I, Aleesha M. Faehr, hereby submit this original work as part of the requirements for the degree of Master of Science in Nutrition.

It is entitled:
The Relationship Between the Availability of Non-Calorie Nutrition Information at the Point of Purchase and an Individual’s Food Purchasing Behavior at Chain Restaurants in King County, Washington

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The Relationship Between the Availability of Non-Calorie Nutrition Information at the Point of Purchase and an Individual's Food Purchasing Behavior at Chain Restaurants in King County, Washington

A thesis submitted to the Division of Research and Advanced Studies of the University of Cincinnati in partial fulfillment of the requirements for the degree of Masters of Science in the Department of Nutrition Sciences of the College of Allied Health Sciences

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ABSTRACT

Background

Nutrition plays a significant role in the increasing incidence of obesity and chronic disease in the US. With a greater proportion of the average American’s diet being eaten outside of the home, many health experts are advocating for required labeling of the content of foods at the point-of-purchase in order for consumers to make informed and healthier food choices. There is limited evidence regarding the benefits of such regulations. In particular, there is a scarcity of information on the impact of non-calorie nutrition information at the point-of-purchase on consumer food purchasing behavior.

Objective

To assess consumer awareness of non-calorie nutrition information in fast food restaurants and food purchasing behavior before and 18-months after enforcement of regulations for posting non-calorie nutrition information at the point-of-purchase in King County, Washington.

Study Design/Methods

The study design incorporated a secondary data analysis that merged 2 cross-sectional data sets. The information was gathered from consumers who purchased a meal at one of eight fast-food restaurants (Burger King, McDonald’s, Jack in the Box, Subway, Quizno’s, Taco Bell, Taco Time, and Taco Del Mar) located in the King County, Washington area at two distinct points in time. Comparisons were made for the period prior to enforcement of menu-labeling regulation—from October and November of 2008—and the period 18-months post-regulation enforcement—from April through June of 2010. Information on foods purchased was collected from itemized food receipts, and a short survey was conducted directly after meals were purchased on location in order to assess awareness and usage of menu labeling. The mean sodium content for meals purchased pre and post-regulation was compared by independent Student’s t-test.
Results
The majority of participants were between 30 and 50 years of age (>40%), male (>60%), and Caucasian (>70%). Compared to data collected pre-regulation, there was a greater number of participants who reported seeing non-caloric nutrition information in the Burger-type (Burger-King, McDonalds, Jack-in-the-Box) and TexMex (Taco-del mar, Taco time, Taco Bell) restaurants post-regulation; the opposite finding was observed with Sandwich-type (Subway, Quizno’s) restaurants. There was no significant difference in the amount of participants who saw and used the non-caloric nutrition information from pre to post-regulation in any of the restaurants. The mean sodium content of meals purchased was significantly lower post-compared to pre-regulation in sandwich-type restaurants and TexMex restaurants, but not burger-type restaurants.

Conclusion
According to our study, patrons in King County, Washington who purchased meals at Burger and TexMex-type restaurants seemed to be more aware of non-caloric nutrition information post- compared to pre-regulation enforcement. There was no significant difference in the number of patrons who saw and used the posted nutrition information. As compared between two time frames, a decrease in mean sodium content specifically at the TexMex and sandwich-type restaurants was observed. There is a need for more research in order to understand the complex dynamic of menu labeling, patron awareness, and patron use of such information.
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INTRODUCTION

The prevalence of obesity and related chronic diseases has dramatically increased in the US over the last several decades.\textsuperscript{1} The increase in caloric intake among adults aged 20 years and older in the US is considered to be a significant contributing factor to the epidemic, especially the intake of energy dense foods.\textsuperscript{1,2} These energy dense foods are increasingly being eaten outside of the home, and, along with being high in calories, these foods are usually higher in salt and fats compared to foods cooked at home.\textsuperscript{3} It has been estimated that since 1972, the proportion of total food expenditures purchased outside of the home on fast-food has increased from 34\% to roughly 50\%.\textsuperscript{4} There is considerable empirical evidence that the increased consumption of restaurant foods is contributing to the growing health crisis in the US.\textsuperscript{5,6}

With more processed and restaurant food being consumed in general, it has also been well established that the high sodium content of these foods is harmful to one’s health. Research has shown that reducing salt content in such foods would be extremely advantageous in lowering the incidence of cardiovascular, renal, and other associated diseases in the wider population.\textsuperscript{7}

Despite significant evidence that sodium intake should be reduced, many questions still remain as to the means of doing so. One avenue suggested in this regard is to increase consumer awareness of the sodium content of food choices by making nutrition information readily available at the point-of-purchase in chain restaurants. Towards this end, legislation has been passed in many states across the US for mandatory menu labeling of caloric and non-caloric (fat, carbohydrate, and sodium) nutrition information at the point-of-purchase in chain restaurants. This legislation requires these restaurants to provide calorie values on menus or
menu boards so that it is clearly visible at the time of purchase. Non-calorie nutrition information may be provided on menu boards or at other visible locations near where the consumer orders their food.

King County, Washington, was one of the first locations to mandate the posting of nutrition information for customers to view in chain restaurants. Thereafter, as part of a comprehensive effort to halt the growing obesity trend and increasing rates of chronic diseases, all restaurant chains across the US with 15 or more locations were mandated to disclose nutrition information on all standard food products at the point-of-purchase, starting in January of 2009. This legislative initiative provided a unique opportunity to evaluate the relationship between consumer food purchasing behavior and in-store menu posting. Herein we discuss specifically the role of non-calorie nutrition labeling, and consumer recognition of and response to such posted information.
REVIEW OF LITERATURE

I. Growing Trends: Obesity, Chronic Disease, and Eating Outside of the Home

Over the past decades, there has been a steady and dramatic increase in the prevalence of obesity in the United States, and it has become a major public health crisis. Both adults and children are significantly affected by this epidemic, and numerous studies of varying type and quality have examined risk factors that predispose individuals to the growing trend. These risk factors include genetic predisposition, lifestyle and behavioral trends, dietary preferences, exercise habits, and environmental triggers.

One of the main contributors to obesity and related chronic health problems (diabetes, heart disease, and certain cancers) is overconsumption of energy dense foods high in sodium. There is growing recognition among scientists, health care professionals, and even politicians that the food environment in the US currently supports overconsumption, and that the epidemic of obesity will not be resolved until the country is able to combat the obesigenic environment. Two of the more prominent avenues that health professionals, legislators, and educational programs have targeted include menu labeling within fast-food chain restaurants to inform consumers about the calories and nutrient content of foods and beverages purchased. The second focused on decreasing the amount of dietary sodium consumed by the average American.

Food purchased away from home now accounts for over 30% of the daily caloric intake of the average American and 50% of yearly food spending among families in the United States. This is significantly increased from 34% of yearly food spending in 1972. Other survey estimates show that in 2010 three out of every ten consumers agreed that meals at a restaurant or fast-food establishment are essential to the way they live. In another cross
sectional study, fast food use was reported by 37% of the adults and 42% of the children.\textsuperscript{14} These statistics exemplify the enormous increase in foods eaten outside the home; with this comes a need for more education on how to be a healthy consumer of take-out foods.

II. Adults and Fast-Food

One significant problem with a diet mostly consisting of fast-food eaten outside of the home is overconsumption and lack of nutrients.\textsuperscript{14} In a New York City survey conducted by the Health Department in 2007, not only are individuals eating out more, but a third of those who are eating take-out purchased 1000 kilocalories or more at lunch time alone.\textsuperscript{15} This is alarming considering almost half of an individual’s caloric intake is coming from foods notoriously trending in high fat and sodium.

