decades in US occupation related physical activity and their associations with obesity," *PLOS ONE* 6, no. 5. (2011):e19657, doi: 10.1371/journal.pone.0019657.

[16] Y Clare Wang, MD, and Klim McPherson, PhD, "Health and economic burden of the projected obesity trends in the USA and the UK," *The Lancet* 378, no. 9793(2011):815, doi: 10.1016/S0140-6736(11)60814-3.

[17] World Cancer Research Fund and American Institute for Cancer Research, "Food, nutrition, physical activity, and the prevention of cancer: a global perspective, 2007," *Washington DC: American Institute for Cancer Research* (2007).

[18] Majid Ezzati, "Comparative quantification of health risks: global and regional burden of disease attributable selected major risk factors," *World Health Organization* (2004).

[19] Australian Institute of Health and Welfare (AIHW) and National Heart Foundation of Australia, "The relationship between overweight, obesity, and cardiovascular disease," *Canberra:AIHW (Cardiovascular Disease Series No. 23)*, (2004).

[20] David W Haslam and W Phillip T James, "Obesity," *The Lancet* 366, no. 9492 (2005):1197, DOI: http://dx.doi.org/10.1016/S0140-6736(05)67483-1.

[21] Susan T Stewart, PhD, and David M Cutler, PhD, "Effects of Obesity and Smoking on US Life Expectancy," *New England Journal of Medicine* 361 (2009):2252, DOI: 10.1056/NEJMc1000079.

[22] S Jay Olshansky, PhD and Douglas J Passaro, MD, "A Potential Decline in Life Expectancy in the United States in the 21st Century," *New England Journal of Medicine* 352 (2005):1138, DOI: 10.1056/NEJMsr043743.

[23] KM Venkayt Narayan and James P Boyle, "Lifetime Risk for Diabetes Mellitus in the United States," *The Journal of the American Medical Association* 290, no. 14 (2003):1884, doi:10.1001/jama.290.14.1884.

[24] Kenneth E Thorpe and Curtis S Florence "The Impact of Obesity on Rising Medical Spending," *Health Affairs* W4(suppl) (2004): 480, doi: 10.1377/hlthaff.w4.480.

[25] Youfa Wang and May A Beydoun, "Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic," *Obesity (Silver Spring)* 16, no 10 (2008):2323, doi: 10.1038/oby.2008.351. Epub 2008 Jul 24.

[26] Eric A Finkelstein and Justin G Trogdon, "Annual medical spending attributable to obesity: payer-and service-specific estimates," *Health Affairs* 28, no. 5 (2009):822, doi: 10.1377/hlthaff.28.5.w822.

[27] www.letsmove.gov/about, accessed May 8 2013.

[28] www.cdc.gov/obesity/stateprograms/cdc.html, accessed May 8 2013.

[29] http://www.cdc.gov/nccdphp/dch/programs/partnershipstoimprovecommunityhealth/pich.html accessed June 15 2015.

[30] Mark Berman, MD, and Risa Lavizzo-Mourey, MD, "Obesity Prevention in the Information Age: Caloric Information at the Point of Purchase," *The Journal of the American Medical Association* 300, no. 4 (2008):433, doi:10.1001/jama.300.4.433.

[31] David S Ludwig and Kelly D Brownell, "Public Health Action amid Scientific Uncertainty: the Case of Restaurant Calorie Labeling Regulations," *Journal of American Medical Association* 302, no. 4 (2009):434, doi:10.1001/jama.2009.1045

[32] James W Krieger and Nadine L Chan, "Menu Labeling Regulations and Calories Purchased at Chain Restaurants," *American Journal of Preventive Medicine* 44, no. 6 (2013):595, DOI: http://dx.doi.org/10.1016/j.amepre.2013.01.031.

[33] Audrey Eertmans and Frank Baeyens, "Food likes and their relative importance in human eating behavior: review and preliminary suggestions for health promotion," *Health Education Research Theory and Practice* 16, no. 4 (2001):443.

