Effect of calorie or exercise labels on menus on calories and macronutrients ordered and calories from specific foods in Hispanic participants: a randomized study

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ABSTRACT

The effect of menu labels on food choices is unknown in Hispanics. This study evaluated the impact of menu labels on calories and macronutrients ordered in Hispanics. 372 Hispanics (18–65 years) were randomly assigned to menus with no labels (NL) (n=127), rank-ordered calorie labels plus a statement on energy needs per meal (CL) (n=123), or rank-ordered exercise labels showing minutes of brisk walking necessary to burn the food calories (EL) (n=122). The menus had identical food choices. Participants were instructed to select foods from the assigned menu as if having lunch in a fast food restaurant. One-way analysis of variance found no difference in calories ordered (median (25th and 75th centiles)) by menu condition (NL: 785.0 (465.0, 1010.0) kcal; CL: 790.0 (510.0, 1020.0) kcal; EL: 752.5 (520.0, 1033.8) kcal; p=0.75). Calories from specific foods and macronutrient intake were not different by menu condition. Menu label use was 26.8% in the CL and 25.4% in the EL condition. Calories ordered were not different between those who used and those who did not use the labels. Regression analysis showed that perception of being overweight (p=0.02), selecting foods based on health value (p<0.0001), and meeting exercise guidelines (p<0.0001) were associated with fewer calories ordered. Logistic regression showed that selecting foods based on health value (p=0.01) was associated with higher food label use. Menu labels did not affect food choices in Hispanic participants. Future studies should determine if nutrition, exercise, and weight perception counseling prior to menu labels intervention would result in better food choices.
Trial registration number NCT02804503; post-results.

Significance of this study

What is already known about this subject?

- According to review studies, providing calorie labels on menus is not effective in reducing the number of calories ordered or consumed.
- Adding contextual information such as the energy needs per meal or interpretive information such as minutes of walking needed to burn the food calories or rank-ordering the food items from the lowest to the highest calorie content may be more effective in making food selections with fewer calories.
- Most studies on menu labels have, however, been conducted in mostly non-Hispanic white individuals, and how menu labels affect food choices in Hispanics is not well understood.

What are the new findings?

- The present study found that menus with contextual or interpretive labels did not affect calories or macronutrients ordered or calories from specific foods in Hispanic participants compared with a menu with no labels.
- Perception of being overweight, selecting foods based on health value, and meeting exercise guidelines were associated with fewer calories ordered.
- Selecting foods based on health value was associated with higher food label use.

How might these results change the focus of research or clinical practice?

- Future studies should determine if nutrition, exercise, and weight perception counseling prior to menu labels intervention would result in better food choices.
- Healthcare practitioners should counsel their Hispanic patients about healthy food selections when eating out.

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INTRODUCTION

About four in five American adults eat away from home at least once a week and ~50% eat out at least three times a week.[1] Foods consumed away from home are high in energy and energy density.[2] On average, US chain restaurant entrées contain 674 kcal, appetizers 813 kcal, sides 260 kcal, salads 496 kcal, and

desserts/baked goods 429 kcal.[3] Fast food patrons order on average two or more items per visit.[3] This would result in consuming more than the 640 kcal limit for lunch or dinner recommended by the Institute of Medicine for an average person with a daily energy need of 2000 kcal.[4] Besides excess calorie intake, eating away from home is associated with poor diet quality and higher body mass index (BMI).[2 5]

To help consumers make better food selections when eating out, the 2010 Patient Protection and Affordable Care Act mandates that restaurants and fast food chains with more than 20 locations display calorie information of standard items on menus and menu boards and provide more comprehensive nutrition information on request.[6 7] A number of investigators have examined the effect of calorie labels on menus on calories ordered and/or consumed. According to several reviews[8–10] and studies published since the reviews,[11 12] providing calorie labels on menus is not effective in reducing the number of calories ordered or consumed, probably because individuals may have difficulty appraising the calorie content without contextual or interpretive information. Sinclair *et al*[9] suggest that adding contextual information, such as the energy needs per day or per meal, or interpretive information, such as minutes or miles of walking/running needed to burn the food calories (exercise labels), rank-ordering the food items from the lowest to the highest calorie content, or traffic light symbols indicating the calorie content of foods on menus, may aid in making food selections with fewer calories.

Several studies have examined the effect of exercise labels on food choices. A recent study[13] reported that participants ordered and consumed fewer calories when given a menu with exercise labels compared with no labels. Other studies have found that participants ordered fewer calories[14–16] when exposed to exercise labels plus calorie labels compared with no labels or purchased fewer calories when exposed to exercise versus no labels.[17] Two other studies,[18 19] however, found no difference in calories ordered between participants exposed to exercise labels plus calorie labels versus no labels.

A number of studies have evaluated the effectiveness of other types of menu labels on food choices and found that menus with calorie labels plus a statement on energy needs,[18 20] rank-ordered calorie labels plus energy needs statement,[21] or calorie labels plus traffic light symbols[22 23] reduced the number of calories ordered compared with menus with no labels. Traffic light symbols also increased the sales of healthy foods and decreased the sales of unhealthy foods.[24 25] Several studies, however, did not find any evidence that health/traffic light symbols[21 26–28] or calorie labels combined with energy needs[13 21 23 27 29] affect the calories ordered.

