

Changes in Awareness and Use of Calorie Information After Mandatory Menu Labeling in Restaurants in King County, Washington

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In recent years, policymakers and public health practitioners have implemented policies such as posting calorie and other nutrition information at restaurants to help curb epidemic levels of obesity.^{1,2} King County, Washington, implemented its menu-labeling regulation on January 1, 2009—the second jurisdiction in the United States to do so after New York City. The regulation requires chain restaurants to provide calorie, saturated fat, carbohydrate, and sodium information.³

To date, research on the impact of menu-labeling policies has focused on pre–post changes in calorie information awareness and calories in food purchased among patrons intercepted at regulated chain restaurants using surveys, receipt data, or both.^{4–10} These studies may not provide an accurate population-level estimate of menu-labeling awareness and use and are not ideal for examining whether impact varies across demographic subgroups. We report on countywide and subpopulation changes in menu-labeling awareness (i.e., seeing calorie information) and use (i.e., using calorie information) before and after policy implementation and examine heterogeneity in outcomes across subpopulations.

METHODS

We conducted an observational study of menu-labeling awareness and use in King County, Washington, using repeated cross-sectional data from May 2008 to December 2010. We defined the prepolicy period as May 1 to December 31, 2008, and the postpolicy period as January 1, 2009 to December 31, 2010. A “regulated chain” was defined by the King County Board of Health as a food establishment with 15 or more locations nationwide.¹¹

Objectives. We examined population-level impact on customer awareness and use and explored potential disparities in outcomes regarding the King County, Washington, regulation requiring chain restaurants to provide calorie information.

Methods. We analyzed 2008 to 2010 Behavioral Risk Factor Surveillance System data from 3132 English-speaking King County residents aged 18 years and older who reported eating at a regulated chain. We used regression models to assess changes in calorie information awareness and use from prepolicy to postpolicy implementation by customer demographics, health status, and restaurant type.

Results. Calorie information awareness and use increased significantly from 2008 to 2010. Unadjusted analyses indicated that the proportion who saw and used calorie information tripled, from 8.1% to 24.8%. Fully adjusted analyses confirmed significant increases. After policy implementation, White, higher income, and obese respondents had greater odds of seeing calorie information. Women, higher income groups, and those eating at a fast-food versus a sit-down chain restaurant were more likely to use this information.

Conclusions. Significant increases in calorie information awareness and use following regulation support the population-wide value of this policy. However, improvements varied across race, income, and gender. (*Am J Public Health*. Published online ahead of print January 20, 2015: e1–e8. doi:10.2105/AJPH.2014.302262)

Data Source

The Washington State Behavioral Risk Factor Surveillance System (BRFSS), the data source for this study, is a random-digit-dial, landline telephone survey using methodology developed by the US Centers for Disease Control and Prevention (CDC).^{12–14} Public Health–Seattle & King County (PHSKC) added a menu-labeling module to the BRFSS survey for administration to King County residents. After pilot testing the module, PHSKC included the final version in the survey from May 1, 2008, through December 31, 2010. The outcomes, seeing and using calorie information, were based on responses to the questions “The last time you ate at or bought take-out food from [name of restaurant or store provided by respondent] did you see any information about the number of calories for the items you

were interested in ordering?” and “Did you use the calorie information you saw to help you decide what to buy?” The surveys, including the menu-labeling module, are available online at the Washington State Department of Health’s BRFSS site.¹⁵

Study Participants

The survey sampling frame included English-speaking adults aged 18 years and older living in King County. Study analyses were limited to respondents who reported having eaten at a regulated restaurant at least once in the past week in response to the question “Since last [day of week, 1 week prior], how many times did you eat at, or buy take-out food from, a chain or fast-food restaurant?” and named a regulated restaurant in response to the question “The last time you ate or got take-out food, what was the name of

the restaurant or store?" We ascertained whether a restaurant was regulated on the basis of a PHSKC review of King County restaurants, restaurant inspection data, and licensing information (which requires any restaurant to disclose whether it is part of a chain with 15 or more locations). The list included nearly 170 chains operating in King County, representing approximately 1500 establishments.¹⁶

