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## Calorie Changes in Chain Restaurant Menu Items: Implications for Obesity and Evaluations of Menu Labeling

Sara N. Bleich, PhD, Julia A. Wolfson, MPP, and Marian P. Jarlenski, MPH

Department of Health Policy and Management, Johns Hopkins Bloomberg School of Public Health, Baltimore, Maryland

### Abstract

**Background**—Supply-side reductions to the calories in chain restaurants are a possible benefit of upcoming menu labeling requirements.

**Purpose**—To describe trends in calories available in large U.S. restaurants.

**Methods**—Data were obtained from the MenuStat project, a census of menu items in 66 of the 100 largest U.S. restaurant chains, for 2012 and 2013 (N=19,417 items). Generalized linear models were used to calculate: (1) the mean change in calories from 2012 to 2013, among items on the menu in both years; and (2) the difference in mean calories, comparing newly introduced items to those on the menu in 2012 only (overall and between core versus non-core items). Data were analyzed in 2014.

**Results**—Mean calories among items on menus in both 2012 and 2013 did not change. Large restaurant chains in the U.S. have recently had overall declines in calories in newly introduced menu items (–56 calories, 12% decline). These declines were concentrated mainly in new main course items (–67 calories, 10% decline). New beverage (–26 calories, 8% decline) and children’s (–46 calories, 20% decline) items also had fewer mean calories. Among chain restaurants with a specific focus (e.g., burgers), average calories in new menu items not core to the business declined more than calories in core menu items.

**Conclusions**—Large chain restaurants significantly reduced the number of calories in newly introduced menu items. Supply-side changes to the calories in chain restaurants may have a significant impact on obesity prevention.

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Address correspondence to: Sara N. Bleich, PhD, Associate Professor, Department of Health Policy and Management, Bloomberg School of Public Health, Johns Hopkins University, 624 N. Broadway, Room 454, Baltimore MD 21205. sbleich@jhu.edu.

SNB conceived the study and developed the hypotheses. MPJ analyzed the data. All authors contributed to the interpretation of study findings. SNB and MPJ produced the first draft of the manuscript and all authors contributed to the final draft.

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## Introduction

Overconsumption of calories is a key determinant of obesity.<sup>1</sup> National restaurant menu labeling—intended to help consumers decrease caloric intake—was included in the 2010 Affordable Care Act (ACA) and requires large chain restaurants to provide caloric information.<sup>2</sup> Specific rules from the U.S. Food and Drug Administration regarding implementation are forthcoming. Some large restaurants have publicized what they describe as self-regulatory actions to increase the transparency of nutritional information.<sup>3</sup>

The extent to which these activities have affected the nutritional content of menu items is for the most part unknown. Empirical evidence suggests that there has been little<sup>4, 5</sup> or no<sup>6</sup> improvement in the nutritional content of restaurant menu items in recent years, which, in general, remain high in calories, fat, and sodium.<sup>7–9</sup> Industry evidence from corporate responsibility reports suggests some improvement.<sup>10</sup> What is clear is that fast food consumption is associated with greater total caloric intake<sup>11, 12</sup> and increased body weight.<sup>8, 13</sup> As a result, chain restaurants' actions to reduce caloric content in menu items may have important implications for the public's health and obesity prevalence.<sup>6, 7</sup>

Little prior research has examined supply-side changes to caloric content of restaurant menu items.<sup>4, 5, 9</sup> They are important because they do not rely on the customer to first notice and then be influenced by the menu label to make a healthy choice. Relatively few restaurant customers notice menu labels,<sup>14,15</sup> and when they do, the evidence of the degree to which they influence food choices is mixed.<sup>14–18</sup> Restaurants with a specific menu focus (e.g., burgers) may be less likely to change existing core menu items but more likely to introduce new non-core menu items.<sup>19, 20</sup>

The objective of this exploratory study is to describe trends in calories available in large U.S. chain restaurants. The study hypothesis is that mean per-item calories will decline, with the largest decrease for newly introduced menu items and menu items not core to the business.