There are some methodological limitations in the studies evaluating contextual or interpretive information. Not all of the studies had randomized controlled designs[24–26 28] or were adequately powered.[19 22] The influence of hunger levels[14–19 22–29] and price of food[13–16 18–20] on food choices were not always taken into account or the information was not provided. Finally, among the studies that provided information on demographics, much of the research was performed in mostly non-Hispanic white individuals.[13–16 18 20 21 24 26 28]

How menu labeling affects food choices among Hispanics is not well understood. According to a recent consumer survey on use of nutrition information on menus, Hispanics reported that they are more likely to use the nutrition information if they have noticed the labels compared with non-Hispanic whites or blacks.[30] However, the impact of menu labels on foods ordered in this population needs to be evaluated in a randomized controlled study. This is especially important given the high rates of obesity in Hispanics.[31]

This study evaluated the effect of menu labels on calories and macronutrients ordered and calories from specific foods in Hispanic participants by randomly assigning them to a menu with no labels (NL), a menu with rank-ordered calorie labels and a statement on the energy needs per meal (CL), and a menu with rank-ordered exercise labels (EL). All the limitations identified above were addressed. It was hypothesized that the EL and CL menu conditions would lead to food selections with fewer calories and less energy from fat compared with the NL menu condition and that there would be no difference between the EL and CL conditions. A secondary objective was to determine the sociodemographic and behavioral variables that predicted the number of calories ordered and use of food labels.

MATERIALS AND METHODS

Participants and recruitment

Three hundred seventy-two participants of Hispanic descent and aged 18–65 years were recruited for the study. Individuals who could not read and write in either English or Spanish or women who were pregnant or lactating were not included in the study. Participants were recruited from Texas and Michigan. Participants were recruited from a grocery store, a library, and restaurants, and via community organizations, fliers placed around campus, university newsletters, classroom announcements, social media, and word of mouth. The study was approved by the Institutional Review Board and each participant read and signed an approved informed consent form in either English or Spanish. The data were collected in a laboratory on college campus or in the location from where the subjects were recruited. All data collection was done at a table, in a quiet area, and using the same procedure. Data collection began in November 2014 and ended in June 2015.

Experimental design

Participants were randomly assigned to the NL, CL or EL menu condition. A detailed description of the three menus is provided below. The randomization was stratified by sex (men and women), age (18–39 and 40–65 years), and BMI (<30 or ≥ 30 kg/m^2) to ensure similar gender distribution, age, and BMI within each menu condition. The randomization sequence was generated by one of the authors, BA-H, a statistician. Participants were blinded to the purpose of the study. They were informed that the investigators were examining food choices among Hispanics.

Menus

All three menus contained the same food items and included burgers, chicken sandwiches, chicken nuggets, salads, dressings, fries, desserts, condiments and beverages.

The menus were similar to McDonald's menu.[32] Price was included next to each item on all three menus.

The NL menu did not contain any food labels. The CL menu displayed calorie labels next to each food item and a statement 'The Institute of Medicine recommends no more than 640 kcal per meal' at the bottom of the menu. In addition, the food items within each food category (burgers, chicken sandwiches, chicken nuggets, salads, fries, desserts and drinks) in the CL menu were rank-ordered by calorie content (lowest to highest). The food items within each food category contained a wide range of calories. The calorie and nutrient content for the menu items were obtained from McDonald's website.[32]

The EL menu displayed the minutes of brisk walking needed to burn the food calories next to each food item. In addition, the food items within each food category were rank-ordered by the minutes of walking needed to burn the food calories (lowest to highest). Since body size and energy expenditure varies by sex, the EL menus were created separately for men and women. The minutes of walking required to burn the food energy was calculated on the basis of the average weight of men and women in the USA (88.7 and 75.4 kg, respectively),[33] a walking speed of 3.5 miles per hour, and an energy expenditure of 7.67 kcal/min for men and 6.49 kcal/min for women corresponding to the above walking speed and respective weight.[34] For example, a food item that contained 500 kcal would have a label of 77 (500/6.49) minutes of brisk walking next to it in the menu for women and 65.2 (500/7.67) minutes in the menu for men.

Measurements

Anthropometric measurements

Height was collected via self-report and weight was measured via an electronic scale (Beurer Model PS 25, Hallandale Beach, Florida, USA). BMI was calculated by dividing body weight in kilogram by height squared in meter (kg/m^2).

Demographic, behavioral and health questionnaires

All participants completed demographic, behavioral and health questionnaires. Demographic information included age, gender and education level. Behavioral information included physical activity level, frequency of eating out in fast food restaurants, and whether the participants considered the cost, taste and health value of food when making food selections at restaurants. Health information was collected on presence of chronic health conditions.

Hunger

Feeling of hunger was assessed using the validated 100 mm visual analog scale (VAS).[35] The scale ranged from not at all hungry to extremely hungry. The participants were asked to place a mark on the scale at a point that best indicated their feeling on hunger.