Another study went further to assess the associations between takeaway fast food consumption, overall diet quality, and abdominal obesity in the adult population. A sample of 1,277 men and 1,585 women ages 26-36 completed a food frequency questionnaire and had their waist circumference measured. Results from this study showed that takeaway fast food consumption occurred two or more times per week among 37.9% of men and 17.7% of women questioned. Those that ate out twice a week or more were less likely to meet dietary recommendations for vegetables, fruits, dairy products, whole grains, and lean meat/lean meat-alternatives. This group was also less likely to meet dietary nutrient recommendations overall. Furthermore, increased takeaway fast food consumption in this study was associated with a 31% higher prevalence of moderate abdominal obesity in men and 25% higher in women.\textsuperscript{16} The finding emphasized the correlation of poor diet quality with eating foods outside of the home.
III. Youth and Fast-Food

In regards to the consumer habits of children and adolescents, fast food intake is rising at a similar rate to that seen in adults.\textsuperscript{14} Although much of the current research is focused on the dietary patterns of adults, the rising intake of take-out and processed foods among children and adolescents is concerning in that food habits established in youth have been shown to track into adulthood.\textsuperscript{17} Additionally, foods consumed by children away from home have more calories, saturated fat, and sodium, are associated with an increased intake of sugary carbonated beverages furthering conditions conducive to obesity, and are linked to lower intakes of Vitamins A and C, milk, fruits, vegetables, and whole grains.\textsuperscript{12,14} These dietary trends of the younger generations are progressively becoming linked to early onset chronic illnesses that persist into adulthood, such as metabolic disorders, diabetes, coronary artery disease, high blood pressure, and kidney disease.\textsuperscript{18} Given this, emphasis on healthier eating habits targeted to youth should also be included in future policy changes related to the fast food industry.

The contribution of fast food intake to poor diet quality has been demonstrated in several studies. In one study, 4746 students, grades 7-12, were questioned about their frequency of fast-food restaurant visits and dietary intake using a semi-quantitative food frequency questionnaire. Based on the questionnaire, 75% of students questioned had visited a fast food restaurant at least once in the previous week, and males of a non-white race were more likely to eat out three or more times per week. Overall, those individuals who reported visiting a fast food restaurant three or more times in one week had a total energy intake that was 40% higher in males and 37% higher in females than those that visited the restaurants less than three times. An increase in fast food consumption was positively correlated with intake of total energy,
percent energy from fat, and daily servings of soft drinks, and was inversely associated with daily servings of vegetables, fruits, and milk. Overall, frequency of fast food restaurant use was associated with higher energy and fat intake among adolescents. Others have shown similar associations between fast food consumption and poor quality of food items eaten by children. A collaborative study conducted by the Agricultural Research Service and Harvard University showed a correlation between decreased nutritional dietary quality, increased caloric intake, and decreased fruit and vegetable consumption among U.S. children on days when they consumed fast food. According to this study, 30.3% of the total sample questioned reported eating fast food on a typical day. On those days, children also consumed higher total carbohydrates, added sugars, total fat, and sugary sweetened beverages, and consumed lower amounts of fiber and milk.

Fast food marketed specifically to children at fast food restaurants is generally of poor nutritional quality. As evidence of this fact, researchers compared the nutrient quality of “kids’ meals” to nutrient quality criteria from the National School Lunch Program (NSLP). The NSLP is a federally assisted meal program operating in public and non-profit schools and bases its criteria on the latest Dietary Guidelines for Americans. These guidelines encourage higher intake of whole grains, fruits, and vegetables, and lower intakes of sodium. The study found in 2008 that only 3% of kids’ meals met all NSLP criteria. Kids’ meals that met the NSLP criteria were uncommon, while those that did not meet criteria were more than 1.5 times more energy dense than those that did meet criteria. More than half of the meals exceeded recommendations for dietary sodium with the average meal containing 863 mg of sodium. This lack of healthy options may be contributing to the poor diet quality of children’s diets in the US. Clearly, there is room for interventions to improve the nutritional quality of fast foods, reduce reliance on fast
food restaurants, decrease restaurant advertisement toward children, and to address the importance of healthy eating among youth.

IV. Youth, Sodium, and Health

In order to address the importance of eating healthy among youth, there has been an increase towards encouraging changes in sodium intake. Calorie and sodium, which are notoriously high in fast foods, have become the front-runners for targeted reduction, as sodium plays a key role in health complications in childhood. High sodium intake early in life influences sodium intake and blood pressure later in life. Thus, more focus is necessary in this area of research.

In a randomized trial conducted among 476 Dutch newborn infants, the effects of “low” or “normal” sodium diets on blood pressure were studied in detail. Infants fed with a “low” sodium diet had a 2.1mmHg lower in systolic blood pressure than those following a “normal” sodium diet at the age of 6 months. A subset of these infants was re-examined 15 years later in order to obtain more information on the long-term impact of dietary sodium on cardiovascular health. Systolic and diastolic blood pressure in these adolescents were 3.6 and 2.2 mmHg lower, respectively, in subjects assigned to the “low” sodium group compared with the “normal” sodium intake group.

Sodium intake has not only been related to blood pressure in youth, but has also been linked to the development of obesity, which has become a worldwide pediatric epidemic in recent years. In a study of 5,025 Korean children 7-18 years of age sodium intake and weight status were measured over a period of 4 years utilizing the Korean National Health and Nutrition Examination Survey (KNHANES) from 2007-2010. Findings from this study indicated that high sodium intake was a significant risk factor for weight gain in these children.
independent of calorie intake. Researchers also observed that children who were obese tended to have an increased sensitivity to sodium chloride, where blood pressure responded more significantly to a sodium load than in children who were normal weight. This finding has also been observed in obese adults and been linked to hyper-aldosteronism, which is present in obese individuals and plays a role in sodium regulation.\textsuperscript{24}

V. Adults, Sodium, and Health

The 2010 \textit{Dietary Guidelines for Americans} recommends limiting sodium intake to less than 2,300 milligrams (mg) per day for all Americans. However, on average, U.S. adults still manage to consume more than 3,400 mg of sodium per day.\textsuperscript{27} Overconsumption of salt, and thus sodium is also a problem worldwide. A 2009 meta-analysis found that the sodium consumption of 19,151 individuals from 33 countries ranged from 2,700 to 4,900 mg/day.\textsuperscript{28} Of concern is the growing body of empirical evidence suggesting that excessive sodium intake is not conducive to good health.

Sodium has the potential to markedly disrupt the delicate homeostasis within the kidneys. With an increase in dietary sodium, there are measurable changes within the hemodynamic structure of the kidney, which can lead to increases in fluid retention and ultimately increases in blood pressure. Over time this strain and damage may lead to chronic kidney disease, fibrosis, and inflammatory damage, and toxic wastes build up in the body. A growing body of evidence suggests that high sodium intakes may promote more rapid progression of chronic kidney failure.\textsuperscript{24,28}

Dietary sodium intake is an important consideration in patients with all stages of chronic kidney disease, including those receiving dialysis therapy. In one prospective controlled study, adult patients on hemodialysis for at least 90 days and those with C-reactive protein (CRP) levels ≥0.7 mg/dl (an indicator of inflammation) were randomly allocated into two
groups: group A included patients treated with 2 g of salt restriction on their habitual diet and group B included controls. Clinical, inflammatory, biochemical, hematological, and nutritional markers were assessed at baseline and after 8 and 16 weeks. If was found that dietary salt restriction was associated with the attenuation of the inflammatory state (based on inflammatory markers such as CRP and IL-6) suggesting inhibition of a salt-induced inflammatory response in those with advanced kidney disease.  

These complications seen in the kidney exacerbate high blood pressure, and this, often complicated by other poor-diet induced comorbidities, increases the risk for cardiovascular disease, coronary artery disease, myocardial infarction, cerebral stroke, and mortality. The link between high sodium chloride intake and elevated blood pressure is well established. One of the first landmark studies on this topic was the International Study of Salt and Blood Pressure (INTERSALT). This study showed that in 10,000 adults, ages 20–59 years old who were evaluated at 52 centers in 32 countries, 24-hour urine sodium excretion (a good reflection of intake) was significantly and positively associated with increased median systolic blood pressure (SBP) and diastolic blood pressure (DBP).  