Data Analysis

To estimate population-level changes, we used all respondents who ate at a regulated chain as the denominator for calculating the proportion of those who saw or used calorie information. We used a categorical policy variable to represent 3 time periods: prepolicy (May–December 2008), postpolicy year 1 (January–December 2009), and postpolicy year 2 (January–December 2010), coded as 0, 1, and 2, respectively. We categorized race as non-Hispanic White and non-White, including Hispanic. Age was grouped into 3 categories, 18 to 30 years, 31 to 50 years, and 51 years and older, following the age groups used by the US Department of Agriculture for dietary guidance.¹⁷ Education was grouped into high school graduate or less, some college, and college graduate. Annual household income was defined as less than \$35 000, \$35 000 to \$49 999, \$50 000 to \$74 999, and \$75 000 and higher. Marital status was defined as married or member of an unmarried couple and as single, including divorced, widowed or separated. We grouped body mass index (BMI; defined as weight in kilograms divided by height in meters squared) into normal weight (BMI < 25), overweight (BMI = 25–29.99), and obese (BMI ≥ 30).¹⁸ A regulated chain restaurant was classified as sit-down if it provided both seating and table service (e.g., Denny's). Otherwise, it was designated as fast food (e.g., McDonald's, Starbucks, Jamba Juice, or Ben & Jerry's).

We conducted univariate analyses to estimate the proportion of patrons who saw or used calorie information over time within demographic subgroups. We used the *t* test to assess pre–post differences in the proportion of respondents who saw or used calorie information and also conducted a stratified *t* test to examine possible differences in the magnitude of changes in calorie information awareness

and use across race, gender, income, education, and BMI groups. We fit a multivariate logistic regression model to compare odds ratios from pre- to postpolicy for seeing and using calorie information, with policy period as the independent variable and the following covariates: race, age, gender, education, income, marital status, BMI, and restaurant type (model 1). We chose covariates on the basis of their potential influence on food choices.^{19–24} We conducted exploratory regression analyses by adding interaction terms to model 1 to examine possible effect modification by race, gender, and income on policy impact. We fit a separate logistic regression model (model 2) limited to the postpolicy period (January 2009–December 2010) including the same covariates as model 1 to identify which groups had higher odds of seeing or using calorie information after the policy was in effect.

We conducted all analyses using Stata/IC version 12.0 (StataCorp LP, College Station, TX). In accordance with CDC methodology,^{12–14} we weighted survey participant responses to equalize selection probability and to adjust for survey noncoverage and nonresponse when compared with King County population estimates.²⁵

RESULTS

King County BRFSS respondents during the study period numbered 8737. Nearly two thirds (65.0%) indicated having eaten at a chain restaurant in the past week. Among these respondents, 72.8% ate at a regulated chain (i.e., 47.7% of the total King County BRFSS sample; Table 1). The 3132 respondents who ate at a regulated chain constituted the study population. Most of the study population was non-Hispanic White, aged at least 31 years, married or partnered, higher income, and relatively well educated. A slightly lower proportion of adults who ate at a regulated chain were 65 years or older compared with the whole King County BRFSS sample (32.9% vs 38.6%; *P* < .05), and a slightly higher proportion were overweight or obese (62.5% vs 57.4%; *P* < .05). Other characteristics of the study population were not statistically different from the whole King County BRFSS sample. The majority of the study population ate out 1 or 2 times in the past week (35.0% and 23.3%,

respectively). Most ate at a burger or pizza chain (42.5%), followed by a coffee or juice chain (24.7%). The majority (87.8%) ate at a fast-food restaurant, not a sit-down restaurant. We found no significant differences in sociodemographic characteristics for respondents across years.