Procedures

Following screening, eligible participants were instructed to complete questionnaires on demographic, behavioral and health information, and the VAS scale to assess hunger. Participants were then given the menu to which they had been randomized and instructed to circle the food and drink items they would order, as if having lunch in a fast food restaurant. Once the menu items were selected, the participants in the CL and the EL menu conditions were asked to complete a brief survey on whether or not they had noticed and used the labels. Finally, participants from all three menu conditions were asked to indicate if they considered the cost, taste, and health value of food when making food selections at restaurants.

All the questionnaires and menus were developed in English and Spanish and the participants decided which language version they preferred. The Spanish version was developed by a senior major in Spanish who was recommended by a Spanish professor. All the Spanish documents were translated back to English to ensure accuracy. It took participants 20–30 min to complete the study. Each participant was paid US$10 for completing the study.

Sample size calculation and statistical analysis

We recruited 35% more participants than the estimated sample size of 270. The sample size of 270 (90 subjects per menu condition) was estimated on the basis of the assumption that the participants in the EL and CL conditions would order 139 kcal less than the participants in the NL menu condition, an SD of the difference of 300 kcal, power of 0.90, and $\alpha=0.05$. The effect size and the SD of the difference were based on data from another study on menu labeling.[13]

With the exception of hunger rating, differences in participant characteristics by menu condition were analyzed by a one-way analysis of variance (ANOVA) model for continuous variables and χ^2 test for categorical variables. Hunger rating by menu condition was assessed by the Kruskal-Wallis test.

A one-way ANOVA model was used to examine the effect of menu condition on calories ordered. Since the data on calories ordered were skewed, a log transformation was performed before analysis. An analysis of covariance model was also used to examine the effect of menu condition on calories ordered, adjusted for possible confounders such as age, gender, BMI, hunger level prior to the survey, total price of the menu items ordered, the state in which the data were collected, and whether they selected the English or Spanish version of the menus and questionnaires. A one-way ANOVA model was also used to examine the effect of menu condition on the percent energy ordered from fat, carbohydrate, and protein and the number of calories ordered from chicken meals, salads, sides, drinks and desserts. In addition to this, a two-way ANOVA model was run to examine if there was an interaction effect between gender and menu condition on calories ordered.

A factorial ANOVA model was used to examine the number of calories ordered between the participants who responded with a 'yes' or 'no' to noticing and using the labels in the CL and EL conditions.

A multivariable regression analysis was performed to determine the sociodemographic and behavioral factors that predict the number of calories ordered. Logistic regression was performed to determine the sociodemographic and behavioral factors that predict the use of food labels in participants randomized to the CL or EL groups. Analysis was performed with SAS software, V.9.4 (SAS Institute, Cary, North Carolina, USA).

RESULTS

The flow chart on the number of participants screened, randomized, and included in the analysis is shown in figure 1. Four hundred and two individuals were evaluated for eligibility. Of these, 24 were ineligible (4 were pregnant or lactating, 2 could not read either Spanish or English, 5 were unwilling to provide their weight, 6 were not Hispanic, and 7 did not meet the age requirement). The remaining 378 participants were randomized to one of three menu conditions. Six participants were excluded from the analysis because they did not complete the menu food choices. Statistical analysis was performed on 372 participants (NL: n=127; CL: n=123; EL: n=122).

Participant characteristics by menu condition are presented in table 1. Mean age±SD was 33.9±13.2 years and mean BMI was 29.7±7.4 kg/m^2. About 62% of the participants were female. Nearly 38% had a high school or less than high school level of education. The median hunger score was 29 (not at all hungry is 0 and extremely hungry is 100). Most participants (84.1%) reported eating any fast food at least once a week. About 77% of participants reported selecting restaurant foods based on taste, 57.3% based on cost, and 53.2% based on the health value of food. About 40% of the participants reported meeting the exercise guideline of 150 min of moderate intensity or 75 min of vigorous intensity aerobic exercise, or a combination of these, per week. Nearly 41% had a chronic health condition. None of the above variables were different by menu condition.

The number of calories ordered, percent energy from macronutrients, and number of calories ordered from specific foods by menu condition are presented in table 2. There was no difference in the number of calories ordered by menu condition. Adjusting for the potential confounding factors identified earlier did not affect the results. There was no menu condition by gender effect (p=0.28) on calories ordered. There was also no difference in percent energy from fat, carbohydrate, and protein, and the number of calories ordered from chicken meals, salads, sides, drinks and desserts by menu condition.

The data on participants who noticed and used the labels in the CL and EL conditions are shown in table 3. The proportion of participants who noticed and used the labels was 76.4% and 26.8%, respectively, in the CL condition, and 72.9% and 25.4%, respectively, in the EL condition. There was no difference in the number of calories ordered between those who noticed and those who did not notice the labels in the CL and EL conditions. There was also no difference in the number of calories ordered between those who used and those who did not use the labels in the CL and EL conditions.

Data from multiple regression analyses on predictors of calories ordered are presented in table 4. BMI was significantly related to the number of calories ordered. Men ordered significantly more calories than women. Overweight perception, meeting the exercise guidelines, and choosing restaurant foods based on health value were associated with significantly fewer calories ordered. None of the other variables in the model were associated with the number of calories ordered.