[34] Steve L Gortmaker, PhD, and Boyd A Swinburn, MD, "Changing the future of obesity: science, policy, and action." *The Lancet* 378 (2011):838, DOI: http://dx.doi.org/10.1016/S0140-6736(11)60815-5.

[35] Nicole Larson and Mary Story, "A review of environmental influences on food choices," *Annals of Behavioral Medicine* 38 (suppl) (2009):S56.

[36] Lukar E Thornton and Robert W Jeffery, "Barriers to avoiding fast-food consumption in an environment supportive of unhealthy eating," *Public Health Nutrition* 16, no. 12 (2012):2105, DOI: http://dx.doi.org/10.1017/S1368980012005083.

[37] Jennifer Schindler and Kamila Kiszko, "Environmental and Individual Factors Affecting Menu Labeling Utilization: A Qualitative Research Study," *Journal of Academy of Nutrition and Dietetics* 113, no. 5 (2013):667, doi:10.1016/j.jand.2012.11.011.

[38] Fuzhong Li and Peter Harmer, "Obesity and the built environment: does the density of neighborhood fast-food outlets matter?," *American Journal of Health Promotion* 23, no. 3 (2009):203.

[39] Thomas A Farley and Anna Caffarelli, "New York City's fight over calorie labeling," *Health Affairs* 28, no.6 (2009): w1098, DOI: 10.1377/hlthaff.28.6.w1098.

[40] Hayden Stewart and Noel Blisard, "Let's eat out: Americans weigh taste, convenience, and nutrition," *United States Department of Agriculture. Economic Information Bulletin*; no.19 (2006). http://www.ers.usda.gov/publications/eib19/eib19.pdf Accessed 06 May 2012.

[41] Biing-Hwan Lin and Elizabeth Frazao, "Away-from-home foods increasingly important to quality of American diet," *United States Department of Agriculture Economic Research Service Agriculture Information Bulletin* no.749 (1999).

[42] Biing-Hwan Lin and Elizabeth Frazao, "Nutritional Quality of Foods at and Away from Home," *Food Review* 20 (1997):33.

[43] Lisa R Young, PhD, and Marion Nestle, PhD, "The Contribution of Expanding Portion Sizes to the Obesity Epidemic," *American Journal of Public Health* 92, no. 2 (2002):246.

[44] Lisa R Young, PhD, and Marion Nestle, PhD, "Expanding portion sizes in the US marketplace: Implications for nutrition counseling," *Journal of the American Diet Association* 103 (2003):231, DOI: http://dx.doi.org/10.1053/jada.2003.50027.

[45] Hank Cardello and Doug Garr, *Stuffed: An Insider's Look at Who's (Really) Making America Fat and How the Food Industry Can Fix It* (New York: HarperCollins, 2009).

[46] Scott Burton and Elizabeth H Creyer, "Attacking the Obesity Epidemic: the Potential Health Benefits of Providing Nutrition Information in Restaurants," *American Journal of Public Health* 96, no. 9 (2006):1669, doi: 10.2105/AJPH.2004.054973.

[47] Barbara J Rolls, "The Supersizing of America: Portion Size and the Obesity Epidemic," *Nutrition Today* 38, no. 2 (2003):42.

[48] Maureen O'Dougherty and Lisa J Harnack, "Nutrition labeling and value size pricing at fast-food restaurants: a consumer perspective. *American Journal of Health Promotion* 20, no. 4 (2006):247, DOI: 10.4278/0890-1171-20.4.247.

[49] Amy M Lando and Judith Labiner-Wolfe, "Helping Consumers Make More Healthful Food Choices: Consumer Views on Modifying Food Labels and Providing Point-of-Purchase Nutrition Information at Quick-Service Restaurants," *Journal of Nutrition Education and Behavior* 39, no. 3 (2007):157, DOI: http://dx.doi.org/10.1016/j.jneb.2006.12.010.

[50] Julie E Obbagy and Margaret D Condrasky, "Chefs' Opinions about Reducing the Calorie Content of Menu Items in Restaurants," *Obesity* 19, no. 2 (2011):332, DOI: 10.1038/oby.2010.188.