Respondents mentioned 73 regulated chains, with 48 designated as fast-food restaurants and 25 as sit-down restaurants. Although nearly 1300 establishments were represented by the 73 chains, it is not possible to know the actual number of restaurants because different respondents may have visited the same restaurant and address information was not collected.

Changes in Calorie Information Awareness and Use

In univariate analyses, the proportion who saw or used calorie information significantly increased (*P* < .001), tripling from 18.6% to 59.4% and from 8.1% to 24.8%, respectively, from May 2008 to December 2010 (Figure 1, Table 2). The full effects of labeling on calorie information awareness and use were not apparent until a year after implementation and were sustained throughout the second year (Figure 1). Our fully adjusted regression model confirmed these upward trends in calorie information awareness and use (Table 3, model 1). The odds of seeing calorie information after policy implementation were 4.96 (95% CI = 3.66, 6.73) in 2009 and 7.17 (95% CI = 5.25, 9.78) in 2010, compared with 2008 (*P* < .001).

Calorie information awareness increased in all subgroups from prepolicy to postpolicy implementation (*P* < .001). Similarly, information use increased in all subgroups (*P* < .05), except among those with a high school education or less (Table 2). However, the amount of change in seeing and using calorie information differed across subgroups. The largest absolute increases in both outcomes were among White, older, wealthier, and more highly educated respondents (Table 2). The absolute change in seeing information was significantly greater in those with annual household incomes of \$50 000 or more compared with those earning less than \$35 000, and greater in the higher education groups than among those with a high school diploma

TABLE 1—Demographics of Survey Respondents: Behavioral Risk Factor Surveillance System (BRFSS), King County, WA, 2008–2010

Characteristic	Total BRFSS Sample (n = 8737), Weighted % (No.)	Total Who Ate at Regulated Chain (n = 3132), Weighted % (No.)
Race/ethnicity		
White, non-Hispanic	79.7 (7392)	82.3 (2715)
Non-White, including Hispanic	20.3 (1345)	17.7 (417)
Age, y		
18–30	19.3 (531)	22.4 (235)
31–50	42.1 (2810)	44.7 (1159)
≥ 51	38.6 (5396)	32.9* (1738)
Gender		
Men	48.4 (3513)	49.5 (1292)
Women	51.6 (5224)	50.6 (1840)
Annual household income, \$		
< 35 000	21.1 (1975)	17.9 (588)
35 000–49 999	11.8 (1058)	11.8 (383)
50 000–74 999	16.2 (1299)	16.1 (500)
≥ 75 000	50.9 (3329)	54.2 (1349)
Marital status		
Single	31.8 (3541)	31.3 (1157)
Married or partnered	68.3 (5149)	68.7 (1962)
Education		
≤ high school graduate	20.2 (1619)	20.1 (560)
Some college	24.5 (2267)	25.0 (839)
College graduate	55.4 (4851)	54.9 (1733)
Weight status		
Normal weight	42.6 (3578)	37.5* (1115)
Overweight	32.5 (2919)	34.5 (1123)
Obese	24.9 (2240)	28.0 (894)

*Significant difference compared with whole King County BRFSS sample, $P < .05$.

or less. The absolute change from 2008 to 2010 in calorie information use was greater among college graduates than among those with a high school diploma or less, among married or partnered respondents than among single respondents, and among those with an annual household income of \$35 000 to \$49 999 or at least \$75 000 than among those in the lowest income group ($P < .05$).