Results from the logistic regression analysis on the predictors of menu label use are presented in figure 2.

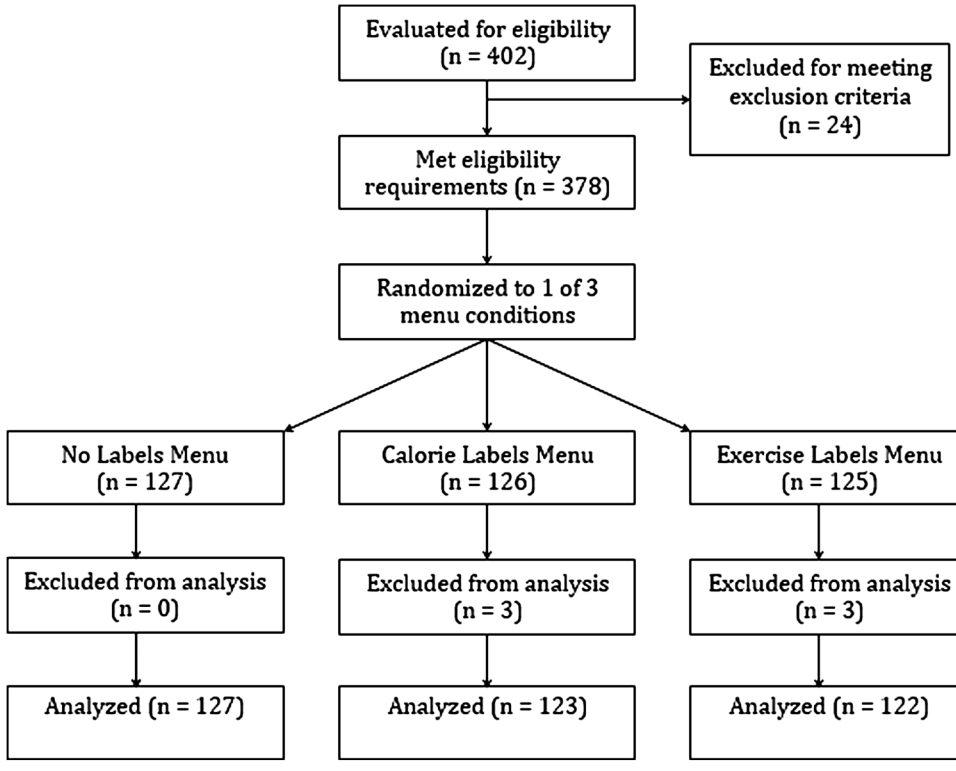

Figure 1 Flow chart for the study on the effect of menu labels on calories ordered in Hispanic participants. The flow chart shows the number of participants screened, randomized, and included in the analysis.

Table 1 Characteristics of Hispanic participants by menu condition

Variable	Total sample (n=372)	No labels menu (n=127)	Calorie labels menu (n=123)	Exercise labels menu (n=122)	p Value*
Age (years)	33.9±13.2	34.8±13.9	33.3±12.9	33.7±12.7	0.65
Female (%)	61.8	63.0	61.8	60.7	0.93
BMI (kg/m^2)	29.7±7.4	29.9±7.6	29.6±6.6	29.6±7.9	0.93
Education (%)					
Less than or equivalent to high school	37.6	40.2	35.8	36.9	0.61
Vocational training/some college	48.7	43.3	51.2	51.6	
Greater than or equivalent to bachelors	13.7	16.5	13.0	11.5	
Hunger level prior to survey (mm) (median and 25th and 75th centiles)	29.0 (6.0, 54.0)	27.0 (3.0, 52.3)	32.0 (6.0, 54.0)	30.0 (7.0, 61.5)	0.68
Eats fast food weekly (%)	84.1	85.8	82.9	83.6	0.81
Selects restaurant foods based on taste (%)	77.2	74.8	77.2	79.5	0.68
Selects restaurant foods based on cost (%)	57.3	56.7	61.8	53.3	0.40
Selects restaurant foods based on health value (%)	53.2	59.1	48.0	52.5	0.21
Meets exercise guidelines (%)	40.3	40.9	44.7	35.2	0.32
Has a chronic condition (%)	40.9	44.9	39.8	37.7	0.49

Values are means±SD unless otherwise noted.
*χ^2 Test was used to compare categorical variables, one-way analysis of variance was used to compare age and BMI, and Kruskal-Wallis test was used to compare hunger by menu condition.
BMI, body mass index.

