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I, Katherine S. Shields, hereby submit this original work as part of the requirements for the degree of Master of Science in Nutrition.

It is entitled: The Difference in Sodium Content of Meal Purchases by Fast-Food Consumers Pre- and Post- Menu-Labeling Regulation Enforcement in King County, Washington

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The Difference in Sodium Content of Meal Purchases by Fast-Food Consumers Pre- and Post- Menu-Labeling Regulation Enforcement in King County, Washington

A thesis submitted to the Graduate School of the University of Cincinnati in partial fulfillment of the requirements for the degree of

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by

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ABSTRACT

Background: Legislators and public health advocates hope that providing the public with nutrition information at the point of purchase will help individuals make better, more informed choices about the items they buy. However, there is mixed evidence as to whether the public sees and/or uses this information. There are limited studies done on the use of sodium nutrition information with regard to fast-food meal purchases.

Purpose: To examine the difference in the number of participants who reported seeing and using non-calorie nutrition information at the point of purchase in fast food establishments, and the mean sodium content of their meal choices pre- and post-regulation enforcement of menu-labeling legislation in King County, Washington.

Study Design and Methods: A secondary data analysis using cross-sectional data collected at two discrete time points: Wave 1 prior to the enforcement of King County’s menu-labeling regulation (October and November 2008), and Wave 2 immediately following enforcement (April, May, and June 2009). Data were collected from itemized food receipts and a short survey developed to assess awareness and usage of menu-labeling given to 3,257 consumers who purchased a meal at one of eight fast-food restaurant chains (Burger King, McDonald’s, Jack in the Box, Subway, Quizno’s, Taco Bell, Taco Time, and Taco Del Mar). Pearson’s Chi Square tests were used for all comparison of proportions for categorical data.
Differences in mean sodium content of participant meal purchased and the three fast-food restaurant types (Burger, Sandwich and TexMex) between Waves 1 and 2 were examined using the independent Student’s t-test.

**Results:** More participants post-regulation enforcement reported that they saw non-calorie nutrition information at the point of purchase compared to participants pre-enforcement. The mean sodium content of meals pre- versus post-regulation was not significantly different and well above national nutrition recommendations for teenagers and adults. The mean sodium content of TexMex consumers’ meals were lower post- compared to pre-regulation enforcement.

**Conclusion:** Based on our findings, patrons to some Burger, Sandwich, and TexMex fast food restaurants in King County, WA, appeared to be more aware of non-calorie nutrition information after federal regulations were enforced to provide this information at the point of purchase. Among patrons to the TexMex Restaurants, this may have impacted the sodium content of their meal purchases. More research is needed to decipher whether it was menu-labeling regulations or other environmental changes that contributed to improvements in sodium purchasing behavior.
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INTRODUCTION

Currently, approximately 31% of American adults have hypertension and it is considered a major public health concern both in the United States and in developed countries around the world.\(^1\) Hypertension is one of the major causes of cardiovascular disease, which is one of the leading causes of death, disability, and health-care costs in the United States.\(^1\) Hypertension’s heavy burden on the American public has prompted extensive research investigating risk factors for hypertension, and dietary sodium consumption is among the leading factors that directly affect development of hypertension.\(^1\) Major sources of dietary sodium include processed and packaged foods such as breads, deli meats, cheeses, poultry, snack items, sauces, and dressings.\(^2\) Fast-food restaurants are dependent on many of these items, and consequently, there menu selections are high in sodium.\(^3\)

As a primary prevention effort to address obesity epidemic, fast-food restaurant menu-labeling was implemented as a system level effort. Besides calorie information, non-calorie information such as sodium, fat, saturated fat, and carbohydrate was also included. In the U.S., only four states—California, Maine, Massachusetts, and Oregon— as well as New York City (NYC), San Francisco, Philadelphia, and Washington’s King County, which includes the Seattle metropolitan area, have adopted mandatory menu-labeling legislation.\(^4\)\(^5\) There are limited studies on the effects of this point-of-purchase non-calorie information, including sodium, on consumer purchasing choices. The goal of this and other menu-labeling legislation is to help fast-food consumers make more informed
choices, which if also more healthful, could potentially reverse the prevalence and public health burden of hypertension and cardiovascular disease (CVD).

REVIEW OF LITERATURE

Hypertension: Prevalence, Risk Factors, and Public Health Implications

Nearly 68 million American adults have high blood pressure (HBP), which is defined as systolic pressure $\geq$140 mm Hg and/or diastolic pressure $\geq$90 mm Hg, use of antihypertensive medication, or being told at least twice by a physician or other health professional that one has HBP.\(^1\)\(^6\) Approximately 31% of American adults have hypertension in the United States.\(^1\) In 2010, the age-adjusted prevalence estimates for hypertension from National Health Interview Survey (NHIS) and National Center for Health Statistics (NCHS) for people $\geq$18 years of age, were more than 20% for whites, Asians, Hispanics or Latinos, 30% for black or African Americans, American Indians or Alaska Natives, 40% for Native Hawaiians or other Pacific Islanders.\(^6\) Hypertension among pediatric populations (defined as a systolic and/or diastolic blood pressure (BP) $\geq$ 95th percentile for age, gender, and height on three or more readings) is on the rise with current prevalence at 3–4%.\(^7\) In both adult and pediatric populations, the long-term health consequences of hypertension are vast and deadly.

Numerous risk factors for hypertension have been identified. Non-dietary risk factors include age, ethnicity, family history of hypertension and genetic factors, lower education and socioeconomic status, excessive weight, physical inactivity, tobacco use, stress, and sleep apnea.\(^6\) Dietary factors include dietary fats, higher
sodium intake, lower potassium intake, and excessive alcohol intake.\textsuperscript{6} The development of hypertension is of serious medical concern because of its close relationship to CVD.

Hypertension is one of the major causes of CVD, which is one of the leading causes of death, disability, and health-care costs in the United States.\textsuperscript{1} Hypertension increases the risk of stroke, heart attack, and kidney failure.\textsuperscript{8} A chronic condition, adults diagnosed as hypertensive are usually on anti-hypertensive medications for the duration of their lives.\textsuperscript{9} Every year, billions of dollars are spent by the health-care industry treating hypertension.\textsuperscript{1, 10, 11} Reducing total daily mean sodium consumption in the United States by more than 10\% (~360 mg) could prevent an estimated 28,000 deaths and $7 billion in health-care costs annually and lessen the public health burden of hypertension and CVD.\textsuperscript{12} According to the Centers for Disease Control (CDC), one of the dietary risks with the largest estimated excess mortality effects is high dietary salt.\textsuperscript{1, 6}

**Sodium and Hypertension**

Excessive dietary sodium has been identified as a major contributor to hypertension and the causal link between the two has been well established.\textsuperscript{1} There is a dose-response relationship between salt intake and blood pressure with intakes of 3 to 12 grams of salt per day.\textsuperscript{13} Reducing one’s sodium intake by 3 grams per day has been reported to predict a decrease in systolic/diastolic blood pressure of 3.6 to 5.6/1.9 to 3.2 mm Hg in hypertensive subjects and 1.8 to 3.5/0.8 to 1.8 mm Hg in normotensive subjects.\textsuperscript{13} Among normotensive individuals, reducing sodium intake
by 2 grams per day over an 18-month period has been shown to decrease the incidence of hypertension by 35% at a 7-year follow-up.\textsuperscript{14} For individuals already diagnosed as hypertensive, reducing dietary sodium intake by 4.6 grams per day yielded a mean reduction in systolic/diastolic blood pressure of 5.06/2.70 mm Hg.\textsuperscript{14}