In exploratory analyses, we did not find significant effect modification (i.e., interaction) of policy implementation period by race or income, for either seeing or using calorie information. Nor did we find significant interaction between policy implementation and gender on using calorie information (results not

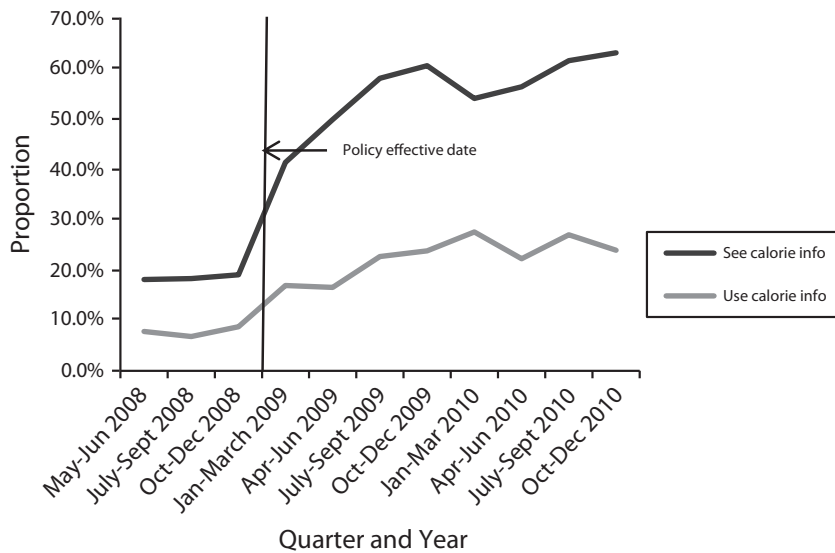
shown). However, effect modification by gender for seeing calorie information was significant, comparing both 2009 and 2010 to 2008 ($P = .004$ and $P = .02$, respectively). At baseline, women had significantly higher odds of seeing calorie information than men (OR = 1.94; 95% CI = 1.13, 3.35). However, women had smaller increases in seeing calorie information from prepolicy to postpolicy implementation compared with men (2009: men, OR = 8.16; 95% CI = 4.94, 13.47; and women, OR = 3.25; 95% CI = 2.21, 4.78; 2010, men OR = 10.91; 95% CI = 6.52, 18.26; and women OR = 5.09; 95% CI = 3.47, 7.49).

Disparities After Policy Implementation

We examined differences in seeing and using calorie information across subgroups using data from after the menu-labeling policy went into effect (Table 3, model 2). Fully adjusted logistic regression models limited to this postpolicy period (i.e., January 2009–December 2010), showed that non-Whites had 0.63 (95% CI = 0.45, 0.90) times the odds of seeing calorie information than non-Hispanic Whites ($P < .05$). The odds for seeing calorie information were 1.45 (95% CI = 1.06, 1.98) among obese compared with normal-weight respondents. Those with annual household incomes of at least \$35 000 had higher odds of seeing calorie information than those in the lowest income group (\$35 000 to \$49 999, OR = 1.87; 95% CI = 1.19, 2.94; \$50 000–\$74 999, OR = 1.97; 95% CI = 1.27, 3.06; \$75 000 and higher, OR = 1.77; 95% CI = 1.17, 2.68, respectively). Women and wealthier respondents were more likely to use calorie information. Women had 1.37 (95% CI = 1.01, 1.86) times the odds of using calorie information than men, and those with annual household incomes of at least \$50 000 had higher odds of using calorie information than the lowest income group (\$50 000–\$74 999, OR = 2.19; 95% CI = 1.25, 3.81; \$75 000 and higher, OR = 2.17; 95% CI = 1.25, 3.75). Those who ate at a sit-down chain had slightly lower odds (OR = 0.63; 95% CI = 0.39, 0.99) of using calorie information than fast-food patrons.

DISCUSSION

After implementation of menu-labeling regulation in King County, Washington, the proportion of customers eating at regulated chains who saw or used calorie information on menus tripled. Results from this population-level study of patrons of regulated chains are consistent with findings from a point-of-purchase evaluation of the 10 leading regulated chains in King County, which also reported increases of similar magnitude among customers who saw and used calorie information from pre- to postregulation.⁹ Evaluations of menu labeling in New York City found similar increases after implementation of its regulations.^{4,5} Using estimates of King County's



Note. Policy effective as of January 1, 2009.