More recently, the Dietary Approaches to Stop Hypertension (DASH) Sodium trial showed that a dietary sodium reduction in addition to a dietary pattern that emphasized fruits, vegetables, low-fat dairy foods, whole grains, and lean protein sources (aka, the DASH diet) was an effective means of lowering blood pressure in adults with hypertension. In this study, participants were randomly assigned to eat a typical U.S. diet or the DASH diet. The researchers provided all of the participants' food for 90 days. During the 90 days, both diet groups were randomly assigned to sodium intake of 3.5 grams, 2.3 grams, or 1.5 grams for each 30-day feeding period. The researchers found that adults who ate the DASH diet had a systolic blood pressure that was 5.5 mm Hg lower and a diastolic blood pressure that was 3 mm
lower than those who ate the typical U.S. diet. Blood pressure was lower by 5 to 8 mm Hg during periods of lower sodium intake than during periods of higher sodium intake in people eating either the DASH diet or the typical diet. People who followed the DASH diet and had the lowest salt intake (1.5 g/day) experienced the largest decrease in blood pressure. Findings from this study were used as rationale for the 2010 Dietary Guidelines for Americans recommendation of a 2.3 g sodium level for all Americans to prevent hypertension and a 1.5 g sodium level for individuals with hypertension as a means of managing elevated blood pressure.32

Lowering dietary salt intake has also been shown to decrease other aspects of cardiovascular disease.30 In India, researchers sought to determine whether salt reductions would be beneficial or feasible to decrease the incidence of myocardial infarction and stroke utilizing a mathematical model. The Markov model projected the expected incidence of both ischemic events in men and women ages 40-69 in both urban and rural locations, incorporating the risk reduction from lowered salt intake. Based on the mathematical model, these researchers found that reducing salt intake by 3g/day would reduce myocardial infarctions by 4.6%, strokes by 6.5%, and cardiovascular-related deaths by 4.9% among the groups studied over a period of 30 years.33 Although small percentages, these findings suggest that if these projections were applied to a larger population sample, many lives could potentially be saved and many cardiovascular complications could be avoided.

In the journal Medical Hypotheses, Tekol provides evidence that intake of sodium chloride may be difficult to modify because sodium chloride has addictive properties.34 According to this researcher, sodium chloride possesses six of the seven criteria for substance dependence and potential addiction based on the Diagnostic and Statistical Manual of Mental Disorders, Axis IV (DSM-IV-TR) criteria.35 These include “tolerance” behaviors or markedly
increasing the amounts of substance over time; withdrawal symptoms at the beginning of abstinence (slight nausea and anorexia); high dose and very long duration of use; unsuccessful efforts to control or cut down use; involvement in chronic behavior to obtain the substance; and use of the substance even though there is persistent or recurrent physical problems caused or exacerbated by the substance.\textsuperscript{34} Although controversial, the mere concept brings to light the often-underestimated effects of dietary sodium intake. If one accepts the hypothesis that sodium may have addictive properties, the potential for societies to combat particular health issues related to high dietary salt intake may be limited based on those addictive properties.

\textbf{VI. Sodium Intake and Food Labeling}

Sodium intake is on the rise, especially in the United States.\textsuperscript{30} Mean sodium intake has increased among all age groups between 1975 and 1990 on average 500 mg/day, with the largest increase in females ages 40-59.\textsuperscript{28} The majority of sodium intake (approximately 77\%) in the US comes from processed foods and restaurant foods.\textsuperscript{36} Despite efforts by various food manufacturers to reduce the amount of salt added to foods during processing and the increase in the lower-sodium options for a variety of processed foods, sodium intake still continues to be positively correlated with energy intake.\textsuperscript{36}

Researchers suggest that one of the reasons why individuals overshoot their daily-recommended intake of sodium is that food labels and sodium labels in particular on food products are simply misunderstood or even ignored by consumers. One study conducted in the United States emphasized this point by looking at consumer knowledge and awareness of sodium and salt reduction in foods. Quantitative Internet surveys were designed to gather knowledge and attitudes towards dietary sodium labeling, sodium in foods, and health. Of those sampled, 92\% claimed to read nutrition labels while grocery shopping, however, most could not
decipher specific sodium measurements as being “healthy or not.” More than 75% of consumers said that label claims for reduced- and low-sodium may positively sway impacted purchasing decisions, but a majority said sodium “free” claims were not useful in deciding what foods to buy.\textsuperscript{37}

Another study conducted between September 2010 and February 2011 in the Americas also pointed out this concept. A convenience sample of 1,992 adults older than 18 years of age from Argentina, Canada, Chile, Costa Rica, and Ecuador were surveyed regarding their knowledge about the health effects of salt/sodium, the current recommendations for sodium, and food sources of the nutrient. A large proportion associated excess intake of dietary salt with the occurrence of adverse health conditions (90%).\textsuperscript{38} However, despite identifying the health implications of a high salt diet, only 26% of participants claimed to know the existence of a recommended maximum value of salt or sodium intake. Furthermore, only 47% of them stated they knew the content of salt in common food items. These data suggest a lack of consumers' knowledge about the existence of a maximum limit for sodium intake and how to accurately monitor and reduce their personal salt intake.\textsuperscript{38}

Outside of the American Continents, the trend seems to be similar. This was emphasized in a study conducted in New Zealand, where 226 consumers were asked about their personal salt intake and awareness of sodium labeling. Participants were asked whether or not they monitored their salt intake, their perceptions about the maximum recommended levels of salt intake, and how much salt should be consumed in one serving when supplied with various food products. The study found that most participants did not know how to interpret the nutritional information in regards to sodium content and that the labeling of sodium was therefore of little use in its current form.\textsuperscript{39}

In another study conducted with adults in Finland in 2002, researchers used the National
FINDIET survey with 48-hour recalls from subjects aged 25-64 years old, along with the Fineli food composition database to calculate sodium intake. The distribution of salt intake was calculated by assuming that all breads, cheeses, processed meat and fish, breakfast cereals, and fat spreads consumed would be either ‘lightly salted’ or ‘heavily salted’ based on the current labeling practice. The study estimated that if participants were to choose ‘lightly salted’ food products outside the home and reduce the amount of added salt to their food, the mean salt intake of these individuals would be reduced by 1.8 g in men and 1.0 g in women, respectively. This study provided evidence that if implemented properly, salt reduction efforts may be feasible and would decrease overall sodium intake in adults.  

VII. Understanding Menu-Labeling

The rise in unhealthy eating outside the home by both adolescents and adults, and consumption of unhealthy food content has led to national initiatives toward menu-labeling of both caloric and non-caloric nutrition information (specifically fat, sodium, and carbohydrate levels) in restaurants. Data support the fact that individuals are either unaware of what they are actually eating or cannot decipher nutrient information even if it is presented. The rationale for menu labeling is to be able to provide information to the consumer that is accessible and relatively easy to understand at the point-of-purchase. Several studies have shown that consumers have difficulty assessing the calorie and nutrient content of fast food items when the items are not labeled.  

Calorie underestimation of restaurant fare by consumers was demonstrated in New York City where menu labeling in chain restaurants is currently being implemented. It was found in 2011 that only one third of all consumers studied properly estimated the number of calories an
adult should consume when compared to consumer behavior in a comparison community which did not utilize menu-labeling procedures. Labeling in New York City did increase the number of low-income consumers who correctly estimated the number of calories in their fast food meal (15% before labeling and 24% after labeling); however, overall knowledge of calories in restaurant fare was still low.\(^4\)\(^5\) Another qualitative research study, also in New York City, used focus groups to study individual and environmental factors affecting the use of menu labels over a 9 month period. It was found that the most frequently mentioned barrier to using menu labeling to make food purchasing decisions, alongside price, time constraints, and preference, was that there was much confusion and lack of understanding about labeled values.\(^4\)\(^6\) Public health advocates in New York have argued that menu labeling information is often not easily accessible and overly complex when consumers order their food.\(^1\)\(^5\) These findings emphasize the need for targeted education on how to read and use the nutrient labels on fast foods at the point-of-purchase.