The Adequate Intake for sodium is 1.5 grams per day for teenagers and adults, as well as older adults up to age 70 years.\textsuperscript{15} Currently, the Dietary Guidelines for Americans recommend that daily sodium intakes not exceed 2,300 mg overall and 1,500 mg for specific at-risk populations that comprise about half of the population.\textsuperscript{11} In 2005, only 9.6% of adults met these recommendations.\textsuperscript{13} According to the CDC, the average sodium intake for individuals $\geq$2 years of age is 3,266 mg/day.\textsuperscript{1} However, according to National Health and Nutrition Examination Survey from 2007-2008, the average daily intake is more than double the recommended dietary upper limit (2,300 mg) for most populations.\textsuperscript{12,16}

**Major Contributors to Dietary Sodium Intake**

The major contributors to sodium intake ($>75\%$) among adults in the U.S. are packaged and restaurant foods excluding table salt or the addition of salt to foods prior to consumption.\textsuperscript{17-19} Only 5-6% of sodium consumed is added at home during cooking and 5-6% at the table.\textsuperscript{2} One-fourth of dietary sodium comes from restaurant food; 13.6% from fast food or pizza and 11.2% from restaurants with table service.\textsuperscript{2}

A study of sodium consumption from specific food categories and sources were estimated among 7,227 participants aged $\geq$2 years in the ‘What We Eat in America’, National Health and Nutrition Examination Survey, 2007–2008.\textsuperscript{2} The
findings demonstrated that mean sodium density was significantly greater for foods and beverages obtained from fast food/pizza or other restaurants than stores.\textsuperscript{12} Approximately 44\% of sodium consumption came from foods in the following 10 categories: bread and rolls (7.4\%), cold cuts/cured meats (5.1\%), pizza (4.9\%), fresh and processed poultry (4.5\%), soups (4.3\%), sandwiches like cheeseburgers (4.0\%), cheese (3.8\%), pasta mixed dishes (e.g., spaghetti with meat sauce) (3.3\%), meat mixed dishes (e.g., meat loaf with tomato sauce) (3.2\%), and savory snacks (e.g., chips and pretzels) (3.1\%).\textsuperscript{2}

In another study, Ni Mhurchu et al. (2011) estimated the mean sodium content of major processed food groups and categories that contribute to sodium in the United Kingdom (U.K.) food supply. Although the sources of foods for analysis were from 44,372 U.K. foods from 21,108 U.K. household purchases between October 2008 and September 2009, the findings are applicable since processed foods are served in fast-food restaurants.\textsuperscript{19} The largest food group contributors to total sodium purchases were processed meats (18\%), breads and bakery products (13\%), dairy products (12\%), and sauces and spreads (11\%).\textsuperscript{19} Processed meat included items like sliced ham, sausages, frozen processed meat, and bacon, which accounted for 46\% of the proportion of sodium from processed meat and 8\% of the total.\textsuperscript{19} Additionally, cheese, sauces and spreads (mayonnaise, barbecue sauce, salad dressing) were also major contributors to sodium intakes.\textsuperscript{19} These results confirm that fast-food restaurants serve foods high in sodium since menu items include cheeseburgers; chicken sandwiches; deli sandwiches with cold cuts, cheese, bacon, and cured meats; sauces and condiments; as well as chips.
Anderson et al. (2010) used data from the INTERMAP Study to define major food sources of sodium in diverse sample from East Asian and Western population in the U.S. They reported that major food sources of sodium were commercially processed breads, cereals, and grains (19.5 %); commercially processed red meats, poultry, and eggs (12.0 %); gravies, seasonings, sauces, and salad dressings (11.7%); and dairy products (8.2%). It was also reported that in the United States, salt added to foods in restaurants, fast-food restaurants, and at home accounted for 29% of dietary sodium. Again, since fast-food restaurant menu items consist of commercially processed breads and grains, red meats, poultry, eggs, sauces, and salad dressings, they are an obvious contributor of dietary sodium for individuals who frequent these fast-food restaurants.

**Impetus for Menu-Labeling Legislation: Calorie Content and Non-Calorie Nutrients Related to Chronic Disease Conditions**

Due to the fact that processed and restaurant foods contain excessive sodium, U.S. consumers have limited control about the amount of sodium they consume when they choose to eat outside the home. In an effort to empower the consumer to make healthier food choices while they are eating out, Congress implemented menu-labeling regulation. While initial legislation was aimed at providing consumers with caloric values for food consumed at table-service and fast-food restaurants, new regulations in some U.S. cities also require restaurants to provide non-calorie nutrition information such as sodium.
The public health rationale behind menu labeling laws include that few Americans eat recommended minimum amounts of produce and many over consume calorie-dense, nutrient-poor foods contributing to obesity and a myriad of negative health consequences, including hypertension and CVD.\textsuperscript{21-23} A quarter of U.S. adults consume fast food everyday.\textsuperscript{24} It has been shown that the nutrient composition of the majority of fast-food menu items are high in fat (specifically saturated fat), overall energy dense, higher in sugar and salt, and lower in fiber and calcium.\textsuperscript{25-29} Fast-food menus rarely provide enough information for health-conscious consumers to make informed purchases and many consumers greatly underestimate the nutritional content (i.e. sodium) of menu items.\textsuperscript{4,30} In the past, the nutrition information was available on some fast-food restaurant websites or by request, but was not easily accessible.\textsuperscript{30} Thus, the Surgeon General, Institute of Medicine, and Food and Drug Administration saw a need for menu-labeling legislation.\textsuperscript{31}

In 2008, NYC became the first U.S. city to implement menu-labeling legislation requiring restaurant owners to post caloric information alongside menus. The primary goal of menu-labeling legislation is to mitigate the obesity epidemic by giving customers more knowledge about the food they are consuming. By providing caloric information to consumers at the point of purchase, public health advocates hope that consumer awareness regarding the caloric and nutritional content of table-service and fast-food restaurant menu items will increase and lead consumers to make healthier food choices when dining outside the home.
In March 2010, Section 4205 of the Affordable Care Act was signed into law, setting new federal requirements for nutrition labeling and food sold at various chain restaurants and similar retail food establishments with establishments of 20 or more locations being affected.\textsuperscript{32} The statutory provisions include posting the number of calories for standard menu items on menus and menu boards, providing additional nutrition information in writing, and posting clearly on menus and menu boards that such information is available upon request.\textsuperscript{32}