Table 2 Total calories (kcal), percent energy from macronutrients, and calories from specific foods ordered by menu condition in Hispanic participants

Variable	No labels menu	Calorie labels menu	Exercise labels menu	p Value*
Calories ordered (kcal)	785.0 (465.0, 1010.0) (n=127)	790.0 (510.0, 1020.0) (n=123)	752.5 (520.0, 1033.8) (n=122)	0.75
Carbohydrate (% energy)	47.3±8.4 (n=127)	48.0±8.7 (n=123)	46.2±9.2 (n=122)	0.27
Protein (% energy)	17.8±7.3 (n=127)	17.5±7.7 (n=123)	18.4±7.7 (n=122)	0.67
Fat (% energy)	34.9±7.3 (n=127)	34.4±8.3 (n=123)	35.4±8.2 (n=122)	0.64
Chicken (kcal)	434.4±96.6 (n=54)	424.3±132.8 (n=39)	467.9±194.7 (n=56)	0.31
Salads (kcal)	248.9±88.8 (n=38)	244.0±79.6 (n=40)	238.9±81.9 (n=41)	0.87
Sides (kcal)	306.1±132.5 (n=80)	278.8±132.8 (n=80)	296.1±157.5 (n=75)	0.47
Drinks (kcal)	151.4±40.9 (n=51)	153.1±52.7 (n=55)	160.5±53.9 (n=42)	0.65
Desserts (kcal)	180.7±130.5 (n=53)	204.6±101.6 (n=53)	189.1±102.8 (n=46)	0.54

Values for calories ordered are medians and 25th and 75th centiles, and the remaining values are means±SD.
*One-way analysis of variance was used to compare the variables by menu condition.

Table 3 Difference in calories ordered among Hispanic participants who did or did not notice and use the labels

	Noticed labels			Used labels		
Variable	Yes	No	p Value*	Yes	No	p Value*
Calorie labels menu						
N (%)	94 (76.4)	29 (23.6)		33 (26.8)	90 (73.1)	
Calories ordered (kcal)	740 (510, 970)	950 (645, 1170)	0.24	660 (360, 950)	830 (570, 1030)	0.07
Exercise labels menu						
N (%)	89 (72.9)	33 (27.1)		31 (25.4)	91 (74.6)	
Calories ordered (kcal)	735 (520, 990)	820 (530, 1060)	0.90	800 (470, 990)	735 (520, 1045)	0.95

Calories ordered (kcal) are shown as medians and 25th and 75th centiles.
*A factorial ANOVA model was used to examine the effect of menu condition and whether or not the subjects noticed or used the labels on calories ordered.

Table 4 Predictor variables of calories ordered (kcal) from menus in Hispanic participants (n=372)

Determinants	β Coefficients (95% CI)	p Value
Menu condition (calorie labels vs no labels)	21.6 (−76.1 to 119.4)	0.66
Menu condition (exercise labels vs no labels)	37.9 (−60.0 to 135.9)	0.45
Age (years)	−2.0 (−5.5 to 1.4)	0.25
BMI (kg/m^2)	11.4 (4.3 to 18.5)	0.002
Gender (male vs female)	134.4 (50.4 to 218.3)	0.002
Education (some college vs high school or less)	−92.1 (−188.1 to 3.8)	0.06
Education (college degree vs high school or less)	−94.8 (−226.9 to 37.4)	0.16
Overweight perception (yes vs no)	−124.4 (−228.3 to −20.5)	0.02
Meet the exercise guidelines (yes vs no)	−202.3 (−289.8 to −114.9)	<0.0001
Select restaurant foods based on health value (yes vs no)	−249.9 (−339.6 to −160.4)	<0.0001
Select restaurant foods based on taste (yes vs no)	65.4 (−41.1 to 172.0)	0.23
Select restaurant foods based on cost (yes vs no)	−20.7 (−103.2 to 61.8)	0.62
Eat out at a fast food restaurant every week (yes vs no)	−16.5 (−130.5 to 97.6)	0.78
Hunger (mm)	1.00 (−0.4 to 2.4)	0.16

Predictors of calories ordered were determined using multivariable regression analysis.
BMI, body mass index.