FIGURE 1—Respondents' seeing and using calorie information over time among those who ate at a regulated chain: Behavioral Risk Factor Surveillance System, King County, WA, 2008–2010.

3-year (2008–2010) adult average population,²⁵ we estimated that at least 600 000 more King County adults saw calorie information and more than 250 000 additional adults used this information after policy implementation. Note that we found no significant change in the proportion of those using calorie information among the subset who saw calorie information (data not shown). The increase in population-level calorie information use was the result of the increase in calorie information awareness.

We note that 19% of patrons saw calorie information prepolicy. Awareness prepolicy was likely the result of the presence of nutritional information in some establishments in 2008. Our prior study found that in 2008, 48% of sampled regulated chains had calorie information available before ordering, but mostly in the form of signs and pamphlets, not on menu boards easily visible at point of purchase.⁹ Postpolicy, 90% had calories posted on menu boards,⁹ and enforcement data from PHSKC restaurant inspections confirmed high compliance rates (91% at the end of 2009 and 94% in early 2010). In 2009, PHSKC launched its “Be Informed Be Healthy” educational media campaign, encouraging people to read menu labels and make healthier choices.

This campaign included a short period of public service announcements in English and Spanish on 3 radio stations and bus placards in early 2009 and a menu-labeling website that included a nutrition education toolkit.²⁶ Although our survey did not ask whether respondents saw or heard the educational campaign, it is possible these efforts contributed to increases in calorie information awareness and use. However, this was a small media campaign with limited reach and low repeated impression rate. If additional resources had been available for communications, awareness and use might have increased even more.

Despite increases in awareness and use of calorie information among all groups from prepolicy to postpolicy implementation, we found disparities across sociodemographic subgroups. Results from both regression models (Table 3) showed that men, non-Whites including Hispanics, and the lowest income group were less likely to see and use the calorie information than their counterparts, similar to findings from a national study of menu-labeling users.²⁷ The reasons for this may vary by subgroup. Men may have different priorities than women in their food choices, for example, favoring meat over fruits and vegetables or being less likely to make dietary changes to lose

weight.²⁸ Non-White groups, particularly those of low socioeconomic status, may have less knowledge of healthy nutrition than Whites of higher socioeconomic status.²⁹ A larger proportion of the non-White population consists of non-native English speakers who may have difficulty understanding and using calorie information posted in English. They may have limited understanding of the meaning of calories and how to interpret and use the information. Lower income groups may not use calorie information if the purpose of their order is to maximize the amount of food purchased relative to price.³⁰ Lack of time, ordering habits, or preferences may also contribute to lower use of calorie information.^{31,32} At post-policy, it is encouraging that obese adults were more likely to see calorie information than their leaner counterparts, suggesting the group that might benefit most from this information is also more likely to see it. However, efforts are needed to encourage them to also use this information.

This study provides new information about the differential impact of menu labeling by restaurant type. We found no differences in calorie information awareness between diners at fast-food and sit-down regulated chains. However, those who ate at a sit-down chain were less likely than fast-food diners to use calorie information. This may be a reflection of patron differences. In our sample, those who ate at a sit-down chain were slightly older and had less education and lower incomes than the fast-food chain diners ($P < .05$; data not shown). As described earlier, those with lower socioeconomic status and older patrons may be less likely to use this information for various reasons (e.g., limited understanding of how to use calorie information). In addition, the reasons consumers choose to eat at a sit-down versus fast-food chain may influence whether they use calorie information (e.g., special occasion).