These menu-labeling laws aim to ensure that customers have the necessary nutrition information—calorie, fat, sodium, and carbohydrate—available at the time of purchase to better inform their buying decisions. While various fast-food restaurants—Subway, Panera, Starbucks—have long provided caloric information to consumers on their menus at point of selection, others provide this information on posters or flyers that are not readily accessible or visible to consumers, hence the need for national mandated menu-labeling laws.\textsuperscript{4, 32} Requiring calorie information to be posted on menus at point-of-selection and drive-thru menu boards could potentially decrease excess energy and sodium intake by increasing consumer awareness of the higher caloric, sodium, and fat content of certain menu items.\textsuperscript{3, 4}

Currently, four states have passed menu-labeling laws—California, Maine, Massachusetts, and Oregon—as well as NYC, San Francisco, Philadelphia, and Washington’s King County, which includes the Seattle metropolitan area.\textsuperscript{4}

**Current Menu-Labeling Legislation: King County, Washington**
King County, Washington, includes the major metropolitan city Seattle, as well as several smaller cities. King County’s Nutrition Labeling Regulation went into effect on August 1, 2008, with mandatory adherence required by January 1, 2009.\(^5\)

The legislation states that chain restaurants with 15 or more national locations and gross annual revenue of at least $1 million are required to provide nutrition labels for calories, saturated fat, carbohydrate, and sodium for all standard menu items. The total number of calories for each standard menu item must be posted next to the item on the menu or menu board and in a font that is easily readable and similar to the other information on the menu (no smaller than 9-point).\(^5\) Non-calorie nutrition information (saturated fat, carbohydrate, and sodium) must be provided to customers in another format that is easily accessible and readable, such as a pamphlet, brochure, or poster and in plain sight from or before the point of ordering.

Additionally, the legislation mandated that each menu alternative (i.e. pamphlets, posters, etc.), in a clearly print the following required statement: “The Dietary Guidelines for Americans recommend limiting saturated fat to 20 grams and sodium to 2,300 milligrams for a typical adult eating 2,000 calories daily. Recommended limits may be higher or lower depending upon daily calorie consumption.”\(^5\)

Labeling regulations for drive through menu boards went into effect on August 1, 2009.

**Evaluation on the Effect of Menu-Labeling**

Recent menu-labeling legislation efforts have prompted the investigation of the effectiveness of providing nutrition information at the point of selection on fast-
food and table-service restaurant menus. Because menu-labeling requirements are new, there is limited data available on their effectiveness and the vast majority of existing studies focus on the effects on purchasing behavior—either actual or intended—in response to caloric information provided at the point of purchase. Researchers have taken different design approaches to answer similar research questions about the effectiveness of menu labeling.

One methodical approach used in multiple studies was to examine the impact on intent to purchase fast-food items after providing adults and adolescents with nutritional information.\textsuperscript{31, 33, 34} For example, Gerend et al. (2009) examined the effect of providing introductory psychology students (111 men, 177 women) with either a calorie or no calorie menu condition modeled off a McDonald’s menu and random assignment to one of three scenarios—“quick dinner,” “starving,” or “not too hungry.” In this study, male participants’ menu selections were unaffected by calorie content but women who received calorie information chose significantly lower calorie meals (146 fewer calories per meal) than did women who did not receive calorie information.\textsuperscript{33} Though not statistically significant, the authors reported that men tended to choose higher calorie content meals when provided (vs. the other condition) with calorie information.\textsuperscript{33}

A few studies analyzed consumer purchasing pre- and post-menu labeling laws that were implemented in NYC through the use of receipt and survey analysis.\textsuperscript{21, 35} Dumanovsky et al. (2010) collected data approximately three months before (pre-enforcement) and three months after (post-enforcement) the regulation
went into effect. Data collectors approached customers exiting the fast-food chain restaurants (three locations for each of the 15 fast-food chains, for a total of 45 sites) and asked them to participate in a brief survey in addition to sharing their receipt with the survey administrator.\textsuperscript{35} The final sample included 1,188 receipts pre-enforcement and 1,229 post-enforcement.\textsuperscript{35} Dumanovsky et al. (2010) found that post-enforcement, 64\% of consumers reported having seen the menu labeling, whereas only 25\% of customers reported seeing anything prior to enforcement. Additionally, 27\% of those customers who reported seeing the calorie information post-enforcement reported choosing a lower calorie option. Basset et al. (2008) conducted a study of 11 fast-food chains—only one of which was reporting calorie information at point-of-purchase (Subway)—and found that unlike other chains, Subway patrons reported more often seeing caloric information (32\% vs. 4\%).\textsuperscript{36} Also, Subway patrons who saw caloric information reported selecting a lower-calorie option (52 less calories) than those who did not.\textsuperscript{36}

Experimental conditions remain a popular mode of evaluating the effectiveness of menu labeling on participants’ food selections even after legislation implementation. Roberto et al. randomly assigned 303 members of the New Haven, Connecticut, community recruited between August 2007 and August 2008 to one of three menu conditions, offering the same items from two restaurants.\textsuperscript{37} Participants were asked to order from either a menu with the offered items only, items plus calorie information, or calorie information and a statement providing the recommended daily caloric intake (~2,000 kcal) for an adult.\textsuperscript{38} Roberto et al. (2010)
found that participants in both the calorie label conditions ordered significantly less calories than those in the no calorie labels condition.

A randomized, controlled experiment in a primary care pediatric clinic in Seattle, Washington, presented parents (n=99) with a McDonald’s menu and asked them to select meals for themselves and their child. The only difference between the control and intervention group menus was the presence of calorie information. Tandon et al. (2010) reported that parents in the intervention arm ordered an average of 102 fewer calories for their children than did control subjects (567.1 kcal vs. 671.5 kcal; p<0.04), however there was no difference between groups in caloric content of the meals selected by the parents for themselves. The reason for this unique finding is unexplained.

Focus groups have been used to explore and understand consumer interest in nutrition information on fast-food menu boards, albeit to a lesser extent than other study designs. For example, Lando et al. (2007) used focus groups to explore and understand consumer interest in nutrition information on food labels and quick-service menu boards. Participants were asked to look at a series of mock quick-service restaurant menu boards, which had received some form of modification by the researchers. Modifications included: (1) printing calories next to each item; (2) grouping more healthful meal combinations together; and (3) identifying more healthful meal combinations with a keyhole symbol. Consistent with other studies, Lando et al. (2007) reported that consumers might not always take nutrition information into consideration when making a selection from a quick-
service menu as factors such as taste, price, convenience often prevail over nutritive content.\textsuperscript{31, 33, 41-44}

Finkelstein et al. (2011) quantified the impact of this regulation using register transaction data or sales reports from one Mexican fast-food chain with locations within and adjacent to King County to analyze the effects of menu labeling and purchasing behavior.\textsuperscript{45} Fourteen Taco Time Northwest locations in and around King County were included in the analysis. Using calorie data from the company’s website, the monthly sales for each menu item were converted the monthly calories sold.\textsuperscript{45} The study ultimately concluded that there was not enough evidence to support that mandatory menu labeling, as implemented in King County, Washington, positively influenced food-purchasing behavior at one type of fast-food chain.\textsuperscript{45}

While the aforementioned studies examined the caloric content of fast-food items and purchases within the context of menu-labeling legislation, none have considered the sodium content of fast-food menu items in the same regard. Furthermore, only one study has examined the sodium content of fast-food restaurant purchases. Johnson et al. (2010) used data from a large cross-sectional survey of patrons exiting fast food chain restaurants in NYC to assess the amount of sodium in meal purchases by fast-food chain and by chain category.\textsuperscript{3} A random sample of 300 chain restaurants was selected, including 11 fast-food chains. Lunch patrons age \textgreater{}18 provided their receipt and answered a brief survey as they were exiting the restaurant and received a $2 MetroCard for their time.\textsuperscript{3} The sodium content for each menu item was ascribed using existing nutritional information
provided on company websites and then meals (at least one entrée) categorized by sodium level: 600 mg or less, 601 to 1,499 mg, 1,500 to 2,299 mg, and 2,300 mg or greater. The final sample size for the analysis of fast food meals was 6,580 receipts from 167 locations. Meals averaged 1,751 mg of sodium; 20% had greater than 2,300 mg. Over half (57%) of all purchases exceeded the 1,500-mg recommended daily sodium limit applicable to most Americans.

