

Consumer Awareness of Fast-Food Calorie Information in New York City After Implementation of a Menu Labeling Regulation

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In 2008, after a series of court challenges by the restaurant industry, New York City became the first jurisdiction in the United States to require restaurant chains to post calorie information on menus and menu boards. Adopting this regulation was part of a broader New York City Health Department public health response to rising rates of overweight and diabetes. These efforts draw on 2 decades of research that suggests a direct link between the growth of chain restaurant industries—both fast food and casual dining—and rising rates of obesity.^{1–4} US fast-food sales increased exponentially between 1970 and 2000, from \$6 billion to \$110 billion.⁵ During the same time, obesity rates among US adults doubled; one third of US adults now meet the criteria for obesity, and another third are considered overweight.⁶

Research examining changes in individual dietary patterns confirms that fast-food consumption is associated with increased body mass index⁷ and increased calorie intake.⁸ On days when they report eating fast food, adults consume 205 more calories, and children and adolescents consume 155 more calories than on days when they do not eat fast food.⁸ Choices at fast-food chains typically consist of high-calorie foods⁹ served in large portions.¹⁰ However, most consumers may not be aware of the high calorie content of such items because such information is often not easily accessible in fast-food establishments. Additionally, consumers have been found to consistently underestimate the calories in foods prepared outside of the home^{11,12}; even nutritionists and other health professionals underestimate the calories in typical chain restaurant foods.¹³

Two studies have shown that few customers report seeing calorie information when it is provided in less accessible formats (e.g., posters, pamphlets) or after the point of purchase.^{14,15a} Prominent placement of calorie information on menus and menu boards was proposed in New York City to assure that customers have ready access to calorie information when they make

Objectives. We assessed consumer awareness of menu calorie information at fast-food chains after the introduction of New York City's health code regulation requiring these chains to display food-item calories on menus and menu boards.

Methods. At 45 restaurants representing the 15 largest fast-food chains in the city, we conducted cross-sectional surveys 3 months before and 3 months after enforcement began. At both time points, customers were asked if they had seen calorie information and, if so, whether it had affected their purchase. Data were weighted to the number of city locations for each chain.

Results. We collected 1188 surveys pre-enforcement and 1229 surveys post-enforcement. Before enforcement, 25% of customers reported seeing calorie information; postenforcement, this figure rose to 64% ($P < .001$; 38% and 72%, weighted). Among customers who saw calorie information postenforcement, 27% said they used the information, which represents a 2-fold increase in the percentage of customers making calorie-informed choices (10% vs 20%, weighted; $P < .001$).

Conclusions. Posting calorie information on menu boards increases the number of people who see and use this information. Since enforcement of New York's calorie labeling regulation began, approximately 1 million New York adults have seen calorie information each day. (*Am J Public Health.* 2010;100:2520–2525. doi:10.2105/AJPH.2010.191908)

menu selections. In December 2006, New York City approved the nation's first regulation requiring calorie labeling in certain fast-food restaurants. That requirement, effective July 1, 2007, was overturned by a US District Court^{15b} in September 2007. An amended regulation was approved in January 2008 and became effective March 31, 2008. The amended regulation requires restaurant chains with 15 or more locations nationwide to post calorie counts on menus, menu boards, and item tags.¹⁶ Calories must be posted clearly and conspicuously, adjacent or in close proximity to the item name, using a font and format that are at least as prominent as the price or item name.

The city began issuing violations for non-compliance in May 2008; full enforcement, including levying of fines, began on July 18, 2008. Because a lawsuit initiated by the New York State Restaurant Association was pending at the time the regulation went into effect, most restaurants waited until the enforcement date for financial penalties to begin posting calorie information. However, some chains began

posting as early as 2007. A New York City Health Department study that we conducted before the city's Board of Health 2006 regulation became effective found that most customers left fast-food chains without seeing any calorie information despite industry claims that restaurants were making substantial efforts to convey such information.^{14a} Fewer than 4% of fast-food customers reported seeing calorie information. This percentage did not include customers at the fast-food chain Subway, which had posted calorie information for a select number of items before the posting requirement went into effect. The earlier study also found that 1 in 3 lunchtime customers purchased food containing more than 1000 calories at the lunchtime meal,⁹ which accounted for more than half of the 2000-calorie daily intake recommendation for most adults.