This study differs from the point-of-purchase studies in that it is the first to document the impact of menu labeling among an entire population of regulated chain restaurant patrons rather than among a selected sample. This extends the generalizability of previous findings that awareness and use of calorie information increase after implementation of a menu-labeling regulation. Prior studies have

TABLE 2—Unadjusted, Weighted Percentage of Respondents Who Saw and Used Calorie Information Over Time: Behavioral Risk Factor Surveillance System, King County, WA, 2008–2010

Characteristic	See Calorie Information				Use Calorie Information			
	Prepolicy, 2008 (n = 796), %	Postpolicy Year 1, 2009 (n = 979), %	Postpolicy Year 2, 2010 (n = 1086), %	Absolute % Change from 2008 to 2010	Prepolicy, 2008 (n = 792), %	Postpolicy Year 1, 2009 (n = 978), %	Postpolicy Year 2, 2010 (n = 1083), %	Absolute % Change from 2008 to 2010
All study respondents	18.6	52.1	59.4	40.8***	8.1	19.7	24.8	16.7***
Race/ethnicity								
White, non-Hispanic (Ref)	18.3	54.0	61.8	43.5***	8.1	22.2	25.8	17.6***
Non-White, including Hispanic	20.3	43.9	49.4	29.1***	7.7	8.9	20.8	13.1*
Age, y								
18–30 (Ref)	17.7	54.3	52.1	34.4***	4.3	20.7	20.1	15.9**
31–50	21.9	56.2	63.2	41.2***	11.8	21.3	24.8	13.1***
≥ 51	14.5	45.0	59.6	45.1***	5.3	16.9	28.2	22.9***
Gender								
Men (Ref)	16.0	55.3	59.8	43.8***	6.4	19.3	20.0	13.6***
Women	21.0	48.9	59.0	38.0***	9.6	20.2	29.6	20.1***
Annual household income, \$								
< 35 000 (Ref)	15.7	44.2	43.2	27.4***	4.7	12.2	12.5	7.7*
35 000–49 999	20.2	52.0	65.1	44.9***	5.0	10.0	27.4	22.5***†
50 000–74 999	16.2	57.7	64.6	48.3***†	9.9	24.9	25.2	15.3**
≥ 75 000	19.6	52.9	64.8	45.2***†	9.8	22.7	30.0	20.2***†
Marital status								
Single (Ref)	19.2	52.0	52.5	33.3***	7.1	19.6	17.5	10.5**
Married or partnered	18.4	52.1	62.6	44.2***	8.5	19.9	28.0	19.6***†
Education								
≤ high school graduate (Ref)	23.4	56.1	45.9	22.6***	8.2	16.7	14.1	5.9
Some college	15.7	47.5	61.7	46.0***†	6.0	18.7	22.0	15.9***
College graduate	18.3	52.7	63.5	45.1***†	9.1	21.4	30.0	21.0***†
Weight status ^a								
Normal weight (Ref)	20.8	48.4	56.0	35.3***	8.6	19.3	25.2	16.6***
Overweight	16.7	50.7	63.0	46.3***	8.5	20.0	26.2	17.7***
Obese	18.2	58.9	59.5	41.3***	6.7	20.0	22.6	15.9***

^aNormal weight is defined as body mass index (BMI; weight in kilograms divided by height in meters squared) of less than 25, overweight as a BMI of 25 or more but less than 30, and obese as a BMI of 30 or greater.

* $P < .05$; ** $P < .01$; *** $P < .001$, for t test used to evaluate change from 2008 to 2010.

† $P < .05$; ‡ $P < .01$, for test of absolute change from 2008 to 2010 compared with referent group.