Numerous studies have examined the effect of point-of-purchase calorie nutritional information on fast-food consumer purchasing behavior and meal choice, but at the present time, none have examined the extent to which non-calorie nutrition information at the point-of-purchase at fast-food restaurants helps consumers decide what to buy. Furthermore, only one other study examines the mean sodium content of fast-food meal purchases. This study aims to examine whether there is a difference in the number of consumers who reported seeing non-calorie nutrition information between pre- and post-regulation enforcement of menu-labeling legislation in King County, Washington, as well as the extent to which those who reported seeing the non-calorie information also reported that the information helped them decide what to buy. Additionally, since there is also a lack of research regarding the sodium content of meals purchased at fast-food restaurants, this study aims to report the mean sodium content of meals purchased pre- and post-regulation enforcement of menu-labeling legislation in King County, Washington.
RESEARCH QUESTIONS

1) What is the proportion of participants who reported seeing non-calorie nutrition information overall, pre- to post-enforcement, and in each fast-food restaurant type (Burger, Sandwich, TexMex)? If they reported seeing non-calorie nutrition information, where did they report seeing it? Was there a significant difference between the proportion of participants who reported seeing non-calorie nutrition between pre- and post-regulation enforcement of menu-labeling laws?

2) Of the participants who reported seeing the non-calorie nutrition information, what is the proportion that reported using it to decide what to buy overall, pre- to post-enforcement, and in each fast-food restaurant type (Burger, Sandwich, TexMex)?

3) On average, was the mean sodium content of meals (entrée, side item, dessert, beverage) purchased by participants post-regulation enforcement less than the sodium content of meals purchased pre-regulation enforcement?

METHODS

The original study protocol was submitted to the University of Washington Human Subjects Division Institutional Review Board and determined to be exempt. The study protocol to conduct a secondary analysis of the data with regard to sodium was submitted to the University of Cincinnati Institutional Review Board and was also determined to be exempt.
Study Design

A secondary data analysis using cross-sectional data collected at two discrete time points: wave 1 prior to the enforcement of King County’s menu-labeling regulation (October and November 2008), and wave 2 immediately following enforcement (April, May, and June 2009). Data were collected from itemized food receipts and a short survey developed to assess awareness and usage of menu-labeling given to 3,257 consumers who purchased a meal at one of eight fast-food restaurant chains (Burger King, McDonald’s, Jack in the Box, Subway, Quizno’s, Taco Bell, Taco Time, and Taco Del Mar). A total of 42 fast-food restaurant locations in King County were surveyed.

Data Source

Two data sources were used in this analysis: food receipts and surveys. The method of data collection for both time points—pre- and post-regulation enforcement of King County’s menu-labeling legislation—were identical.

Fast-Food Receipts

Participants provided their individual, itemized food receipts to survey administrators upon exiting the fast-food restaurant at both time points. Each item was entered in Microsoft Excel as it appeared on the original receipt. These itemized receipt codes (per case, per restaurant, per wave) were used to compute the sodium content of each item and subsequent total for each participant’s purchase respectively. The original data file from King County, WA contained additional
information about the purchase obtained through the customer point-of-purchase survey (i.e. modifications, condiments, dressings, sizes, etc.). Sodium values for each item (as indicated by the receipt code recorded) were ascribed using the nutrition information provided by each specific fast-food restaurant.

**Survey**

An in-person survey was conducted by Gilmore Research Group at the time of receipt collection to obtain demographic information and clarifying information about participants’ purchases, as well as ascertain whether the participant saw and used non-calorie nutrition information and if they saw it, where they saw it. Surveys were conducted in English only. Trained survey administrators followed a protocol, which included asking probing questions to patrons about food purchases such as, “Was it diet or regular?; “Did you see other nutrition information amounts for saturated fat, sodium, or carbohydrates in the restaurant? Where?; “If yes, did you use this information to decide what to buy?” Each receipt and its corresponding survey were stapled together and then entered into Microsoft Excel. Participants were given $2 as an incentive for their participation.

**Estimation of Sodium Content**

When available, menus with nutrition information, which were obtained from fast-food restaurant locations and company websites during the original time point of data collection, were used in calculating total sodium content for each item purchased. However, the fast-food restaurant’s current nutrition information, as provided on their website, was utilized in certain instances (i.e. when a menu for
that time period was not available or the item indicated by the receipt code not be 
obtained from its original corresponding menu). Additionally, when sodium 
information could not be obtained from either the menus provided with the original 
data set or from current fast-food restaurants websites, nutritional information was 
obtained from the website which provide nutrition info on fast foods, such as 
caloriecount.com, myfitnesspal.com, livestrong.com, dolejuice.com, 
pepsiproductfacts.com, thedailyplate.com among others. Sodium amounts for 
customizations such as “extras,” “substitutions,” “exclusions,” etc. were also entered 
and totaled. Examples of these customizations include “extra cheese,” “no mayo,” 
“substitute light mayo,” or “substitute whole-wheat tortilla.” When a customer did 
not specify the details of a purchase, such as type of “chips” or “soup” or “cookie”, 
the average of the available types of chips, cookies, or soups, etc. at that restaurant 
was calculated and used to ascribe a sodium value to that item. A detailed account of 
how the calorie and sodium values were calculated for each restaurant is available 
upon request.

Once the sodium values had been calculated for each of the individual items 
for both time points and each fast-food restaurant, the data were organized by case 
(or purchase) using Microsoft Excel version 14.1.4. The sum of sodium values for all 
of the items purchased (for example, “Big Mac,” “medium fry,” “large Diet Coke,” etc.) 
by each individual case was calculated. These sums, along with each case’s 
corresponding survey response questions (specifically demographics and whether 
they saw non-calorie nutrition information, etc.) were used in the analysis.
Sample and Eligibility Criteria

The initial sample included 3,900 cases.

Inclusion Criteria: Customers who purchased a meal—as indicated by replying with “meal” versus “snack” on the survey—at one of the Burger, Sandwich, or TexMex fast-food restaurants were included in the analysis. To be included in this analysis, customers were required to provide their original itemized receipt at the time of purchase, as well as complete the survey.