[51] "Appendix C: The Committee's Recommendations, Strategies, and Action Steps. Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation," *Food and Nutrition Board* (Washington, DC: The National Academies Press, 2012).

[52] "Part II Department of Health and Human Services Food and Drug Administration 21 CFR Parts 11 and 101 Food Labeling; Nutrition Labeling of Standard Menu Items in Restaurants and Similar Retail Food Establishments; Calorie Labeling of Articles of Food in Vending Machines; Final Rule," *Federal Register* 79, no. 230 (2014), https://www.federalregister.gov/articles/2014/12/01/2014-27833/food-labeling-nutrition-labeling-of-standard-menu-items-in-restaurants-and-similar-retail-food#h-65.

[53] http://thinkprogress.org/health/2013/03/13/1703541/fda-menu-labeling, accessed May 8, 2013.

[54] Lisa J Harnack and Simone A French, "Effects of calorie labeling and value size pricing on fast food meal choices: Results from an experimental trial," *International Journal of Behavioral Nutrition and Physical Activity* 5 (2008):63, DOI:10.1186/1479-5868-5-63.

[55] Christina A Roberto and Peter D Larsen, "Evaluating the Impact of Menu Labeling on Food Choices and Intake," *American Journal of Public Health* 100, no. 2 (2010):312, DOI: 10.2105/AJPH.2009.160226.

[56] Brian Elbel and Rogan Kersh, "Calorie Labeling and Food Choices: A First Look at the Effects on Low-income People in New York City," *Health Affairs* 28, no. 6 (2009): w1110, DOI: 10.1377/hlthaff.28.6.w1110.

[57] Brian Elbel and Tod Mijanovich, "Calorie Labeling, Fast Food Purchasing and Restaurant Visits," *Obesity Research Journal* 21, no. 11 (2013):2172, DOI: 10.1002/oby.20550.

[58] Eric A Finkelstein and Kiersten L, Strombotne, "Mandatory Menu Labeling in One Fast-Food Chain in King County, Washington," *American Journal of Preventive Medicine* 40, no. 2 (2011):122, DOI: http://dx.doi.org/10.1016/j.amepre.2010.10.019.

[59] Maya K Vadiveloo and L Beth Dixon, "Consumer purchasing patterns in response to calorie labeling legislation in New York City," *International Journal of Behavioral Nutrition and Physical Activity* 8, no. 51 (2011), DOI::10.1186/1479-5868-8-51.

[60] Brian Bollinger and Phillip Leslie, "Calorie Posting in Chain Restaurants," *National Bureau of Economic Research, Inc.* 2010.

[61] Tamara Dumanovsky and Christina Y Huang, "Changes in energy content of lunchtime purchases from fast food restaurants after introduction of calorie labeling: cross sectional customer surveys," *British Medical Journal* 343 (2011):d4464, DOI: http://dx.doi.org/10.1136/bmj.d4464.

[62] Yong H Chu and Edward A Frongillo, "Improving Patrons' Meal Selections through the Use of Point-of-Selection Nutrition Labels," *American Journal of Public Health* 99, no. 11 (2009):2001, DOI: 10.2105/AJPH.2008.153205.

[63] Mary T Bassett, MD and Tamara Dumanovsky, "Purchasing Behavior and Calorie Information at Fast-Food Chains in New York City, 2007," *American Journal of Public Health* 98, no. 8 (2008):1457.

[64] "Lower-Calorie Foods – It's Just Good Business," *Hudson Institute Report; Obesity Solutions Initiative*, (2013); http://www.hudson.org/events/998-lower-calorie-foods-it-s-just-good-business22013.

[65] Lorien E Urban and Alice H Lichtenstein, "The Energy Content of Restaurant Foods without Stated Calorie Information," *JAMA Internal Medicine* 173, no. 14 (2013):1292, DOI:10.1001/jamainternmed.2013.6163

[66] http://www.cbsnews.com/news/panera-breads-calorie-postings-the-writings-on-the-wall-literally/, accessed June 21, 2015.