If the proper education methodologies were put forth in order for consumers to adequately see, understand, and use nutrition labeling on food purchases at fast food establishments or other locations, it would be expected that unhealthful consumption trends may decline. A research group in the United Kingdom highlighted this point in 2010.\(^4\)\(^7\) They utilized three major retailers, focused on six product categories, and conducted observations, interviews, and take-home questionnaires in order to analyze usage of product labeling and patrons’ abilities to identify “healthy” products. After using regression analysis, they found that only 27% of patrons looked at labels, but that usage mainly related to interest in healthy eating. They also found that 87.5% of those sampled were able to successfully identify the healthiest of three similar products, and that alongside this, understanding of labeling related mainly to knowledge of nutrition labeling.\(^4\)\(^7\) Although this study focused on food product labeling as
opposed to menu-labeling, it would be expected that the same concepts could be applied. If consumers are able to fully understand nutrition information when presented in an accessible and organized manner, a sense of empowerment from knowledge may lead to an increase in healthier food consumption choices.

The interest in mandatory menu labeling is obvious among Americans, as evidenced by two important studies. The first was a study of eight adult consumer focus groups questioned about their food consumption behavior in four U.S. cities. It was found that participants were interested in having nutrition information available on menus in restaurants, although, most indicated that the information would likely not be used at every eating occasion. Participants in this study also indicated that an icon on food labels and menu boards that indicated that a food was a healthier option could be helpful in making informed decisions about restaurant fare. They also suggested that nutrient information should be listed for single servings of food only.⁴⁸

A second study conducted phone surveys in 2009 of 663 randomly sampled adults 18 years of age and older in order to assess the same variables. They examined the public’s preference for and understanding and perceptions of calorie posting in chain restaurants. The study showed that government-required posting of nutrition information at the point-of-purchase was favored by 68% of Americans surveyed. Support for menu labeling was significantly higher among African Americans, Hispanics and women as compared to other ethnic and gender groups. Responses were divided, also, regarding how calorie information should be posted to best help consumers make informed decisions: 35% of those questioned favored posting the number of calories/serving; 26% favored posting a physical activity equivalent for the food item; and 39% favored posting the percentage of total energy intake contributed by one serving of the food.⁴⁹ Taken together, consumer research regarding food consumption behavior demonstrates
support for menu labeling and indicates that, if properly educated, consumers could use this nutrition information more effectively to make informed food choices when eating out.

VIII. Support for Menu Labeling

Based on the evidence presented in this review, menu-labeling initiatives have resulted in increased awareness regarding the nutrient content of food purchases, and in some studies in reduced caloric and sodium intakes, but there is still reported skepticism as to the feasibility and effectiveness of enforcing menu labeling regulations at the national level. Arguments have arisen for and against menu-labeling and some say that consumers do not want this information because it complicates the food purchasing process. However, five national polls have found that between 67% and 83% of people support menu labeling, and local county polls have found that between 82% and 84% of people support menu labeling in Connecticut, California, and King County, WA. Furthermore, a recent survey conducted in New York City found that 89% of individuals were in favor of the New York menu-labeling policy after it had gone into effect.

The restaurant industry has strongly opposed menu-labeling legislation over the years. The industry’s main argument is that restaurants would incur an increase in costs when posting, updating, or further analyzing nutrition data and menus. This argument has not been substantiated since most chain restaurants already have nutritional information on most items, and for those items where information is not known, the costs of nutritional analysis was actually quite low.

The current standing of legislation surrounding menu labeling is promising, and is part of a larger effort to address issues of obesity, chronic illness, and high sodium intake. Public health laws show more potential for benefit if there is a strong public health rationale inspiring
government action. In order to minimize further subsequent legal challenges, these laws must also be legally sound.53

The role of government and the authority to require those who sell products to disclose relevant information to consumers have a long legal history. The federal government for a number of years has implemented this authority by requiring food manufacturers to label nutrition information on packaged foods. It thus seems illogical to label packaged foods but not restaurant foods, particularly when it has been demonstrated that a large portion of food purchases are outside of the home.54

With regards to sodium specifically, there seems to be some promise of reduction in sodium intake, as shown, but benefits from changes in regulations as well. Some menu labeling campaigns have forced industry compliance by using laws or government regulations, whereas other campaigns have used a purely voluntary approach. A short-term examination of those campaigns shows that the first approach achieved much more success than the second approach.55 However, starting in 2000/2001, the Food Standards Agency (an agency of the UK government) embarked on a campaign to lower salt intake on a voluntary action approach by industry and had success. Sodium intake by adults decreased by about 10% from 2001 to 2008.56

Whether strongly encouraged or mandated, empirical evidence suggests that there are public health benefits to higher standards of nutrition labeling for consumers. Provision of health and nutrition information at the point-of-purchase in restaurants is an increasingly important strategy in promoting public health, particularly with regards to preventable risk factors associated with chronic disease, such as poor diet quality and obesity.

IX. Point-of-Purchase Interventions
Menu labeling in restaurants and on food packaging is a population strategy being implemented and advocated to increase consumer awareness of the nutritional content of foods purchased. As results from these population approaches to controlling sodium intake are unfolding, questions are being raised about the feasibility and potential for success and sustainability of these approaches.

Results from a study by Roberto et al. suggests that menu labeling helps consumers make informed decisions and lower calorie intake. These researchers recruited 303 individuals over the age of 18 in New Haven, Connecticut. Dinner patrons to a local restaurant were told that consumer market research was being conducted and that they would be asked to answer questions about their dining preferences and eating habits; in return for their participation they were allowed to order and eat a free meal; the patrons were then asked to return the next day for a brief interview. Researchers randomly assigned patrons to one of three menu conditions when they ordered: one menu had no calorie information, one had calorie information for the foods served, and a third had calorie information for the foods served and also provided the recommended daily caloric intake for different age and gender groups. Findings from this study showed that the patron groups that had calories included on the menu ate 14% fewer calories than those in the no-calorie information group. The addition of the daily calorie recommendation on the menu along with the calorie information for menu items did not result in any further decrease in energy intake in that group compared to the group receiving calorie information only. These findings suggest that providing calories on menus in some form helps patrons make more healthful choices.

In another study, six restaurants in Pierce County, Washington added nutrition information to their menus and looked at the nutrition content of entrées sold for 30 days before and 30 days after the information was added. The restaurants included were locally owned,
strictly on a volunteer basis, and incorporated full-service restaurants. These researchers found that the average entrée sold after menu labeling contained about 15 fewer calories, 1.5 fewer grams of fat, and 45 fewer milligrams of sodium than the average entrée sold before labeling. Additionally, 71% of patrons reported noticing the nutrition information in the restaurant after menu labeling compared to before; 20.4% reported ordering an entrée lower in calories as a result of labeling, and 16.5% reported ordering an entrée lower in fat as a result of labeling. Given the positive results in a short time frame, the possibilities for more significant results from a long term study look promising. Successful approaches like these are examples for future programs.

When considering the utility of labeling of packaged food, another quasi-experimental approach presented evidence that the Nutrition Facts panel, which is mandated by the Nutrition Labeling and Education Act (NLEA), has had a modest but beneficial impact on dietary intakes of Americans. The disclosure of nutritional characteristics of most packaged foods became mandatory in the United States with the implementation of the NLEA in 1994. Under the NLEA regulations, a ‘Nutrition Facts’ panel (NFP) displays information on nutrients such as calories, total and saturated fats, cholesterol, and sodium in a standardized format. When examined via data from the National Health Interview Survey (NHIS) (a multipurpose survey of the U.S. civilian non-institutionalized population fielded annually to adults 18 years of age and older), those who reported using the NFP when buying food had significantly higher fiber and iron intakes compared with those who rarely or never used the NFP. This data showed that by providing nutrition information in a credible, distinctive, and easy-to-read format, consumers were better able to choose healthier, more nutritious items.