Exclusion Criteria: Six-hundred and forty-three cases were excluded from the total sample for two reasons: 1) Purchases with itemized receipt codes that could not be identified via available fast-food restaurant nutrition info provided with the original data set or via current fast-food restaurant websites (n=100); and 2) purchases identified as a “snack” by the participants’ survey response to whether the purchase was a “snack” or a “meal” (n=543). The final sample included 3,257 valid receipts.

Statistical Analyses

Statistical analyses were conducted using the Statistical Analysis System for Windows (version 9.2, SAS Institute, Cary, North Carolina). For continuous variables, means and standard deviations were calculated and for categorical data, frequencies were derived. Pearson’s Chi Square tests were used for all comparison of proportions for categorical data. Differences in mean sodium content of participant meals and the three fast-food restaurant types (Burger, Sandwich and TexMex)
between Waves 1 and 2 were examined using the independent Student’s t-test. P values <0.05 were considered to be statistically significant.

RESULTS

Participant Characteristics

The majority of the participants were white and more than half were male in both Wave 1 and Wave 2 (data shown in Table 1). There were no significant differences in gender or race/ethnicity between Wave 1 and Wave 2. There was a significant difference in age distribution between the two time points ($\chi^2 = 9.6367$, $p=0.0081$), with more teenagers and less older adults in Wave 2 compared to Wave 1.

Table 1. Characteristics of Study Participants

<table>
<thead>
<tr>
<th>Demographics</th>
<th>Wave 1 N=1,606</th>
<th>Wave 2 N=1,651</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (yrs)*</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teenager (≥13-17)</td>
<td>8 (0.50%)</td>
<td>21 (1.29%)</td>
</tr>
<tr>
<td>Adult (18-65)</td>
<td>1,440 (90.4%)</td>
<td>1,497 (91.62%)</td>
</tr>
<tr>
<td>Older Adult (&gt;65)</td>
<td>145 (9.1%)</td>
<td>116 (7.1%)</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>1,036 (64.75%)</td>
<td>1,050 (63.71%)</td>
</tr>
<tr>
<td>Female</td>
<td>564 (35.25%)</td>
<td>598 (36.29%)</td>
</tr>
</tbody>
</table>
### Race

<table>
<thead>
<tr>
<th>Race</th>
<th>Wave 1</th>
<th>Wave 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>White/Caucasian</td>
<td>1,193</td>
<td>1,234</td>
</tr>
<tr>
<td>Black/African American</td>
<td>81</td>
<td>82</td>
</tr>
<tr>
<td>Asian/South Asian</td>
<td>108</td>
<td>101</td>
</tr>
<tr>
<td>Mexican¹</td>
<td>99</td>
<td>109</td>
</tr>
<tr>
<td>Other²</td>
<td>109</td>
<td>116</td>
</tr>
</tbody>
</table>

p<0.05 considered significant

¹Also 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.

*Proportion of age groups between Wave 1 and Wave 2; Pearson Chi Square test $\chi^2 = 9.6367, df=2, p=0.0081$

### Visibility of Non-Calorie Nutrition Information At Point-of-Purchase

More participants in Wave 2 reported that they saw non-calorie nutrition information while they purchased their meals than participants in Wave 1 ($\chi^2=33.0195, p<0.0001$) as shown in Table 2. The proportion of participants who reported seeing non-calorie nutrition information among Burger and TexMex fast-food restaurants in Wave 1 was significantly less compared with Wave 2, whereas there was no difference among patrons at Sandwich restaurants. In both Wave 1 and Wave 2, the participants who purchased meals at Sandwich restaurants were more likely to have answered, “Yes,” about seeing non-calorie nutrition information when compared to the participants at the Burger and TexMex fast-food restaurants.
Table 2. Frequency and Proportion (%) of Participants Who Reported Seeing Non-Calorie Nutrition Information According to Fast-Food Restaurant Type and Wave

<table>
<thead>
<tr>
<th>Seeing Non-Calorie Nutrition Information</th>
<th>Burger(^1) Fast-Food Restaurants</th>
<th>Sandwich(^2) Fast-Food Restaurants</th>
<th>TexMex(^3) Fast-Food Restaurants</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WAVE 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>14 (2.75%)</td>
<td>132 (21.02%)</td>
<td>19 (4.09%)</td>
<td>165 (10.31%)</td>
</tr>
<tr>
<td>No</td>
<td>476 (93.52%)</td>
<td>469 (74.68%)</td>
<td>431 (92.89%)</td>
<td>1,376 (85.95%)</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>19 (3.73%)</td>
<td>27 (4.30%)</td>
<td>14 (3.02%)</td>
<td>60 (3.75%)</td>
</tr>
<tr>
<td>Total</td>
<td>509 (100%)</td>
<td>628 (100%)</td>
<td>464 (100%)</td>
<td>1,606 (100%)</td>
</tr>
<tr>
<td><strong>WAVE 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>79 (15.61%)*</td>
<td>126 (19.38%)</td>
<td>70 (14.14%)**</td>
<td>275 (16.66%)***</td>
</tr>
<tr>
<td>No</td>
<td>394 (77.87%)</td>
<td>486 (74.77%)</td>
<td>413 (83.43%)</td>
<td>1,293 (78.32%)</td>
</tr>
<tr>
<td>Don’t Know</td>
<td>33 (6.52%)</td>
<td>38 (5.85%)</td>
<td>12 (2.42%)</td>
<td>83 (5.03%)</td>
</tr>
<tr>
<td>Total</td>
<td>506 (100%)</td>
<td>650 (100%)</td>
<td>495 (100%)</td>
<td>1,646 (100%)</td>
</tr>
</tbody>
</table>

p<0.05 considered significant
\(^1\)Burger Fast-Food Restaurants include Burger King, McDonald’s, and Jack in the Box
\(^2\)Sandwich Fast-Food Restaurants include Subway and Quizno’s
\(^3\)TexMex Fast-Food Restaurants include Taco Time, Taco Bell, and Taco Del Mar
*Proportion of participants who saw non-calorie nutrition information at Burger fast-food restaurants between Wave 1 and Wave 2; Pearson Chi Square test, \(\chi^2 = 56.9197, \text{df}=2, p<0.0001\)
**Proportion of participants who saw non-calorie nutrition information at TexMex fast-food restaurants between Wave 1 and Wave 2; Pearson Chi Square test, \(\chi^2 = 28.7904, \text{df}=2, p<0.0001\)
***Proportion of participants who saw non-calorie nutrition information between Wave 1 and Wave 2; Pearson Chi Square test, \(\chi^2 = 33.0195, \text{df}=2, p<0.0001\)

Source of Non-Calorie Nutrition Information

Between Wave 1 and Wave 2, the proportion of participants who reported the location of seeing non-calorie nutrition information in TexMex fast-food
restaurants was significantly different ($\chi^2 = 15.7978, p=0.0149$) (data not shown). “Other” included “tray liner,” “wrapper,” “glass,” “sneeze guard,” “napkin,” “cup,” “decal,” “glass,” “website,” “food container,” etc. Among the Burger fast-food restaurants in both time periods, participants only reported seeing non-calorie nutrition information on the menu boards as well as “other,” which primarily included “wrapper,” “food container,” and “tray liner” (data not shown). Overall, Sandwich fast-food restaurants participants who reported the source of non-calorie nutrition information most often reported seeing it either on the menu board or “other,” which primarily included “glass,” “napkin,” “cups,” and “decal.” (data not shown). Overall, TexMex participants more frequently reported seeing non-calorie nutrition information on a menu board, wall, pamphlet compared to other locations (data not shown).