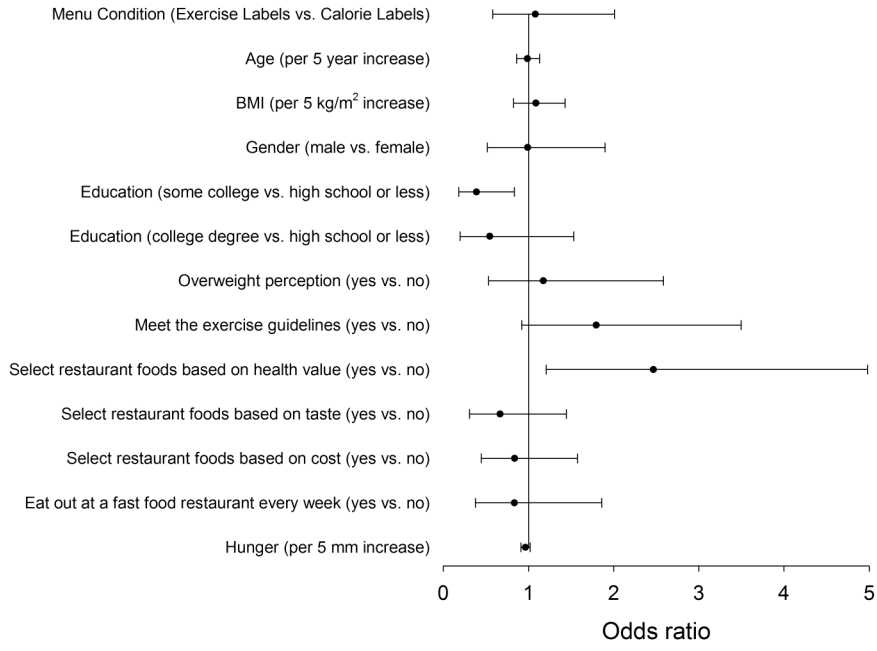

Figure 2 Predictor variables of menu labels use in Hispanic participants (n=245). The figure shows ORs and 95% CIs from a logistic regression model on predictors of menu label use. Choosing restaurant foods based on health was significantly (p=0.01) related to the odds of using the menu labels. Menu condition (p=0.80), age (p=0.84), body mass index (BMI) (p=0.55), gender (male vs female: p=0.98), some college education (some college vs high school or less: p=0.08), college education (college degree vs high school or less: p=0.78), overweight perception (yes vs no: p=0.69), meet the exercise guidelines (yes vs no: p=0.09), select restaurant foods based on taste (yes vs no: p=0.30), select restaurant foods based on cost (yes vs no: p=0.58), eat out at a fast food restaurant every week (yes vs no: p=0.66), and hunger (p=0.19) were not related to the odds of using the menu labels.

Selecting restaurant foods based on health value was associated with significantly higher odds of using the menu labels compared with not selecting foods based on health value. None of the other variables in the model were related to odds of using the labels.

DISCUSSION

This is the first study to evaluate the effect of menu labels on food choices among a sample of Hispanic participants. Neither the exercise nor the calorie labels affected the number of calories ordered. Menu labels also did not influence percent energy from macronutrients and calories ordered from specific foods.

The findings from this study on exercise labels are corroborated by results from the studies by Pang and Hammond[18] and Platkin *et al*.[19] Several other studies, however, found exercise labels to be effective in reducing the number of calories purchased[17] or ordered.[13–16] The findings from this

study on rank-ordered calorie labels plus energy statement were also corroborated by several studies which found no effect of calorie labels combined with energy needs statement on total calories ordered[13 21 23 27 29] or calories ordered from specific foods.[27 29] Three studies, on the other hand, found fewer calories ordered by participants assigned to a menu condition with calorie labels and energy needs statement[18 20] or rank-ordered calorie labels plus a statement on energy needs[21] compared with no labels.

Possible reasons why there was no difference in calories ordered by menu labels may be because only 53.2% of our participants reported considering the health value of foods when making food choices in restaurants and only 40.3% of the participants reported meeting the exercise guidelines. In addition, only 57.5% of our participants thought they were overweight or obese, whereas 71.8% were actually overweight or obese. Several studies have noted that Hispanics are more likely to underestimate their weight than non-Hispanic whites.[36 37] The above factors may have attenuated the influence of menu labels on food choices. The cultural differences in weight perception among Hispanics and non-Hispanic whites may partly explain why menu labels, specifically exercise labels, were effective in lowering the number of calories ordered and consumed in our previous study in mostly non-Hispanic young white individuals[13] but not effective in the participants in this study. Regression analysis on predictors of calories ordered in this study showed that participants who perceived their weight as overweight, met the exercise guidelines, or selected foods for health reasons ordered fewer calories than participants who did not. The above information indicates that education in nutrition, exercise, and weight perception prior to menu labels intervention may result in better food choices but remains to be evaluated.

Most participants in the CL (76.4%) and EL (72.9%) menu conditions noticed the labels and 26.8% in the CL condition and 25.4% in the EL condition used the labels. These numbers are higher than those reported by Green *et al*[38] (57.4% and 16%, respectively) from a survey conducted among mostly non-Hispanic customers eating at a fast food restaurant. Nevertheless, this study did not find any differences in the number of calories ordered between those who used and those who did not use the labels, whereas Green *et al*[38] reported fewer calories ordered among those who used the menu labels. Logistic regression in this study showed that the odds of using the menu labels were 2.5 times higher among subjects who choose foods based on health value compared with those who did not. A similar result was also reported by Breck *et al*[39] who found higher odds of using after seeing the menu labels among those who considered the nutrient value of food. Unlike the studies by Breck *et al*[39] and Green *et al*,[38] college degree was not a determinant of menu label use in this study. Breck *et al*[39] also reported that the odds of seeing and using the menu labels were higher among females, obese individuals, those concerned about weight gain, and those eating out in fast food restaurants at least five times a week. Schindler *et al*[40] found that barriers to the use of menu labels included price, food preferences and hunger. However, gender, age, BMI, hunger, selecting foods based on taste or cost when eating out, and eating out in fast food restaurants were not predictors of food label use in our study.