Not only has menu and food product labeling been successful in adults, studies have shown that this approach is impactful across various age groups as well. For example, the food
buying patterns of a multiethnic group of college students were assessed in a quasi-experimental study of cafeteria food purchasing behavior to determine whether the “Eat Smart” Point-of-Purchase program affected their buying habits. In this study, baseline sales of four various categories of food items were obtained over a 6-week period, and then a few items within each group were labeled as “healthful” and were priced identically to their counterpart. Sales were again collected over another 5-week period. This study showed that, following the food labeling intervention, there was an increase in sales of the newly tagged, lower calorie items. This experiment emphasized the point that labeling foods with easy to interpret nutrition information was useful in modifying the food buying decisions of teenagers, who can be a difficult audience to reach with nutrition information and programming.

Empirical studies have demonstrated the impact of high salt diets on health and wellness, and there is an obvious need to create a consumer environment conducive to lowering sodium intake levels in all individuals. By understanding the nature and successes of other point-of-purchase interventions, it may help evolve a more effective methodology for targeting restaurant menu labeling of non-caloric nutrition information.
MAJOR RESEARCH QUESTIONS AND HYPOTHESES

**Research Question 1:** Was there a significant difference in consumer awareness of non-calorie nutrition information at the point-of-purchase from pre- to 18-month post-regulation enforcement among chain restaurants in King County Washington?

**Hypothesis:** There will be a significant increase in the awareness of non-calorie nutrition information at the point-of-purchase among patrons of chain restaurants from pre- to 18-month post-regulation.

**Research Question 2:** Of those who reported seeing non-calorie nutrition information, was there a difference in the number of individuals who reported using this information to help them make food purchases from pre to post-regulation?

**Hypothesis:** Among those that see non-calorie nutrition information at the point-of-purchase, there will be a significant increase in the usage of non-calorie nutrition information by patrons of chain restaurants in King County, Washington.

**Research Question 3:** Was there a change in the mean sodium content of meals purchased (per person) from pre to 18-months post-regulation enforcement among chain restaurants in King County, Washington?

**Hypothesis:** There will be a significant decrease in the mean sodium content of meals purchased per person from pre to post-regulation enforcement among patrons of chain restaurants in King County, Washington.
METHODS

Study Design

The present study was a secondary data analysis of 2 merged cross-sectional data sets. The data were gathered from fast food receipts from consumers who purchased a meal at one of eight fast-food restaurants (Burger King, McDonald’s, Jack in the Box, Subway, Quizno’s, Taco Bell, Taco Time, and Taco Del Mar) located in the King County, Washington area at two distinct points in time. The first time period, designated Wave 1, occurred prior to enforcement of the menu-labeling regulation—from October and November of 2008. The second period, Wave 3, occurred post-regulation enforcement—from April through June of 2010. A third period (Wave 2) occurred 6 months post-regulation. Wave 2 data have already been analyzed and reported (Shields KS, et al, 2012) and will not be included in this thesis. All patrons who participated in the original study signed informed consent prior to participation. The University of Washington Institutional Review Board approved this study.

Data Source

Data regarding foods purchased by consumers were collected from itemized food receipts. A short survey was also given to consumers that addressed questions about point-of-purchase non-calorie nutrition information. This survey was given directly after food was purchased at each location. Methods of data collection in King Country for both pre and post-regulation waves were identical.

Survey

The Gilmore Research Group administered in-person surveys to patrons of fast food restaurants after food purchases were made. Each willing patron was given $2 as incentive for
his or her participation. Demographic information was collected, as well as clarification of information on each participant’s food purchases including whether the food was purchased as part of a meal or snack, whether the food purchased was for one person or multiple persons, and whether any modifications to the foods were made. These included condiment changes, dressing type, sizes, etc. Also, the survey asked about their awareness, usage, and location of non-calorie information in the restaurant. Following inquiry, each food receipt was filed together with the appropriate survey and entered into an Excel spreadsheet.

**Fast-Food Receipts**

Study personnel collected individual customers’ food receipts before exiting the restaurant. Following collection, itemized food receipts were entered in an Excel spreadsheet. Subsequently, receipt codes for foods purchased were utilized to compute the sodium content for each item purchased and the sodium content of the meal was calculated. The receipt codes were itemized per person, per restaurant, and per wave.

**Estimation of Sodium Content**

Details and calculations about sodium content of menu items were collected from on-site menus or from website information at the original time of data collection. Under special circumstances, current menu information was substituted when a menu was unavailable from that time period or a particular item from the receipt code could not be matched to the proper menu. If the situation arose when sodium information could not be obtained from either source, the information was obtained from one of the following websites: caloriecount.com, myfitnesspal.com, livestrong.com, dolejuice.com, pepsiproductfacts.com, and thedailyplate.com. Customization data for foods purchased were also entered and the sodium content of the food/meals was corrected accordingly. For example: if “extra cheese,” was indicated on the
survey for a hamburger order, then the sodium content of 1 ounce of American cheese was added to the sodium content of the hamburger purchased. In some cases, foods were ordered and the receipt did not specify a brand name. For example, chip type was not specified at Subway restaurants when someone purchased a bag of chips. In these cases, the average sodium value for all chips at Subway was used as a default sodium value for any unlabeled chips purchased.

Once sodium values had been calculated for individual meal items, the sodium content of the meal was determined by summing the sodium values of each individual item. Meal sodium values were then organized by case (or purchase). For example: if a participants had purchased a “burger,” “large fry,” and “large coca-cola” at the sandwich-type fast food restaurant, the sodium content for each item would be added in order to calculate the total sodium for the entire meal (sodium content of the burger + the sodium content of the large fry + the sodium content of the large beverage). These sums, along with each case’s corresponding survey responses, were used for the present analysis.

Sample/Eligibility Criteria

The initial sample included 5938 cases. Following exclusion criteria, the final sample included 3245 cases for Waves 1 and 3.

Inclusion Criteria: Participants who indicated on the survey that they purchased a “meal” (as opposed to a “snack”) from one of the sandwich, burger, or TexMex restaurants surveyed and who were able to provide their original itemized receipt were included in these analyses.

Exclusion Criteria: If purchases made with itemized receipt codes could not be properly identified with available fast-food restaurant menus or websites, or if the participant indicated that they purchased a “snack” rather than a “meal” from the restaurant surveyed then they were
excluded from analysis.

**Statistical Analyses**

Statistical analyses were performed using the Statistical Analysis System for Windows (version 9.2, SAS Institute, Cary, North Carolina). Differences in mean sodium content from one of the three fast-food restaurant types (Sandwich, Burger, TexMex) were analyzed using the independent Student’s t-test between Waves 1 and 3. Proportions for categorical data were compared using Pearson’s Chi Square tests. For continuous variables, the means and standard deviations were calculated, and for categorical data the frequencies were derived. For all data, a P value of <0.05 was considered to be statistically significant.
RESULTS

Participants Characteristics

The majority of participants were between the ages of 30 and 50 years old (>40%), male (>60%), and Caucasian (>70%) in both Waves 1 and 3. Between waves, there were no significant differences in relation to demographic characteristics (age, gender, race).