**Figure 1.** Proportion of Non-Calorie Nutrition Information Source According to Those Who Reported Seeing it at Burger, Sandwich, and TexMex Fast-Food Restaurants By Wave
Note: Other included responses such as “door,” “napkin,” “cup,” “window,” “chip bag,” etc.

Usage of non-calorie nutrition info on meals purchase

Table 3 and Figure 2 show that there were no significant differences in the proportion that reported using non-calorie nutrition information between Wave 1 and Wave 2 overall or by fast-food restaurant type.

Table 3. Proportion of Participants Who Reported Seeing Non-Calorie Nutrition Information and Using it to Decide What to Buy According to Fast-Food Restaurant Type and Wave

<table>
<thead>
<tr>
<th>Proportion Who Reported Using Non-Calorie Nutrition Information</th>
<th>Burger Fast-Food Restaurants$^1$</th>
<th>Sandwich Fast-Food Restaurants$^2$</th>
<th>TexMex Fast-Food Restaurants$^3$</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wave 1</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>4 (28.57%)</td>
<td>36 (27.27%)</td>
<td>5 (26.32%)</td>
<td>45 (27.27%)</td>
</tr>
<tr>
<td>No</td>
<td>5 (35.71%)</td>
<td>63 (47.73%)</td>
<td>2 (10.53%)</td>
<td>70 (42.42%)</td>
</tr>
<tr>
<td>No response$^a$</td>
<td>5 (35.71%)</td>
<td>33 (25%)</td>
<td>12 (63.16%)</td>
<td>50 (30.30%)</td>
</tr>
<tr>
<td><strong>Wave 2</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Yes</td>
<td>21 (26.58%)</td>
<td>44 (34.92%)</td>
<td>26 (37.14%)</td>
<td>91 (33.09%)</td>
</tr>
<tr>
<td>No</td>
<td>56 (70.89%)</td>
<td>79 (62.70%)</td>
<td>39 (55.71%)</td>
<td>174 (63.27%)</td>
</tr>
<tr>
<td>No response$^a$</td>
<td>2 (2.53%)</td>
<td>3 (2.38%)</td>
<td>5 (7.14%)</td>
<td>10 (3.64%)</td>
</tr>
</tbody>
</table>

p<0.05 considered significant

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

$^a$Not every participant who reported seeing non-calorie nutrition information responded as to whether they used it to help decide what to buy.
Figure 2.

1Burger Fast-Food Restaurants include Burger King, McDonald’s, and Jack in the Box
2Sandwich Fast-Food Restaurants include Subway and Quizno’s
3TexMex Fast-Food Restaurants include Taco Time, Taco Bell, and Taco Del Mar
Note: Not every participant who reported seeing non-calorie nutrition information responded as to whether they used it to help decide what to buy
Mean Sodium Content of Participant Meals

As shown in, the mean sodium contents of meals purchased in Wave 1 and Wave 2 were well above the Adequate Intake of 1,500 grams of sodium per day for adults and nearly exceed the 2,300 mg per day limit recommended by the Dietary Guidelines for Americans. Among the three fast-food restaurant types, the mean sodium content of TexMex fast-food restaurant participants’ meal purchases was significantly lower in Wave 2 compared to Wave 1 (p=0.0191).

Table 4. Mean Sodium Content (mg) of Meals Pre-Regulation Enforcement (Wave 1) and Post-Regulation Enforcement (Wave 2)

<table>
<thead>
<tr>
<th></th>
<th>Total (mg)</th>
<th>Burger Fast-Food Restaurants</th>
<th>Sandwich Fast-Food Restaurants</th>
<th>TexMex Fast-Food Restaurants</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Wave 1</strong> (N=1,606)</td>
<td>2,172.6 ± 1,029.1</td>
<td>1,608.8 ± 841.6</td>
<td>2,554.2 ± 1,064.9</td>
<td>2,195.8 ± 940.4</td>
</tr>
<tr>
<td><strong>Wave 2</strong> (N=1,651)</td>
<td>2,203.6 ± 1,082.4</td>
<td>1,768.2 ± 911.1</td>
<td>2,653.8 ± 1,167.4</td>
<td>2,057.3* ± 889.8</td>
</tr>
</tbody>
</table>

*Burger Fast-Food Restaurants include Burger King, McDonald’s, and Jack in the Box
*Sandwich Fast-Food Restaurants include Subway and Quizno’s
*TexMex Fast-Food Restaurants include Taco Time, Taco Bell, and Taco Del Mar
*p<0.05

Mean Sodium Content of Participant Meals and Non-Calorie Nutrition Information Visibility and Use

As presented in Table 5, the mean sodium content of meal purchases among participants who reported seeing non-calorie nutrition information in Wave 2 compared to Wave 1 was significantly lower (p=0.0082). Regarding the participants
who also indicated using the non-calorie nutrition information to help decide what to buy, the overall mean sodium content in Wave 2 compared to Wave 1 was not significantly different (p=0.10), but there was evidence of a trend.

**Table 5.** Mean Sodium Content (mg) of Meals By Response to Whether Participants Saw Non-Calorie Nutrition Information Pre-Regulation Enforcement (Wave 1) and Post-Regulation Enforcement (Wave 2) According to Fast-Food Restaurant Type

<table>
<thead>
<tr>
<th></th>
<th>Total</th>
<th>Burger Fast-Food Restaurants¹</th>
<th>Sandwich Fast-Food Restaurants²</th>
<th>TexMex Fast-Food Restaurants³</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>WAVE 1</strong></td>
<td>N=1606</td>
<td>n=509</td>
<td>n=628</td>
<td>n=464</td>
</tr>
<tr>
<td><strong>Yes</strong></td>
<td></td>
<td>2,460.4±1,225.0 (10.3%)</td>
<td>1,538.6 ± 799.6 (2.75%)</td>
<td>2,625.5 ± 1,225.8 (21.02%)</td>
</tr>
<tr>
<td><strong>Yes and Used It to Help with Deciding What to Buy</strong></td>
<td></td>
<td>2,329.1 ± 1,215.0; n= 45</td>
<td>1,658.8 ± 261.3; n=4</td>
<td>2,384.2 ± 1,212.4; n=36</td>
</tr>
<tr>
<td><strong>No</strong></td>
<td></td>
<td>2,130.9 ± 986.0 (85.68%)</td>
<td>1,678.6 ± 840.2 (93.52%)</td>
<td>2,532.5 ± 992.2 (74.68%)</td>
</tr>
<tr>
<td><strong>Don't Know</strong></td>
<td></td>
<td>2,256.0 ± 1,246.4 (3.74%)</td>
<td>1,774.2 ± 906.8 (3.73%)</td>
<td>2,499.8 ± 1,368.1 (4.30%)</td>
</tr>
<tr>
<td><strong>WAVE 2</strong></td>
<td>N=1,651</td>
<td>n=506</td>
<td>n=650</td>
<td>n=495</td>
</tr>
</tbody>
</table>
Yes & Used It to Help with Deciding What to Buy