## Methods

### Data

Data from the MenuStat project ([menustat.org/](http://menustat.org/)) were used, which include information about menu items in each of the 100 largest U.S. restaurant chains. Detailed methods are described elsewhere.<sup>21</sup> Briefly, the data include caloric information about menu items made public by restaurants on their websites. Each item is categorized into one of 12 mutually exclusive menu categories. In 2012 and 2013, the 2 years for which data are available, 66 of the 100 largest U.S. restaurants had caloric data available.

The data set was a census of menu items in 66 large chain restaurants (N=19,417), meaning that the absolute changes in calories from 2012 to 2013 observed represented actual changes in these restaurants. To make inferences on the national level, the data were also used as a non-probability sample of menu items from other large, U.S.-based chain restaurants.

## Measures

Two continuous outcomes were examined: (1) the mean within-item change in calories from 2012 to 2013, among items on the menu in both years; and (2) the difference in mean per-item calories, comparing menu items newly introduced in 2013 to those on the menu in 2012 only. Menu items offered in both years were defined as those with the same item name and description within a given restaurant and menu category. New menu items were defined as those that had no item name, description, or calories recorded in 2012, but did have an item name, description, and calories recorded in 2013 (per personal communication with MenuStat).

For the first outcome (within-item calorie changes), the main independent variable was a year indicator (2013 versus 2012). For the second outcome (difference in calories between newly introduced items versus old items), the main independent variable was an indicator of whether a menu item was newly introduced in 2013.

Several covariates were included to classify menu items in terms of children's menu item status, and whether an item was an appetizer, main course, dessert, or topping/ingredient. At the restaurant level, covariates were defined to indicate whether a restaurant was national or not (based on having locations in each of the nine U.S. Census Divisions), and restaurant types (fast food, full-service, or fast casual). For the subgroup analysis of core versus non-core menu items, a variable indicating whether a restaurant had a specific menu focus (burger, pizza, chicken, or sandwich) was also created. Descriptions of covariate definition methods are included in the Appendix (available online); descriptive statistics of restaurant-level data are shown in Appendix Table 1.

## Statistical Analysis

Two sets of analyses were conducted using generalized linear models to examine: (1) per-item calorie changes between 2012 and 2013 among items on the menu in both years; and (2) mean calories in new items in 2013 compared to items on the menu in 2012 only. For these comparisons, *p*-values are presented, as the census data are also conceived as a sample generalizable to large chain restaurants. Subgroup analyses were conducted among menu items in 30 restaurants with a main focus area (burgers, pizza, sandwiches, or chicken) to examine whether calorie differences between newly introduced items in 2013 and menu items offered in 2012 differed between core and non-core items. All analyses controlled for the aforementioned covariates.

## Results

Table 1 shows the characteristics of 19,417 menu items in 2012–2013, overall and stratified by menu category. Overall, 63.2% of items were offered on menus in both years, 23.3% of items were newly introduced in 2013, and the remaining 13.5% of items were offered only in 2012. No meaningful changes in the predicted mean calorie changes among items on menus in both 2012 and 2013 were observed (Table 2).

In the 66 large chain restaurants, menu items newly introduced in 2013 had substantially fewer calories (–56 calories on average) relative to items only on the menu in 2012 (Table

3) ( $p=0.02$ ). New food items, beverages, and children's menu items all had fewer mean calories relative to old menu items ( $-50$ ,  $-26$ , and  $-46$  calories, respectively). Predicted mean per-item calories in new main course items had 66.8 fewer calories relative to old main course items ( $p=0.03$ ).

Figure 1 shows the proportion of newly introduced menu items that had caloric content greater than ( $> 50$  calories greater), similar to (within  $\pm 50$  calories), or less than ( $< 50$  calories lower) menu items offered only in 2012. The distributions differed by menu category, with the new main course items having the greatest proportion of items (62%) with lower calories relative to old items.