Table 1: Characteristics of Study Participants

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Wave 1</th>
<th>Wave 3</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N=1594</td>
<td>N=1651</td>
</tr>
<tr>
<td>Age</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt;30 years</td>
<td>390 (24.5%)</td>
<td>413 (25.0%)</td>
</tr>
<tr>
<td>&gt;30-50 years</td>
<td>712 (44.7%)</td>
<td>702 (42.5%)</td>
</tr>
<tr>
<td>&gt;50-70 years</td>
<td>423 (26.5%)</td>
<td>473 (28.7%)</td>
</tr>
<tr>
<td>&gt;70 years</td>
<td>69 (4.3%)</td>
<td>63 (3.8%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1036 (64.8%)</td>
<td>1066 (64.1%)</td>
</tr>
<tr>
<td>Female</td>
<td>564 (35.3%)</td>
<td>596 (35.9%)</td>
</tr>
<tr>
<td>Race</td>
<td></td>
<td></td>
</tr>
<tr>
<td>White/Caucasian</td>
<td>1193 (74.3%)</td>
<td>1228 (73.9%)</td>
</tr>
<tr>
<td>Black/African American</td>
<td>81 (5.0%)</td>
<td>82 (4.9%)</td>
</tr>
<tr>
<td>Asian/South Asian</td>
<td>108 (6.7%)</td>
<td>117 (7.0%)</td>
</tr>
<tr>
<td>Mexican(^1)</td>
<td>99 (6.2%)</td>
<td>101 (6.1%)</td>
</tr>
<tr>
<td>Other(^2)</td>
<td>125 (7.8%)</td>
<td>134 (8.1%)</td>
</tr>
</tbody>
</table>

1 Also includes Central and South American, Puerto Rican, and Cuban
2 "Other" includes Pacific American, Native Hawaiian, American Indian, Russian, Arabic, Italian, Spanish, Middle Eastern, Persian, Maldivian, bi-racial, etc.
Change in Awareness

Between Waves 1 and 3, there was a significant difference in the number of individuals that reported seeing non-calorie nutrition information in all types of fast-food restaurants surveyed (Burger, Sandwich, TexMex) as shown in Table 2 (an overall increase of 3%). The number of individuals seeing this information increased from Wave 1 to Wave 3 among patrons of Burger and TexMex restaurants (7% and 7%, respectively), while those that purchased food in Sandwich type restaurants reported less awareness (4%) of non-caloric nutrition information from Wave 1 to Wave 3.

Table 2: Frequency and Proportion (%) of those who Reported Seeing Non-Calorie Nutrition Information at Point-of-Purchase Between Waves 1 and 3 According to Restaurant Type

<table>
<thead>
<tr>
<th>Wave</th>
<th>Did you see non-calorie nutrition information?</th>
<th>Burger – type Fast Food Restaurant&lt;sup&gt;1&lt;/sup&gt;</th>
<th>Sandwich-type Fast Food Restaurant&lt;sup&gt;2&lt;/sup&gt;</th>
<th>TexMex-type Fast Food Restaurant&lt;sup&gt;3&lt;/sup&gt;</th>
<th>All-types Fast Food Restaurants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14 (2.7%)</td>
<td>132 (21.2%)</td>
<td>19 (4.1%)</td>
<td>165 (10.3%)</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>481 (93.6%)</td>
<td>464 (74.5%)</td>
<td>431 (92.9%)</td>
<td>1376 (86.0%)</td>
<td></td>
</tr>
<tr>
<td>Don’t Know</td>
<td>19 (3.7%)</td>
<td>27 (4.3%)</td>
<td>14 (3.0%)</td>
<td>60 (3.8%)</td>
<td></td>
</tr>
<tr>
<td>Wave 3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>49 (9.8%)*</td>
<td>110 (16.7%)*</td>
<td>56 (11.2%)*</td>
<td>215 (13.0%)*</td>
<td></td>
</tr>
<tr>
<td>No</td>
<td>440 (87.8%)</td>
<td>543 (82.5%)</td>
<td>435 (87.2%)</td>
<td>1418 (85.5%)</td>
<td></td>
</tr>
<tr>
<td>Don’t Know</td>
<td>12 (2.4%)</td>
<td>5 (0.76%)</td>
<td>8 (1.6%)</td>
<td>25 (1.5%)</td>
<td></td>
</tr>
</tbody>
</table>

* = p < .0001

<sup>1</sup> Burger Fast Food Restaurants include McDonald’s, Jack in the Box, and Burger King
<sup>2</sup> Sandwich Fast Food Restaurants include Quizno’s and Subway
<sup>3</sup> TexMex Fast Food Restaurants include Taco Bell, Taco Del Mar, and Taco Time
Usage of Non-Calorie Nutrition Information on Meals Purchased?

Out of those individuals who reported seeing non-calorie nutrition information, there were no significant differences between waves in the number of participants who reported using the nutrient information to help them make food purchase decisions (Figure 1). The TexMex-type restaurant had a 32% decrease in patron usage from Wave 1 to Wave 3 (71% down to 37%); the Burger-type restaurant had a 12% decrease (43% down to 29%); the Sandwich-type restaurant had a 1% increase (47% up to 48%) of individuals who reported seeing and using the non-calorie information. It should be noted that there was a significant difference between waves for response to this survey item, with 28% missing data in Wave 1 and 0.01% missing in Wave 3.

Figure 1: Proportion of Participants who Saw and Used Non-Caloric Nutrition Information

Percentage of Participants Who Used Non-Calorie Nutrition Information from Those who Saw it by Wave

<table>
<thead>
<tr>
<th>Wave</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td>43%</td>
<td>57%</td>
</tr>
<tr>
<td>Wave 3</td>
<td>44%</td>
<td>56%</td>
</tr>
</tbody>
</table>

Figure 1

Burger-type
Sandwich-type
TexMex-type

Burger Fast Food Restaurants include McDonald’s, Jack in the Box, and Burger King
Sandwich Fast Food Restaurants include Quizno’s and Subway
TexMex Fast Food Restaurants include Taco Bell, Taco Del Mar, and Taco Time
Source of Non-Calorie Nutrition Information

The places where participants saw non-calorie nutrition information in restaurants surveyed is shown in Figure 2. The majority of non-calorie nutrition information in Wave 1 was observed from sources listed as “other,” while the menu-board was the second most frequent place participants saw the information. Items listed as “other” included locations such as doors, napkins, cups, and window advertisements. For Wave 3, the leading location to see non-caloric information included queues, followed by the menu board and “other.” There was no difference between waves for reported locations for posting non-calorie nutrition information by restaurant type.

Figure 2: Proportion Non-Caloric Information Source According to those who Reported Seeing it by Wave

*Other: “door,” “napkin,” “cup,” “window,” etc.
Mean Sodium Content of Participant Meals

From Wave 1 to Wave 3, there was a significant decrease in the mean sodium content of meals purchased by consumers from Sandwich-type and TexMex-type restaurants (Table 3) (a decrease of 146 mg sodium and 197.4 mg sodium, respectively). Overall, mean sodium content of meals purchased from all types of fast food restaurants studied (Sandwich, Burger, TexMex) was significantly lower in Wave 3 when compared to Wave 1 (a decrease of 81.6 mg sodium).

Table 3: Change in Mean Sodium Content (mg) of Meals by Restaurant Type Purchased by Wave

<table>
<thead>
<tr>
<th>Wave</th>
<th>Burger –type Fast Food Restaurant</th>
<th>Sandwich-type Fast Food Restaurant</th>
<th>TexMex-type Fast Food Restaurant</th>
<th>All-types Fast Food Restaurants</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wave 1</td>
<td>1649.6 (855.9)</td>
<td>2486.7 (1002)</td>
<td>2134.1 (885.3)</td>
<td>2115.8 (987.5)</td>
</tr>
<tr>
<td>Wave 3</td>
<td>1728.8 (996.3)</td>
<td>2340.7 (1105.3)*</td>
<td>1936.7 (856.1)**</td>
<td>2034.2 (1035.4)*</td>
</tr>
</tbody>
</table>

* = <0.05, ** = <0.001

1 Burger Fast Food Restaurants include McDonald’s, Jack in the Box, and Burger King
2 Sandwich Fast Food Restaurants include Quizno’s and Subway
3 TexMex Fast Food Restaurants include Taco Bell, Taco Del Mar, and Taco Time

Mean Sodium Content of Meals for Those who Reported Seeing and Using Non-Calorie Nutrition Information

Of those that reported seeing non-calorie nutrition information alone, there was a significant decrease in mean sodium content of meals purchased from Wave 1 to Wave 3 (Table 4) (a decrease of 338.4 mg sodium). Similarly, of those that reported seeing and using the non-
caloric nutrition information, there was a significant decrease in the mean sodium content of meals purchased from Wave 1 to Wave 3 (a decrease of 516.3 mg of sodium).