<table>
<thead>
<tr>
<th></th>
<th>Yes</th>
<th>Yes &amp; Used It</th>
<th>No</th>
<th>Don’t Know</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2,154.7 ± 1060.6</td>
<td>2,674.4 ± 1,167.5</td>
<td>2,206.3 ± 1,092.3</td>
<td>2,322.8 ± 996.5</td>
</tr>
<tr>
<td></td>
<td>(16.66%)</td>
<td>(19.38%)</td>
<td>(78.32%)</td>
<td>(5.03%)</td>
</tr>
<tr>
<td></td>
<td>1,692.2 ± 735.8</td>
<td>1,741.3 ± 688.2</td>
<td>1,777.8 ± 949.4</td>
<td>1,835.2 ± 843.5</td>
</tr>
<tr>
<td></td>
<td>(15.61%)</td>
<td>(14.14%)</td>
<td>(77.87%)</td>
<td>(6.52%)</td>
</tr>
</tbody>
</table>

\( ^* \text{p}<0.05 \)

\( ^{^*} \text{Trend} \)

**DISCUSSION**

The findings from this study add valuable information to the existing literature, which is overwhelmingly focused on the effects of providing calorie (versus non-calorie) information on menus at fast-food restaurants. One major finding of this study was that overall, few people saw the non-calorie nutrition information in Wave 1 and Wave 2, and of those who reported seeing it, very few consumers reported actually using it. This study is one of the few to examine the difference in consumer behavior before and after menu-labeling regulation enforcement with regard to non-calorie nutrition information.\(^{31, 46, 47}\) To date, the few studies examining the effects of menu-labeling legislation with regard to non-
calorie nutrition information looked at non-caloric and caloric information simultaneously and only one of them included sodium.

Yamamoto et al. (2005) found that when calorie and fat nutrition information were posted on the restaurant menu as part of a simulation exercise, 29% of adolescent participants (n=106) modified orders and 46% of those modifications resulted in lower calorie orders. Burton et al. (2006) examined the potential public health benefits of providing easily accessible nutrition information in restaurants through two related studies. In the first, a survey of consumers was used to examine the accuracy of consumers’ expectations of the nutrient content (calorie, sodium, fat, saturated fat) of menu items and assess whether the difference between expected and objective levels varied depending on the nutrient values. Based on the results from the first study, Burton et al. (2006) then conducted an experiment to address how the provision of nutrition information on menus influences purchase intentions and reported preferences. The sample included 241 subjects who were randomized to one of three nutrition information conditions: calories, fat, saturated/ trans fats, and sodium levels presented, (2) only calorie information presented, and (3) no nutrition information presented. The study reported that when calorie-plus-nutrient information was presented, the percentage of consumers decreased selection of items with higher levels of calories and fat than expected. Pulos et al. (2010) found some evidence to suggest that providing consumers with calorie and fat content of menu items led to choosing an entrée with less calories or fat. In a survey of restaurant patrons, these researchers found that 20.4% reported ordering
an entrée lower in calories as a result of nutrition information on the menu and another 16.5% reported ordering an entrée lower in fat.47

While these studies suggest that providing consumers with non-calorie nutrition information may influence purchasing behavior, they did not distinguish among the non-calorie nutrients (i.e. sodium, fat, saturated fat, etc. are all listed together). Also, the existing research does not separate non-calorie nutrients from calories limiting the extent to which results may be generalizable. Lastly, none of the studies were conducted at fast-food restaurants.

Other than the present study, none have examined the visibility and effect of mandatory non-calorie nutrition information enforcement at fast-food restaurants on sodium content of purchases. Overall in the present study, the proportion of participants who reported seeing non-calorie nutrition information between Wave 1 versus Wave 2 was significantly different, but there was no significant difference in those who reported using the information to make food purchases. This is consistent with other studies that examined whether point-of-purchase nutrient labeling is seen and used by consumers in post-labeling legislation periods, although the degree to which the information is used remains inconsistent. Vadiveloo et al. (2011) examined whether point-of-purchase calorie labels in NYC chain restaurants affected food purchasing patterns in a sample of lower income adults (n=440) in NYC.48 During the post-labeling period, 41% of adults reported that they noticed the information but did not use it, and 14.5% reported that they both noticed and used the information.48 As previously described,
Dumanovsky et al. (2010) found that post-enforcement, 64% of consumers reported having seen the menu labeling, whereas only 25% of customers reported seeing anything prior to enforcement, which is consistent with the findings of the present study.

Notably, the proportion of participants who reported seeing non-calorie nutrition information differed by restaurant type with more patrons of Burger and TexMex fast-food restaurants seeing the non-calorie nutrition information in Wave 2 versus Wave 1, however this was not true for Sandwich fast-food restaurants. This finding is consistent with an earlier study, which found that Subway restaurant patrons reported seeing caloric information at point of purchase more often than patrons who frequented other fast-food restaurant locations. This finding may be explained by the long-time healthy marketing campaign of Subway Restaurants. Since Subway has provided patrons with nutrition information—both caloric and non-caloric—at the point of purchase long before mandated menu-labeling legislation, it is possible that the proportion of people who noticed the non-calorie nutrition information in Wave 2 would have been different from Wave 1 if consumers were not already familiar with Subway’s menu-labeling legislation.

With the exception of the Burger fast-food restaurants, the proportion of participants at Sandwich and TexMex fast-food restaurants who reported seeing and using non-calorie nutrition information increased between Wave 1 and Wave 2. This is consistent with earlier findings regarding using calorie information post-enforcement in NYC. The present study also found that not every participant who
saw non-calorie information reported using it to help them decide what to buy and is consistent with other studies.\textsuperscript{21, 35, 36, 48} One possible explanation for this finding is that those participants may have been more motivated by taste, price, or convenience than healthful eating.\textsuperscript{30, 33, 40-42, 49} Regarding the location of the nutrient information, the present study found that overall, participants reported seeing non-calorie nutrition information on the menu board more often than other locations, which is consistent with previous findings regarding the location of nutrition information and its visibility.\textsuperscript{35, 50}

Finally, the mean sodium contents of meals in Wave 1 and Wave 2 were well above the Adequate Intake of 1,500 grams of sodium per day for adults and nearly exceeded the 2,300 mg of sodium per day upper limit recommended by the Dietary Guidelines for Americans.\textsuperscript{11, 15} This important finding is also echoed in one other study examining the sodium content of fast-food meal purchases.\textsuperscript{3} As previously described, Johnson et al. (2010) found that more than half of all purchases exceeded the 1,500-mg recommended daily sodium limit applicable to most Americans.\textsuperscript{3}

**Strengths**

This present study has a few strengths. First, the sample was recruited at a variety of different types of fast-food restaurant versus only at burger and fry or sandwich fast-food restaurants. Since the people who frequent each of these fast-food restaurants may embody different characteristics, it is important to examine non-calorie menu labeling legislation on not only different types of fast-food
restaurants but also multiple chains among each type, as presented in this study.