[67] Mick P Couper, *Designing Effective Web Surveys* (Cambridge: Cambridge University Press, 2008).

[68] Don A Dillman and Jolene D Smyth, *Internet, Mail, and Mixed-Mode Surveys: The Tailored Design Method*, 3rd edition. (Hoboken: John Wiley & Sons, 2009).

[69] Andrew Breck and Johnathan Cantor, "Who reports noticing and using calorie information posted on fast food restaurant menus?," *Appetite* 81, no. 1 (2014):30, doi:10.1016/j.appet.2014.05.027.

[70] Roxana Chen and Michael Smyser, "Changes in awareness and use of calorie information after mandatory menu labeling in restaurants in King County, Washington," *American Journal of Public Health*105, no. 3 (2015):546.

[71] Bethany Schornack and Susan Rozensher, "The Effects of Menu Calorie Labeling on Consumer Food Choice Behavior," *American Journal of Health Sciences* 5, no. 1 (2014):29.

[72] Sun YuHua, "Menu nutrition labels' effects on customer's attitudes toward menu and restaurant intentions - the moderating role of

psychosocial factors," *Journal of Foodservice Business Research* 16, no. 2 (2013):139.

[73] Ashley James and Beverley Adams-Huet, "Menu Labels Displaying the Kilocalorie Content or the Exercise Equivalent: Effects on Energy Ordered and Consumed in Young Adults," *American Journal of Health Promotion* 29, no. 5 (2015):294, DOI: http://dx.doi.org/10.4278/ajhp.130522-QUAN-267.

[74] Jocelyn Pang and David Hammond, PhD, "Efficacy and consumer preferences for different approaches to calorie labeling on menus," *Journal of Nutrition Education and Behavior* 45, no. 6 (2013):669.

[75] Wendall Berry, *What Are People For?* (San Francisco: North Point Press, 1990) essay: The pleasures of eating.

[76] Peggy J Liu and Jessica Wisdom, "Using behavioral economics to design more effective food policies to address obesity," *Applied Economic Perspectives and Policy* 36, no. 1 (2014):6, DOI:10.1093/aepp/ppt027.

[77] Anemone Hartocollis, "Calorie Postings Don't Change Habits, Study Finds," *The New York Times,* accessed October 30, 2011 *(Discussion)* http://www.nytimes.com/2009/10/06/nyregion/06calories.html?pagewanted=print.

[78] Ted O'Donoghue and Matthew Rabin, "The Economics of Immediate Gratification," *Journal of Behavioral Decision Making* 13, no. 2 (2000):233, DOI: 10.1002/(SICI)1099-0771(200004/06)13:2<233::AID-BDM325>3.0.CO;2-U.

[79] Daniel Kahneman, "Maps of Bounded Rationality: Psychology for Behavioral Economics," *The American Economic Review* 93, no. 5 (2003):1449.

[80] Scott Kahan, *Health Behavior Change in Populations: The State of the Evidence and Roles for Key Stakeholders* (Baltimore: Johns Hopkins University Press, 2014).

[81] Rachel E Van Pelt and Frank A Dinneno, "Age-related decline in RMR in physically active men: relation to exercise volume and energy intake," *American Journal of Physiology – Endocrinology and Metabolism* 281, no. 3 (2001): 633.

[82] Rachel E Van Pelt and Pamela P Jones, "Regular Exercise and the Age-Related Decline in Resting Metabolic Rate in Women," *Journal of Clinical Endocrinology and Metabolism* 82, no. 10 (1997):320, DOI: http://dx.doi.org/10.1210/jcem.82.10.4268.

[83] Naomi K Fukagawa and Linda G Bandini, "Effect of age on body composition and resting metabolic rate," *American Journal of Physiology - Endocrinology and Metabolism* 259 (1990):233.

[84] Gabriella Boston, “Basal metabolic rate changes as you age,” *The Washington Post* online edition, accessed June 17, 2015, http://www.washingtonpost.com/lifestyle/wellness/basal-metabolic-rate-changes-as-you-age/2013/03/05/d26b1c18-80f1-11e2-a350-49866afab584_story.html.