primarily used point-of-purchase surveys and receipt information from a limited set of chain restaurants, typically fast-food chains.^{4–6,9,10,33,34} Our BRFSS evaluation also provides an assessment of calorie information awareness and use over an extended period of time, 8 months before policy implementation to 24 months after policy implementation, a follow-up period longer than any of the other studies to date. Our observation that the full effect of

labeling may not be apparent until as much as a year after implementation suggests that negative findings of some prior studies may have been the result of their limited follow-up period.^{4,10} In addition, this study is not limited to respondents who ate at fast-food chains but includes data from respondents who ate at any type of regulated chain, either fast food or sit-down, with 73 different chains represented. Therefore, these study findings paint a more complete

picture of population-level calorie information use and awareness patterns and whether changes in calorie information awareness and use are sustained or magnified over time. However, it is important to note that despite the positive trends observed in awareness and use of menu labels in this and other studies,^{4,5,9} the evidence is mixed as to whether consumers will order fewer calories or choose healthier food options after having seen calorie information.^{4,6–10,33–36}

TABLE 3—Fully Adjusted Odds Ratios From Multivariate Logistic Regression Models for Respondents' Seeing and Using Calorie Information: King County, WA, Behavioral Risk Factor Surveillance System, 2008–2010

Variable	Model 1: All Time Periods (2008–2010) ^a		Model 2: Postpolicy Period (2009–2010) ^b	
	See Calorie Information (n = 2562), OR (95% CI)	Use Calorie Information (n = 2557), OR (95% CI)	See Calorie Information (n = 1862), OR (95% CI)	Use Calorie Information (n = 1859), OR (95% CI)
Survey year				
2008 (Ref)	1.00	1.00		
2009	4.96*** (3.66, 6.73)	2.74*** (1.82, 4.14)	NA	NA
2010	7.17*** (5.25, 9.78)	3.89*** (2.62, 5.78)	NA	NA
Race/ethnicity				
White, non-Hispanic (Ref)	1.00	1.00	1.00	1.00
Non-White, including Hispanic	0.69* (0.50, 0.96)	0.76 (0.50, 1.17)	0.63* (0.45, 0.90)	0.71 (0.45, 1.13)
Age, y				
18–30 (Ref)	1.00	1.00	1.00	1.00
31–50	1.06 (0.73, 1.55)	0.96 (0.59, 1.55)	0.95 (0.62, 1.46)	0.80 (0.48, 1.33)
≥ 51	0.77 (0.53, 1.10)	0.98 (0.62, 1.54)	0.73 (0.48, 1.10)	0.93 (0.58, 1.51)
Gender				
Men (Ref)	1.00	1.00	1.00	1.00
Women	0.96 (0.77, 1.21)	1.45* (1.09, 1.92)	0.84 (0.66, 1.08)	1.37* (1.01, 1.86)
Household income, \$				
< 35 000 (Ref)	1.00	1.00	1.00	1.00
35 000–49 999	1.83** (1.20, 2.78)	1.45 (0.81, 2.59)	1.87** (1.19, 2.94)	1.47 (0.79, 2.74)
50 000–74 999	1.87** (1.25, 2.80)	2.23** (1.32, 3.77)	1.97** (1.27, 3.06)	2.19** (1.25, 3.81)
≥ 75 000	1.75** (1.19, 2.57)	2.19** (1.30, 3.67)	1.77** (1.17, 2.68)	2.17** (1.25, 3.75)
Marital status				
Single (Ref)	1.00	1.00	1.00	1.00
Married or partnered	0.96 (0.73, 1.26)	1.06 (0.75, 1.50)	0.97 (0.72, 1.32)	1.09 (0.75, 1.58)
Education				
≤ high school graduate (Ref)	1.00	1.00	1.00	1.00
Some college	0.94 (0.65, 1.36)	1.00 (0.62, 1.61)	1.03 (0.69, 1.53)	1.07 (0.64, 1.79)
College graduate	0.99 (0.70, 1.41)	1.29 (0.84, 1.99)	1.10 (0.75, 1.60)	1.39 (0.87, 2.20)
Weight status^c				
Normal weight (Ref)	1.00	1.00	1.00	1.00
Overweight	1.04 (0.79, 1.36)	1.14 (0.82, 1.59)	1.07 (0.80, 1.45)	1.13 (0.79, 1.61)
Obese	1.35* (1.02, 1.79)	1.11 (0.78, 1.58)	1.45* (1.06, 1.98)	1.15 (0.79, 1.68)
Chain restaurant type				
Regulated fast food (Ref)	1.00	1.00	1.00	1.00
Regulated sit down	0.83 (0.59, 1.18)	0.77 (0.50, 1.18)	0.74 (0.51, 1.06)	0.63* (0.39, 0.99)

Note. CI = confidence interval; NA = not applicable; OR = odds ratio.