Figure 2 compares calorie differences between newly introduced items in 2013 and menu items offered in 2012 between core and non-core items, in the 30 restaurants with a specific focus (burgers, pizza, chicken, or sandwiches). Among items in burger-focused restaurants, new burgers had greater predicted mean calories relative to burgers on the menu only in 2012, whereas new non-burger items had lower predicted mean calories in 2013 relative to non-burger items on the menu only in 2012 (330 calories vs 426 calories). This pattern, in which new non-core items had a larger decline in calories from 2012 to 2013 relative to core items, also occurred among items in pizza- (353 calories vs 592 calories) and chicken-focused (186 calories vs 195 calories) restaurants. A statistically significantly greater decline in calories in non-core items relative to core items was observed in pizza-focused restaurants ( $p=0.01$ ), while a statistically significantly greater increase in non-core items relative to core items was observed in sandwich-focused restaurants ( $p<0.01$ ).

## Discussion

This study finds that large restaurant chains in the U.S. have had recent overall declines in calories in newly introduced menu items ( $-56$  calories, 12% decline). These declines were concentrated mainly in new main course items ( $-67$  calories, 10% decline). Within the 30 restaurants with a primary food focus (e.g., burgers), declines in calories in new items were larger among menu items not core to the business of the chain restaurant. Because many core items are entrees whereas non-core items are not, it is notable that this trend appears to differ from the overall results, which found the greatest calorie decreases among entrees. Therefore, this finding suggests that large chain restaurants might be more willing to offer lower-calorie options in menu items not core to their customer base. No differences in mean calories among items on menus in both 2012 and 2013 were found. Given that federal menu labeling provisions are not yet in effect, the observed declines in newly introduced menu items may be capturing voluntary actions by large chain restaurants to increase the transparency of nutritional information.<sup>3</sup> This study, the first to use MenuStat data to explore changes in the caloric content to menu items in large chain restaurants nationally, could mark the beginning of a trend toward reducing calories.

Though a similar methodology was used, the results of this study contrast with those of Wu & Strum (2014),<sup>4</sup> who did not find meaningful differences in energy content of chain restaurant menu entrees between 2010 and 2011. That the data are more recent (and closer to the forthcoming implementation of federal menu labeling regulation), limited to the very

largest restaurant chains (66 of the top 100 as opposed to the top 400), and include the full range of menu items (rather than being limited to entrees) are possible explanations for this difference. The changes in energy content observed in this analysis are consistent with the magnitude of changes found in Kings County Washington,<sup>5</sup> with unpublished results from the New York City Health Department that estimated average calorie reductions of 10% as a result of menu labeling in chain restaurants, and other empirical evidence.<sup>4, 9</sup>

The finding of meaningful changes in calories in the nations' largest chain restaurants—primarily through the introduction of new, lower-calorie menu items—has significant implications for evaluations of the federal menu labeling regulation. It may be unrealistic to expect large changes in consumer purchases in response to menu labeling because individual behaviors prove resistant to change.<sup>22</sup> Yet, virtually all research to date evaluating local menu labeling efforts has focused on the demand side.<sup>16, 17, 23–29</sup>

These results have implications for obesity. On a typical day, 33% of children, 41% of adolescents, and 36% of adults eat at fast food restaurants, with a mean caloric intake of 191 calories, 404 calories, and 315 calories, respectively.<sup>30</sup> If the average calories consumed at each visit were reduced by approximately 60 calories (the average decline observed in newly introduced menu items in 2013), the population impact on obesity could be significant. Of note, however, the caloric content of restaurant meals remains quite high.