Second, the study sample was large.

**Limitations**

The present study is not without limitations. The study design—cross-sectional at two time points (pre- and post-menu labeling legislation enforcement) has inherent weaknesses in that the sample is not followed nor is it necessarily the same in Wave 1 and Wave 2. Customer profiles may have varied across fast-food restaurant locations, as well. The greatest limitation is that the survey instrument did not specify which non-calorie information was seen. Rather, one survey item was used, “Did you see other nutrition information amounts for saturate fat, sodium, or carbohydrates in the restaurant?” Therefore, it is impossible to know whether participants who responded, “Yes,” to whether they saw if they saw and used non-calorie nutrition information on sodium specifically. Changes in the mean sodium content of participant meals between Wave and Wave 2 and among the different fast-food restaurant types may not accurately reflect changes due to non-calorie nutrition information regulation. Between Wave 1 and Wave 2, the reported sodium content for some items on each menu (the only exceptions being for Taco Time and Taco Del Mar) changed. For example, Subway’s nutrition brochure (September, 2007) reported 1,210 mg of sodium in its “6-inch Turkey Breast & Black Forest Ham” sandwich, while in the revised nutrition information (September, 2009), the same sandwich is reported as having 1,140 mg of sodium. This discrepancy is representative of similar changes in sodium values from one year to the next at all
the fast-food restaurants except Taco Time and Taco Del Mar, as the same nutrition information source was used in recording and calculating both Wave 1 and Wave 2 sodium content. Participant meals varied greatly. A “meal,” as indicated by a participant’s response, “Meal,” to the survey question, “Was this a meal or a snack?” The meal could have consisted of a single entrée, up to three different entrees (“Big Mac,” “6 piece Chicken McNuggets,” “Cheeseburger”), up to four of the same entrée (4 quantity “Chicken Soft Tacos”), up to three different side items, beverages, and desserts. Thus, the sodium content for a “meal” was not controlled for on the basis of the content within the meal. Future analysis of the data set to control for these discrepancies would likely yield results with smaller standard deviations in mean sodium content of meals, as well as provide a clearer picture of sodium content of individual entrees, sides, beverages, and desserts. Additionally, the present study does not account for the chance that the participant making the purchase was purchasing meals for more than one or two persons, therefore it is unclear whether the sodium content of the meal is to be attributed to one individual or multiple. Likewise, since the present study examines meals purchased not consumed, there is a chance that a participant may have only consumed part of a purchase and disposed of the rest. A survey with more specific questions addressing the purchase and its consumption are needed if this study is to be replicated in the future.

**CONCLUSION**

Based on our findings, patrons to some Burger, Sandwich and TexMex fast food restaurants in King County, WA, appeared to be more aware of non-calorie
nutrition information after federal regulations were enforced to provide this
information at the point of purchase. Among patrons to the TexMex Restaurants,
this may have impacted the sodium content of their meal purchases. More research
is needed to decipher whether it was menu-labeling regulations or other
environmental changes that contributed to improvements in sodium purchasing
behavior.
References


21. Dumanovsky T, Huang CY, Nonas CA, Matte TD, Bassett MT, Silver LD. Changes in energy content of lunchtime purchases from fast food restaurants after
introduction of calorie labelling: cross sectional customer surveys. BMJ. 2011;343:d4464.


Appendix A. Nutrition Labeling Evaluation: Point of Purchase Customer Survey

<table>
<thead>
<tr>
<th>BEVERAGE</th>
<th>Soy</th>
<th>Whole</th>
<th>Milk</th>
<th>Lowfat</th>
<th>Nonfat</th>
<th>Cream</th>
<th>Half and Half</th>
<th>Coffee/Tea Hot Chocolate</th>
<th>Non-Calorie Substitute</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>S</td>
<td>W</td>
<td>L</td>
<td>N</td>
<td></td>
<td>H</td>
<td>C</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SWEETENER</th>
<th>Sugar/Honey/Syrup</th>
<th>No Sugar/Sweetener</th>
<th>Artificial Sweetener</th>
<th>Other</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>SU/HO/SY</td>
<td>NC</td>
<td>R</td>
<td>D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CUSTOMIZATIONS TO ORDER</th>
<th>Combo</th>
<th>Adult</th>
<th>Kids</th>
<th>Upgrade</th>
<th>Upgrade Item</th>
<th>Tortillas</th>
<th>Wheat/Corn</th>
<th>Cheese/ Guac/ Mayo/ Sour Creams</th>
<th>Olive/ Vinaigrette</th>
<th>No Cheese/Sour Creams</th>
<th>Regular</th>
<th>Low Fat</th>
<th>Dressing</th>
<th>Regular/Low Fat</th>
<th>On the side</th>
<th>No dressing</th>
<th>DR/ DL</th>
<th>DS</th>
<th>DN</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CA</td>
<td>CK</td>
<td>U</td>
<td>F</td>
<td>W/C</td>
<td>Yes - Extra</td>
<td>XCIX/XMX/SXQWN</td>
<td>NCM/NSM/NSX/NSQWN</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>SALAD</th>
<th>Dressing</th>
<th>Regular/Low Fat</th>
<th>On the side</th>
<th>No dressing</th>
<th>DR/ DL</th>
<th>DS</th>
<th>DN</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>NUTRITION INFO</th>
<th>A (Self)</th>
<th>Snack</th>
<th>B (2nd person)</th>
<th>Snack</th>
<th>Specify</th>
<th>Specify</th>
<th>Specify</th>
<th>Specify</th>
<th>Specify</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Meal</th>
<th>Snack</th>
<th>Specify</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>SAW OTHER NUTRITION AMOUNTS FOR SAT FAT, SODIUM, OR CARBS IN THE RESTAURANT WHERE?</th>
<th>Specify</th>
<th>Specify</th>
</tr>
</thead>
</table>

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

<table>
<thead>
<tr>
<th>GENDER</th>
<th>YR OF BIRTH</th>
<th>Specify</th>
<th>Specify</th>
<th>Specify</th>
<th>Specify</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>RECIPE</th>
<th>Specify</th>
<th>Specify</th>
<th>Specify</th>
<th>Specify</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>ZIP CODE WHERE YOU LIVE</th>
<th>Specify</th>
<th>Specify</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Nearest Intersection (1st st)</th>
<th>Street where you live</th>
<th>1st</th>
<th>1st</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Nearest Intersection (2nd st)</th>
<th>Nearest cross-street</th>
<th>2nd</th>
<th>2nd</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>PROBE FOR DIRECTIONAL</th>
<th>N, S, E, W, NE, NW, SE, SW and if the street name is Road, St, Ave, Pl, Ct</th>
</tr>
</thead>
</table>

* 1 Menu board, 2 Wall, 3 Queue, 4 Pamphlet, 5 Poster, 6 Menu, 7 2nd Menu, 8 Insert, 9 Appendix, 10 Kiosk, 11 Other
Appendix B. Nutrition Labeling Evaluation (Burger/Sandwich) Survey