^aModel 1 includes policy time indicator variable to examine odds ratios for seeing and using calorie information from pre- (2008) to postpolicy (2009 and 2010).

^bModel 2 limited to postpolicy period (January 2009–December 2010) to identify which groups had higher odds of seeing or using calorie information once policy was in effect.

^cNormal weight is defined as body mass index (BMI; weight in kilograms divided by height in meters squared) > 25, overweight as BMI = 25–29.99, and obese as a BMI ≥ 30.

P* < .05; *P* < .01; ****P* < .001.

Limitations

This study has several limitations. First are threats to generalizability. Until recently, the BRFSS has been a landline telephone–based survey. The demographics of those who both have a landline telephone and agree to participate in a survey may not be representative of

the entire King County population. Details regarding limitations in BRFSS have previously been described.³⁷ Even if the study sample were representative of the county, King County may not be representative of other regions in the United States. Also, our study population was limited to those who ate at a regulated

chain in the past week. Findings may not be generalizable to those who eat at chain restaurants less frequently. Another limitation is the lack of a comparison site. The high cost of fielding the survey outside of King County prevented us from including a comparison site. Third, this study did not capture the amount of

calories purchased or consumed. Ascertaining this information via telephone survey would have been unreliable (e.g., poor recall of exact food items purchased as much as a week ago) and expensive (e.g., asking multiple questions regarding all items purchased). A final limitation is that the BRFSS captures data for adults, so we could not examine the effect of menu labeling on children and adolescents.

Food choice is a complex process. Additional research is needed to understand the reasons why some groups have less awareness and use of menu labeling to identify strategies to eliminate these disparities. Further study is also needed to identify factors that influence consumers' decisions to use or ignore menu-labeling information to make healthier food choices, to understand why consumers may choose higher calorie over lower calorie options, and to determine whether and how restaurant type may influence these decisions. Additional research is also needed on how to optimize the use of menu labeling. How information is formatted,^{38–40} the presence of promotions for specific menu items,⁴¹ difficulties in understanding caloric information,⁴² and lack of interest in limiting caloric intake may affect use.

Conclusion and Policy Implications

After implementation of a menu-labeling regulation in King County, awareness and use of calorie information among residents who ate at regulated chains increased significantly and across all demographic subgroups. These findings suggest that mandatory menu labeling contributes to improving consumer awareness and use of nutrition information. However, non-Whites, men, and lower income groups may be less likely to see or use this information than their counterparts. The reasons for these disparities require additional study to identify strategies to improve calorie information awareness and use.

Under the Patient Protection and Affordable Care Act, menu-labeling requirements similar to King County's will be required of chain restaurants with 20 or more locations nationwide.⁴³ Lessons learned from King County and other jurisdictions that have studied the impact of their respective regulations may be useful as the Food and Drug Administration further develops national menu-labeling regulations. The Food and Drug Administration, policymakers, and public health practitioners should

consider whether additional approaches are needed to not only improve menu-labeling awareness and use among all customers but also to help groups less likely to see and use menu labels better understand and translate calorie information into healthier food choices. ■

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Contributors

R. Chen led the analysis and drafting of the article. M. Smyser oversaw data collection and study implementation. B. E. Saelens and J. Krieger secured funding for the study. All authors contributed to the study design, interpretation of data, and writing of the article.

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Human Participant Protection

This project was reviewed by the University of Washington's institutional review board, which determined that this study did not constitute human participant research.

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