The menu food items in this study were from McDonald's restaurant rather than a Hispanic fast food restaurant because preliminary assessment of fast food preferences among Hispanic individuals indicated that they prefer McDonald's restaurant to Hispanic fast food chain restaurants. In addition, according to a national survey conducted by ThinkNow Research, McDonald's restaurant is the most popular restaurant among both Hispanics and non-Hispanic whites.[41] Seventy-nine percent of Hispanics and 75% of non-Hispanic whites reported having eaten at McDonald's restaurant over the past year. Restaurants with Hispanic foods are not as popular. The corresponding percentages for Taco Bell were 54% and 57%, for Chipotle 24% and 20%, and for Del Taco 15% and 5%.[41] The median (25th and 75th centiles) number of times that the participants reported eating out at McDonald's restaurant in this study was two (0, 4) times per month, and there was no difference by menu condition.

This study had several limitations. The sample was a convenience sample. In addition, the subjects were not fed the food that they had selected. This study was not conducted in an actual restaurant setting where many factors including the smell and sight of food and the presence of other patrons may affect food choices. The effect of menu labeling on food choices was tested only on one occasion and the results may not reflect what the participants would choose if they were exposed to menu labels for a longer period of time and in a restaurant setting.

The study had several strengths. It was a randomized controlled design and the participants were blinded to the study purpose. The number of participants recruited was 35% above the required sample size. Nevertheless, it was not powered to evaluate differences by gender. This was the first study to examine the effect of menu labeling in male and female Hispanic participants with diverse age and weight status. The menus contained a wide selection of foods with varying calorie content within each food category. This study also provided information on the effect of menu labels on calories from macronutrients and specific foods. Most previous studies in this area have not provided nutrition information besides the calories ordered.

Future studies on menu labeling need to be conducted over a sustained period of time, because multiple exposures to menu labels may result in different outcomes to the results observed in our study. To possibly improve the effect of menu labels on food choices, studies combining education in nutrition, exercise, and weight perception with menu labels need to be evaluated. In addition, the study population needs to be diverse, including both African-Americans and Hispanics, given that much of the research on menu labeling has been conducted in largely non-Hispanic whites. Only one study has been conducted in African-Americans,[17] and this study found exercise labels to be effective in reducing the purchases of sugar sweetened beverages. However, these results need to be confirmed by other studies in this population.

In conclusion, menu labels did not affect food choices in Hispanic participants. Future studies should examine whether education in nutrition, exercise, and weight perception improves food choices from menu labels over a sustained period of time in a diverse population.