Table 4: Change in Mean Sodium Content (mg) of Meals of those who Reported Seeing Non-Caloric Information compared to those who Reported Seeing and Using Non-Caloric Information

<table>
<thead>
<tr>
<th>Wave</th>
<th>Those that Saw Non-Calorie Nutrition Information</th>
<th>Those that Saw and Used Non-Calorie Nutrition Information</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
<td>Mean (SD) Sodium</td>
</tr>
<tr>
<td>Wave 1</td>
<td>165</td>
<td>2378.3 (1128.9)</td>
</tr>
<tr>
<td>Wave 3</td>
<td>221</td>
<td>2039.9 (1166.5)**</td>
</tr>
</tbody>
</table>

** = p<0.001
DISCUSSION

Findings from this study indicate that more consumers did report seeing non-calorie nutrition information 18-months post-compared to pre-regulation enforcement of point-of-purchase fast food labeling in King County, Washington. Although there was a significant change in the number of consumers who saw the information after regulation compared to before, this change reflects a small proportion of those who purchased food at the fast-food restaurants studied (10 % compared with 13% in Wave 1 versus Wave 3, respectively). Of those who saw the non-calorie nutrition information in the different restaurants, even fewer reported using the posted non-calorie nutrition information to help them make food purchase decisions (there was a decline of 32% in the TexMex-type restaurant, and a 12% decline in the Burger-type restaurant of those who saw the information reporting using the information).

There was an observed shift in the location where patrons saw the nutrition information between waves. In Wave 1, the primary location (63%) where patrons noticed this information was listed as “other,” where “other” included items such as doors, napkins, cups, windows, etc. This was followed by menu boards (20%) as the second leading location. In contrast, in Wave 3, the leading location where patrons saw non-calorie nutrition information was in the queue (34%), followed by the menu boards (24%). This change in location may have contributed to the increase in consumer awareness of non-caloric nutrition information from pre- to post-regulation since menu boards tend to be more prominent and noticeable than locations designated as “other” in most chain restaurants. It would be of interest to see if nutrition posting location was related to usage of the information in making food-purchasing decisions. A larger study sample would be needed to address this question.
Although this study did not assess what other factors may contribute to food purchasing-behavior in fast-food restaurants, it is possible that even when nutrition information is provided at the point-of-purchase, taste, price, convenience, and variety remain prominent factors in the purchasing-decision for many consumers. Often patrons are creatures of habit and tend to gravitate to certain preferences despite any outside influences. Socioeconomic factors may have heavily influenced some patrons’ purchasing decisions. Still others may have been influenced by a culture notorious for “hurriedness,” so time and convenience may have weighed heavily on the decision of what to purchase as opposed to nutrition labeling influences. It would be of interest to assess these factors more adequately in a subsequent study.

It is then important to consider the format and context in which non-calorie nutrition information at the point-of-purchase was provided to consumers. Non-calorie nutrition information was simply made available at the point-of-purchase and was not provided as part of a nutrition education program in the restaurants. Consumers had to read and interpret the information on their own. In the present study, there was an increase in the number of patrons who saw the information in the restaurants, but there was not a significant change in the number of patrons who used the information to help them make food-purchasing decisions. This finding suggests that consumers may have been unable to understand and internalize the information from the point-of-purchase postings. Other researchers have shown similar findings. In a cross-sectional study of 649 adults and 316 college students were questioned about the utility of calorie menu labeling in local restaurants. Of those questioned only 48% of adults and 66% of students looked at food labels, and 64% of adults and 73% of students were able to report accurate knowledge of what the information meant relative to their own daily caloric needs. These data suggest that recent legislation advocating for an increase in menu-labeling might not be as effective in combating health problems if people are unable to understand the information.
presented to them. Therefore, it may be worthwhile for labeling legislature to be accompanied by some type of national media campaign designed to teach individuals appropriate portion sizes, recommended daily calorie and nutrient needs for good health, and general food label reading skills.

Findings from this study suggest that providing non-calorie nutrition labeling at the point-of-purchase in fast food restaurants may be a useful means of increasing awareness about levels of nutrients, including sodium, that are present in fast food. However, the fact that the restaurant patrons did not use this information to make decisions about foods to purchase indicates that more needs to be done to educate consumers about how to use this information and why it is important to combat or reduce risk of chronic disease. The future success of national menu labeling programs depends on how information is communicated to the consumers as well as on the ability of consumers to appropriately interpret and use the information.

In regards to sodium intake in the present study, the mean sodium content for a meal purchased at one of three types of fast-food restaurant exceeded the Adequate Intake level of sodium for adults (1.5 g daily). It nearly exceeded the daily-recommended limit for sodium (<2,300mg) suggest by the Dietary Guidelines for Americans. Notably, the sodium content of meals purchased in all restaurants decreased 18 month post-labeling regulations as compared to pre-regulations. Although patrons did not report that they used non-calorie nutrition information to help them make meal purchases, food selections at the sandwich-type restaurants and TexMex-type restaurants studied were, on average, lower in sodium 18-months post-regulation compared to pre-regulation.
Reasons for the disconnect between the reported decrease in usage of non-calorie nutrition information among those that saw the information and the decline in overall mean sodium content of food purchases in this study are unclear. However one potential explanation may be that chain restaurants changed their recipes and cooking methods to be lower in sodium in response to the federal mandate to post nutrition information. As evidence of this, Bruemmer et al. analyzed the energy, saturated fat, and sodium content of entrées in restaurants in King County, Washington 6 months and 18 months post-enforcement of menu labeling legislation; this was the same location and time frame as the present study. A total of 37 chains within 4 restaurant types (burger, Tex-Mex, sandwich, and pizza) were audited of the total 92 regulated chains that were subject to the King County Board of Health restaurant menu-labeling regulation implemented in 2009. Chains were also divided into “sit-down” and “quick-service” categories. Study personnel visited these establishments and recorded energy content per item/combo meal as posted at both time intervals, and 3,941 menu items were included. Results indicate a significant decrease in mean energy across all items from 6 months to 18 months post-regulation when analyzed for all chains, for sit-down chains separately, and for quick-service chains separately. Mean saturated fat and sodium levels for all items also decreased significantly across all chains and sit-down chains. The change in sodium and saturated fat was not significant across all quick-service subtypes; however, there was a decrease for saturated fat at burger chains, and sodium at burger and Tex-Mex chains.62

Data from this study show that modest improvements in the nutrient content of sit-down and quick-service restaurant entrées occurred in King County over the same time period as the present study. These findings provide evidence that the foods offered at chain restaurants within King County differed in their sodium content from pre-regulation to the 18 month post-regulation period. This likely explains, at least in part, the discrepancy between the findings that there was
an overall reported decrease in usage of posted non-calorie nutrition information by consumers yet a simultaneous decrease in overall mean sodium content of meals purchased.

Overall research in this field yields few studies that have examined the effects of menu labeling on consumer use of non-caloric nutrition information. With the growing rise in dietary sodium intake among all populations including adolescents, few studies have examined the relationship between menu-labeling, salt intake, and chronic disease.\textsuperscript{11} With the majority of salt intake coming from processed and restaurant foods, and the growing trend of individuals purchasing food outside of the home, it is vital that these relationships be examined more thoroughly. By doing so, the potential to decrease long-term health effects that a diet high in sodium influences is promising.\textsuperscript{36} Future studies are increasingly becoming necessary to connect the relationship between menu-labeling findings, inclusive of both caloric and non-caloric information, and its link with long-term health effects, such as obesity, blood pressure, cardiovascular disease, and diabetes.