The present findings should be interpreted in light of several limitations. The analysis examines 2 years of data; whether the observed changes are part of a longer-term trend is unknown. Because the data are limited to menu items in the largest U.S. chain restaurants, these results are unlikely to be generalizable to small chains, locally owned, or fine dining restaurants. It is not possible to make causal claims about the decline in calories among newly introduced menu items in 2013. The coding of caloric information may have been subject to human error, as calories were transcribed from restaurants' websites. However, the caloric content published by restaurants has high accuracy.<sup>21</sup> It is unknown whether supply-side changes in menu items calories will reduce caloric intake and, subsequently, obesity. Finally, these data describe menu items available for purchase, not sales. Therefore, the frequency with which lower-calorie items were purchased or the characteristics of customers who typically made that choice are unknown.

This study describes national-level data from 2012 to 2013 about caloric content of menu items in large chain restaurants in the U.S. Future studies evaluating menu labeling in large chain restaurants should consider supply-side impacts. Modest reductions to the caloric content of menu items have the potential to make significant improvements in obesity prevalence.

## Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

## Acknowledgments

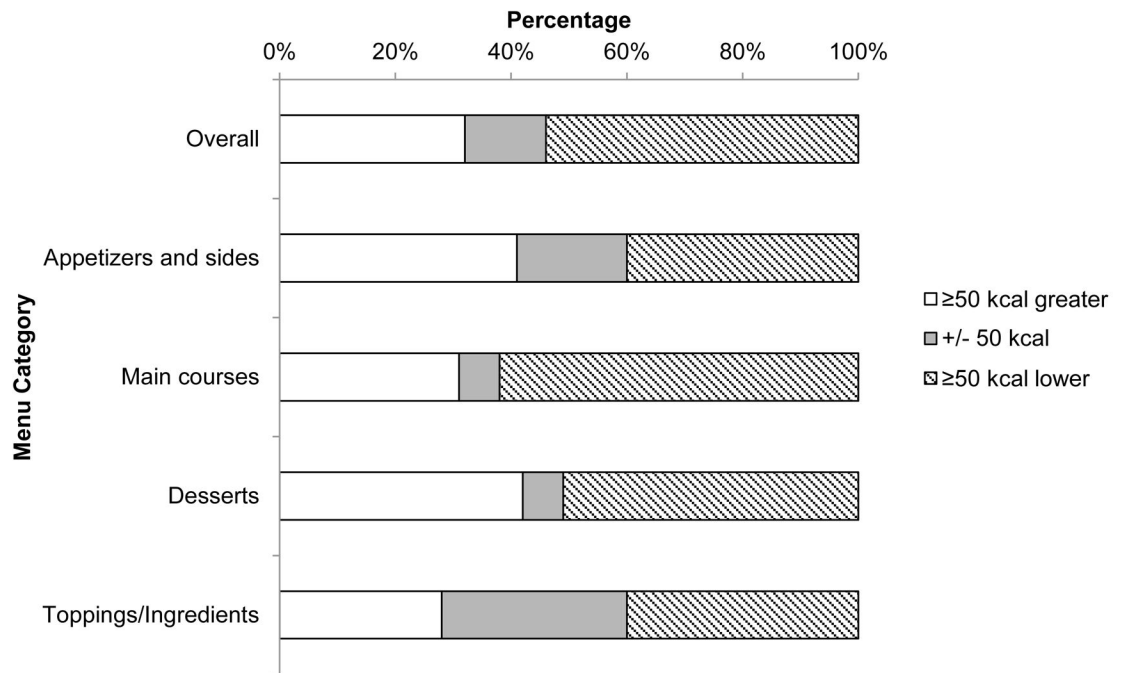
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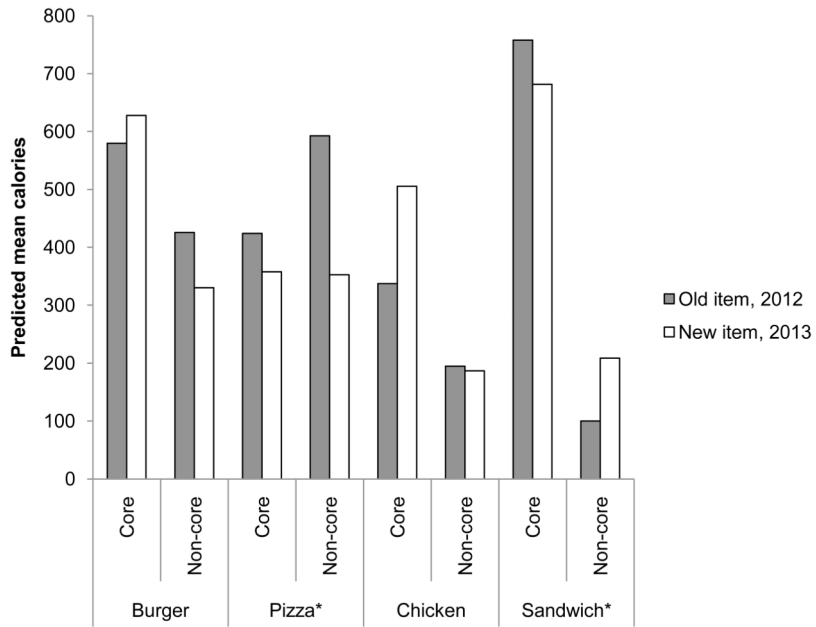