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REFERENCES

1 Variyam J, Smith TA. Tracking changes in dietary awareness and food choices. US Department of Agriculture, Economic Research Service. 2010. http://www.ers.usda.gov/amber-waves/2010-june/data-feature%E2%80%94-tracking-changes-in-dietary-awareness-and-food-choices.aspx#.Va0ailLbI5v (accessed 8 Jul 2015).
2 Bowman SA, Vinyard BT. Fast food consumption of U.S. adults: impact on energy and nutrient intakes and overweight status. *J Am Coll Nutr* 2004;23:163–8.
3 Wu HW, Sturm R. What's on the menu? A review of the energy and nutritional content of US chain restaurant menus. *Public Health Nutr* 2013;16:87–96.
4 Cohen DA, Story M. Mitigating the health risks of dining out: the need for standardized portion sizes in restaurants. *Am J Public Health* 2014;104:586–90.
5 Kant AK, Whitley MI, Graubard BI. Away from home meals: associations with biomarkers of chronic disease and dietary intake in American adults, NHANES 2005–2010. *Int J Obes (Lond)* 2015;39:820–7.
6 Food and Drug Administration. Menu and vending machines labeling requirement. Published Online First: April 2011. http://www.fda.gov/food/ingredientspackaginglabeling/ucm217762.htm (accessed Dec 2015).
7 Stein K. A national approach to restaurant menu labeling: the Patient Protection and Affordable Health Care Act, Section 4205. *J Am Diet Assoc* 2011;111(5 Suppl):S19–27.
8 Swartz JJ, Braxton D, Viera AJ. Calorie menu labeling on quick-service restaurant menus: an updated systematic review of the literature. *Int J Behav Nutr Phys Act* 2011;8:135.
9 Sinclair SE, Cooper M, Mansfield ED. The influence of menu labeling on calories selected or consumed: a systematic review and meta-analysis. *J Acad Nutr Diet* 2014;114:1375–88.e15.
10 Long MW, Tobias DK, Cradock AL, *et al*. Systematic review and meta-analysis of the impact of restaurant menu calorie labeling. *Am J Public Health* 2015;105:e11–24.
11 Cantor J, Torres A, Abrams C, *et al*. Five years later: awareness of New York City's calorie labels declined with no changes in calories purchased. *Health Aff (Millwood)* 2015;34:1839–900.
12 Lillico HG, Hanning R, Findlay S, *et al*. The effects of calorie labels on those at high-risk of eating pathologies: a pre-post intervention study in a University cafeteria. *Public Health* 2015;129:732–9.
13 James A, Adams-Huet B, Shah M. Menu labels displaying the kilocalorie content or the exercise equivalent: effects on energy ordered and consumed in young adults. *Am J Health Promot* 2015;29:294–302.
14 Dowray S, Swartz JJ, Braxton D, *et al*. Potential effect of physical activity based menu labels on the calorie content of selected fast food meals. *Appetite* 2013;62:173–81.
15 Antonelli R, Viera AJ. Potential effect of Physical Activity Calorie Equivalent (PACE) labeling on adult fast food ordering and exercise. *PLoS ONE* 2015;10:e0134289.
16 Viera AJ, Antonelli R. Potential effect of physical activity calorie equivalent labeling on parent fast food decisions. *Pediatrics* 2015;135:e376–82.
17 Bleich SN, Herring BJ, Flagg DD, *et al*. Reduction in purchases of sugar-sweetened beverages among low-income Black adolescents after exposure to caloric information. *Am J Public Health* 2012;102:329–35.
18 Pang J, Hammond D. Efficacy and consumer preferences for different approaches to calorie labeling on menus. *J Nutr Educ Behav* 2013;45:669–75.
19 Platkin C, Yeh MC, Hirsh K, *et al*. The effect of menu labeling with calories and exercise equivalents on food selection and consumption. *BMC Obes* 2014;1:1–7.
20 Roberto CA, Larsen PD, Agnew H, *et al*. Evaluating the impact of menu labeling on food choices and intake. *Am J Public Health* 2010;100:312–18.
21 Liu PJ, Roberto CA, Liu LJ, *et al*. A test of different menu labeling presentations. *Appetite* 2012;59:770–7.
22 Ellison B, Lusk JL, Davis D. Looking at the label and beyond: the effects of calorie labels, health consciousness, and demographics on calorie intake in restaurants. *Int J Behav Nutr Phys Act* 2013;10:21.
23 Morley B, Scully M, Martin J, *et al*. What types of nutrition menu labelling lead consumers to select less energy-dense fast food? An experimental study. *Appetite* 2013;67:8–15.
24 Thorndike AN, Riis J, Sonnenberg LM, *et al*. Traffic-light labels and choice architecture: promoting healthy food choices. *Am J Prev Med* 2014;46:143–9.
25 Olstad DL, Vermeer J, McCargar LJ, *et al*. Using traffic light labels to improve food selection in recreation and sport facility eating environments. *Appetite* 2015;91:329–35.
26 Holmes AS, Serrano EL, Machin JE, *et al*. Effect of different children's menu labeling designs on family purchases. *Appetite* 2013;62:198–202.
27 Dodds P, Wolfenden L, Chapman K, *et al*. The effect of energy and traffic light labelling on parent and child fast food selection: a randomised controlled trial. *Appetite* 2014;73:23–30.
28 Sonnenberg L, Gelsomin E, Levy DE, *et al*. A traffic light food labeling intervention increases consumer awareness of health and healthy choices at the point-of-purchase. *Prev Med* 2013;57:253–7.
29 Downs JS, Wisdom J, Wansink B, *et al*. Supplementing menu labeling with calorie recommendations to test for facilitation effects. *Am J Public Health* 2013;103:1604–9.
30 Gregory CA, Rahkovsky I, Anekwe D. Consumers' use of nutrition information when eating out. USDA-ERS 2014 Economic Information Bulletin Number 127. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2504039 (accessed 11 Dec 2015).
31 Ogden CL, Carroll MD, Kit BK, *et al*. Prevalence of childhood and adult obesity in the United States, 2011–2012. *JAMA* 2014;311:806–14.
32 McDonalds Corporation. McDonald's USA nutrition facts for popular menu items. http://nutrition.mcdonalds.com/getnutrition/nutritionfacts.pdf (accessed 29 Oct 2014).
33 Fryar CD, Gu Q, Ogden CL. Anthropometric reference data for children and adults: United States, 2007–2010. *Vital Health Stat* Series 11 2012:1–48.
34 McArdle WD, Katch FI, Katch VL. *Energy expenditure in household, occupational, recreational, and sports activities*. 5th edn. Amherst: Fitness Technologies, 2001.
35 Flint A, Raben A, Blundell JE, *et al*. Reproducibility, power and validity of visual analogue scales in assessment of appetite sensations in single test meal studies. *Int J Obes Relat Metab Disord* 2000;24:38–48.
36 Sivalingam SK, Ashraf J, Vallurupalli N, *et al*. Ethnic differences in the self-recognition of obesity and obesity-related comorbidities: a cross-sectional analysis. *J Gen Intern Med* 2011;26:616–20.
37 Giardina EG, Sciacca RR, Flink LE, *et al*. Cardiovascular disease knowledge and weight perception among Hispanic and non-Hispanic white women. *J Womens Health (Larchmt)* 2013;22:1009–15.
38 Green JE, Brown AG, Ohri-Vachaspati P. Sociodemographic disparities among fast-food restaurant customers who notice and use calorie menu labels. *J Acad Nutr Diet* 2015;115:1093–101.
39 Breck A, Cantor J, Martinez O, *et al*. Who reports noticing and using calorie information posted on fast food restaurant menus? *Appetite* 2014;81:30–6.
40 Schindler J, Kiszko K, Abrams C, *et al*. Environmental and individual factors affecting menu labeling utilization: a qualitative research study. *J Acad Nutr Diet* 2013;113:667–72.
41 ThinkNow Research. Quick Service Restaurant Study. http://www.thinknowresearch.com/shop/fast-food-study/ (accessed 23 Jun 2016).