Strengths

The present study has a number of strengths. The large study sample provided adequate power to detect differences between waves for sodium purchasing behavior. This, along with the fact that the study was a natural experiment (no experimental intervention was employed), allowed for a true assessment of consumer response to a policy change regarding point-of-purchase labeling. There were also a variety of fast food restaurants sampled in this study. This variety enabled the consumer response to be investigated across several different demographics and tastes, thus broadening the application of the findings from this study as a whole. The distinct time frame of data sampling in this study allowed the long-term impact of menu labeling legislation to be analyzed. Our findings show that while patrons of fast food
restaurants were more aware of non-nutrition information at the point-of-purchase 18 months after labeling regulations were enforced compared to before, they did not use this information to help them make their food purchases. Other environmental factors may have contributed to these decisions and to the lowering of sodium in foods purchased from pre- to post-regulation. A more detailed assessment of consumer behavior and an examination of fast food industry changes during this time frame may help to decipher the sodium changes observed.

**Limitations**

The present study included a few limitations. Despite the fact that different points in time were analyzed (pre versus post-regulation), different consumer groups were analyzed at each time point (it was not a longitudinal design). Although the characteristics of the groups were similar by wave, there may have been differences in other variables not measured that may have led to an over or underestimation of non-calorie nutrition awareness or sodium intake levels observed.

The survey also did not allow the participant to specify which type of non-caloric information they saw (i.e. was it sodium specifically or just simply carbohydrate information?). This lack of specificity could have potential effects on patron survey responses. Also, the timing of receipt collection and survey implementation did not account for whether or not the “meal” purchased was actually consumed. The “meal” may have contained a certain sodium amount, but it is unknown as to whether or not that sodium content was consumed entirely. Therefore the translation of the sodium findings from this study into what patrons actually ate cannot be made. The data collection process was also unable to collect information from drive-through customers, and seeing as how that is a prominent component of fast-food restaurant consumerism in the United States, a key component was missed.
CONCLUSION

As one of the frontrunners in the area of menu-labeling legislation, King County, Washington has set the stage for more research opportunities as to the relationship between point-of-purchase nutrition information and consumer food purchasing behavior. According to our study, looking at responses to non-calorie nutrition information and consumer choices at three different styles of restaurants, patrons seemed to be more aware of this information post-mandatory regulation compared to pre-regulation. Among those that did see posted information in the sandwich-type and TexMex-style restaurants, our findings suggest that this information may have impacted their food purchases to be lower in sodium. To explore this relationship further, more research is needed to decipher whether it was point of purchase nutrition labeling or other environmental changes that ultimately influenced consumer choices and sodium content of meals purchased.
REFERENCES


7.


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   doi:10.1038/ejcn.2012.204


51. Center for Science in the Public Interest. Summary of polls on nutrition labeling in

52. Technomic Inc. Executive summary: Consumer reaction to calorie disclosure on menus/menu boards in New York City. 2009.


Appendix A: Nutrition Labeling Evaluation (Burger/Sandwich) Survey

<table>
<thead>
<tr>
<th>BEVERAGE</th>
<th>A (self)</th>
<th>B (2nd person): Choose youngest</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td></td>
<td>Yes</td>
<td>Regular</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CUSTOMIZATIONS TO ORDER</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>BURGER/SANDWICH</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CHICKEN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SALAD</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Was this a meal or a snack?</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Self)</td>
</tr>
<tr>
<td>Meal</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAW CALORIE AMOUNTS IN THE RESTAURANT WHERE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SAW OTHER NUTRITION AMOUNTS ABOUT FATS, SODIUM (SALT) OR CARBS IN THE RESTAURANT WHERE?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CALORIES A PERSON YOUR AGE, WEIGHT, AND HEIGHT SHOULD EAT EACH DAY</th>
</tr>
</thead>
<tbody>
<tr>
<td>Specify:</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>GENDER</th>
<th>YR OF BIRTH</th>
</tr>
</thead>
<tbody>
<tr>
<td>M</td>
<td>F</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>HISPANIC, LATINO/AA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Y</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>RACE (WHITE/CAUCASIAN)</th>
</tr>
</thead>
<tbody>
<tr>
<td>BLACK/AFR AM</td>
</tr>
<tr>
<td>ASIAN/SOUTH ASIAN</td>
</tr>
<tr>
<td>MEXICAN, CENTRAL, SOUTH AMERICAN, PUERTO RICAN, OR CUBAN</td>
</tr>
<tr>
<td>AMERICAN/ALASKA NATIVE</td>
</tr>
<tr>
<td>NAT HAWAIIAN/OTHER PACIFIST</td>
</tr>
<tr>
<td>OTHER</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>ZIP CODE WHERE YOU LIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>OK</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>NEAREST INTERSECTION (1ST ST)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>2ND INTERSECTION (2ND ST)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>PROBE FOR DIRECTIONAL: N, S, E, W, NE, NW, SE, SW AND IF THE STREET NAME IS ROAD, ST, AVE, PL, CT</th>
</tr>
</thead>
</table>

Appendix B: Nutrition Labeling Evaluation: Point of Purchase Customer Survey

### CUSTOMIZATIONS TO ORDER

| Beverage | Soy | Whole | Lowfat | Nonfat | Half and Half | Cream or Whipped Cream | Black (no milk/sugar) | Don't Know | Sugar/Honey/Other | Non-Calorie Substitute | Sweetener
|-----------|-----|-------|--------|--------|--------------|------------------------|-----------------------|------------|------------------|------------------------|----------
| Coffee/Tea Hot Chocolate | S   | W     | L      | N      | H            | C                      | B                     | DK         | SU/NO/SY         | NC                     | Regular |
| Diet or No Calorie Beverage | D   |       |        |        |              |                        |                       |            |                  |                        |          |

### FOOD

<table>
<thead>
<tr>
<th>Customization</th>
<th>Adult</th>
<th>Kids</th>
<th>Upgrade Item</th>
<th>Flour</th>
<th>Tortillas</th>
<th>Wheat/Other</th>
<th>Cheese/Guac/Mayo</th>
<th>Sauce/Sour Cream</th>
<th>Oil/Vinaigre</th>
</tr>
</thead>
<tbody>
<tr>
<td>Combo</td>
<td>CA</td>
<td>CK</td>
<td>U</td>
<td>F</td>
<td>W/C</td>
<td>X/OXG/XMSX/XSC/COV</td>
<td>NC/NO/MS/XNS/NO/ON/W</td>
<td>NC/NO/MS/XNS/NO/ON/W</td>
<td></td>
</tr>
</tbody>
</table>

### SALAD

<table>
<thead>
<tr>
<th>Dressing</th>
<th>Regal</th>
<th>Lowfat</th>
<th>On the side</th>
<th>No dressing</th>
</tr>
</thead>
<tbody>
<tr>
<td>A (Self)</td>
<td>DR/DL</td>
<td></td>
<td>DR / DL</td>
<td>DN</td>
</tr>
<tr>
<td>B (2nd person)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### NUTRITION INFO

- Was this a meal or a snack? A (Self): Meal, Snack B (2nd person): Meal, Snack
- Saw calorie amounts in the restaurant? Y: Yes, N: No, DK: Don't Know
- Saw other nutrition amounts for fat, sodium, or carbs? Y: Yes, N: No, DK: Don't Know
- Calories a person your age, weight, and height should eat each day
  - Specify: DK
  - Specify: DK

### DEMOGRAPHIC INFO

- Gender: M: Male, F: Female
- Year of Birth: Yr:
- Hispanic, Latino/a: Y: Yes, N: No, DK: Don't Know
- Race: White/Caucasian, Black/African American, Mexican, Central, South American, Puerto Rican, Cuban, Asian/South Asian, Am Indian/Alaskan Native, Nat Hawaiian/Other Pacific Islander
- Specify: DK
- Zip code where you live: Zip
- Nearest intersection (1st st): Street where you live: 1st, 2nd, 3rd, etc.
- Nearest intersection (2nd st): Nearest cross-street: 1st, 2nd, etc.
- Probe for directional: N, S, E, W, NE, NW, SE, SW and if the street name is Road, St, Ave, Pl, Ct