**Figure 1.**

Proportion of newly introduced menu items in 2013 that had caloric content greater than, similar to, or less than that of menu items in 2012, overall and stratified by menu category

Notes: Histograms showing the distribution of the proportions of newly introduced menu items in 2013 whose caloric content was greater, similar to, or lower than that of menu items offered in 2012, in 66 large chain U.S. restaurants. All analyses exclude beverages.





**Figure 2.** Predicted mean per-item calories among new menu items in 2013 versus items offered in 2012, comparing core to non-core items in restaurants with a specific menu focus

Notes: Histograms of predicted mean per-item calories among newly introduced menu items in 2013 versus that of menu items offered in 2012, comparing core to non-core items in restaurants with a specific menu focus in the 30 restaurants with a specific focus. Core items in burger restaurants include only burgers (n=77), and non-core items include all else (n=1,381). Core items in pizza restaurants include only pizzas (n=209), and non-core items include all else (n=120). Core items in chicken restaurants include only chicken items (n=27), and non-core items include all else (n=89). Core items in sandwich restaurants include only sandwiches (n=642), and non-core items include all else (n=384). Predicted mean per-item calories are from generalized linear models adjusting for children’s menu item status, whether a restaurant chain is national, and restaurant type (fast food, full service, fast casual).

\* Difference in calories between old and new items in core vs. non-core items is significant at  $p < 0.05$ .

**Table 1**  
Menu item characteristics in 66 U.S. restaurants in 2012–2013, overall and by menu category

Menu category	n	% all menu items	% items offered both years	% items introduced 2013	% items in national restaurants <sup>d</sup>	% children's menu items <sup>b</sup>	% items in fast-food restaurants <sup>c</sup>
Overall N	--	19,417	12,211	4,550	12,932	1,222	10,697
Overall	19,417	100.0	63.2	23.3	66.6	6.3	54.9
Food <sup>d</sup>	10,396	53.4	65.9	17.8	62.9	5.3	50.7
Beverages	5,818	30.2	56.0	35.8	73.9	8.2	62.5
Children's menu <sup>e</sup>	1,222	6.3	68.4	21.7	54.9	100.0	38.7
Menu category							
Appetizers and sides	1,247	6.4	80.0	10.7	56.7	10.1	40.0
Main courses <sup>f</sup>	7,172	36.8	60.7	19.5	62.9	5.0	48.1
Desserts <sup>g</sup>	1,977	10.2	75.9	16.1	66.6	3.3	67.1
Toppings/Ingredients	3,203	16.4	67.5	18.0	65.3	5.9	54.3

<sup>a</sup>National restaurants defined as restaurants with locations all 9 U.S. Census Divisions.

<sup>b</sup>Children's menu items defined as the words "kids", "kid", "child", or "children" appearing the menu item or menu item description.

<sup>c</sup>Fast-food restaurants defined as those without table service and that did not meet criteria for fast casual restaurants. 28.0% of items were on menus in full service restaurants and 16.9% of items were on menus in fast casual restaurants.

<sup>d</sup>Includes all menu categories except beverages and toppings/ingredients.

<sup>e</sup>Includes food and beverages with menu descriptions containing the words "kid", "kids", "child", or "children".

<sup>f</sup>Includes burgers, entrees, pizza, sandwiches, and salads and soups that are not categorized as appetizers or side dishes.

<sup>g</sup>Includes desserts and other baked goods.

**Table 2**

Predicted mean per-item calories among items on menus in 2012 and 2013

Menu category	n	Mean calories, 2012	Mean calories, 2013	Change in calories, 2012–2013	p-value
Overall	12,211	351.3	350.3	-1.0	0.24
Food <sup>a</sup>	6,833	471.2	469.4	-1.8	0.20
Beverages	3,218	252.9	253.3	0.4	0.66
Children's menu <sup>b</sup>	835	238.9	239.4	0.5	0.67
Menu category					
Appetizers and sides	995	355.2	353.9	-1.3	0.75
Main courses <sup>c</sup>	4,341	517.8	515.8	-2.0	0.17
Desserts <sup>d</sup>	1,497	413.1	411.6	-1.5	0.32
Toppings/Ingredients	2,160	118.6	118.1	-0.6	0.39

<sup>a</sup>Includes all menu categories except beverages and toppings/ingredients.

<sup>b</sup>Includes food and beverages with menu descriptions containing the words “kid”, “kids”, “child”, or “children”.

<sup>c</sup>Includes burgers, entrees, pizza, sandwiches, and salads and soups that are not categorized as appetizers or side dishes.

<sup>d</sup>Includes desserts and other baked goods.

Notes: Mean per-item calories in each year adjusted for children's menu item status, whether a restaurant chain is national, and restaurant type (fast food, full service, fast casual). Standard errors are clustered to account for correlation within restaurants. The p-value tests whether the change in calories from 2012 to 2013 is statistically different from zero.

Table 3

Predicted mean per-item calories among 2012 menu items compared to those items introduced in 2013

Menu category	n	Mean calories, 2012 items	Mean calories, 2013 items	Difference in calories, new items	p-value
Overall	7,206	450.4	394.2	-56.2	0.02
Food <sup>a</sup>	3,563	601.6	551.6	-50.0	0.12
Beverages	2,600	333.9	308.0	-25.9	0.46
Children's menu <sup>b</sup>	387	227.3	181.6	-45.7	0.36
Menu category					
Appetizers and sides	252	350.2	410.9	60.6	0.12
Main course <sup>c</sup>	2,831	637.7	570.9	-66.8	0.03
Desserts <sup>d</sup>	480	476.6	520.2	43.6	0.24
Toppings/Ingredients	1,043	101.7	135.9	34.1	0.12

<sup>a</sup>Includes all menu categories except beverages and toppings/ingredients.

<sup>b</sup>Includes food and beverages with menu descriptions containing the words "kid", "kids", "child", or "children".

<sup>c</sup>Includes burgers, entrees, pizza, sandwiches, and salads and soups that are not categorized as appetizers or side dishes.

<sup>d</sup>Includes desserts and other baked goods.

Notes: Mean per-item calories in each year adjusted for children's menu item status, whether a restaurant chain is national, and restaurant type (fast food, full service, fast casual). Standard errors are clustered to account for correlation within restaurants. The p-value tests whether the difference in calories between items on the menu in 2013 relative to those on the menu in only 2012 is statistically different from zero.