Immediately preceding and following the full enforcement (with levying of fines) of the calorie-labeling regulation, we assessed the impact of the regulation on customers' awareness of calorie information and their report of its use in making food choices. The rationale

that calorie information may help guide healthier choices was supported by data collected at Subway restaurant chains. Subway customers who reported seeing calorie information and using that information in making their food choices purchased 99 fewer calories than did customers who said they had not seen the calorie information.^{14a}

METHODS

The New York City Health Department's Bureau of Food Safety and Community Sanitation, which inspects all food-service establishments in the city, provided a list of fast-food restaurants in the city that were required to comply with the regulation's provisions (restaurant chains with at least 15 locations nationwide) and were registered with the city as of March 27, 2008. We selected the 17 fast-food chains with the most locations in the city. The department later determined that 2 of these chains were local chains that did not meet the regulation's definition of a chain (Kennedy Fried Chicken, Crown Fried Chicken); data for these 2 chains were not reported here. Restaurants in the 15 sampled chains accounted for approximately 75% of the estimated 2600 chain restaurant locations required to comply with this city regulation. Because we were interested in potential variations in consumer awareness among chains, we stratified the sample by fast-food chain, randomly sampling 3 locations for each of the 15 fast-food chains, for a total of 45 sites.

Data Collection

We collected data approximately 3 months before (pre-enforcement) and 3 months after (postenforcement) July 18, 2008, the date when levying of fines for noncompliance with the regulation began. Pre-enforcement data were collected for 3 consecutive weeks in March and April 2008; postenforcement data were collected for 3 weeks in September and October 2008.

Three-person data collection teams were stationed outside sampled restaurants. Data collectors approached customers exiting the restaurant and asked them to participate in a brief survey. The data collectors administered the surveys, which asked customers (1) if they had purchased a meal or snack or had made no purchase for themselves; (2) if they saw calorie

information in the restaurant that day, or had they ever seen calorie information for that restaurant chain; (3) where they had seen calorie information; and (4) if the information affected their purchase that day. The data collectors also asked customers how often they frequented fast-food chains and coffee chains in an average week. Finally, customers were asked to rate how often they considered calories when deciding what foods to buy, using a 5-point scale from "almost never" to "almost always."

Demographic information included self-report of age by category (18–24 years, 25–34 years, 35–44 years, 45–64 years, and 65 years and older), residential zip code, and gender. Surveys were administered in English to adults only. Customers who completed the survey received a \$2 MetroCard (a public transit pass valid for 1 subway or bus ride) for their participation.

Data collectors also counted the number of customers leaving each restaurant and explicit refusals to participate. The survey target for each restaurant location was 50 respondents; data collection continued for 2 hours or until 50 surveys were completed, whichever happened first. For fast-food chains, data were collected on weekdays between 12:00 PM and 2:00 PM; for coffee and ice-cream chains, data were collected on weekdays between 2:00 PM and 4:00 PM.

Because the restaurant industry's court challenge to the regulation was prolonged, chains varied in their compliance with the contested requirements at the pre-enforcement time point in spring 2008. To determine if the method of posting affected whether customers saw calorie information, data collectors used an observational checklist to assess the availability of calorie information at each surveyed location both pre- and postenforcement. Details collected included whether calorie information was available for the complete listing of items sold, what types of formats were used to display calorie information (menu board, paper menus, item tags, poster, pamphlets, food packaging, or other), and the location of the information within the store. Official brand Web sites were also accessed to check for calorie information. Each site was classified as having either a full menu board posting (calories posted for all menu items on the menu board next to the

item name or price), partial menu board posting (for selected items only), other in-store posting (e.g., pamphlets, posters, tray liners), Web site only, or no availability of calorie information.

Data Analysis

The sample data were weighted to reflect the number of locations operating in the city for each chain. These weighted analyses allowed us to better estimate the relative impact of the regulation on fast-food customers in general. All analyses were restricted to customers who reported that they had purchased something for themselves. Customers were coded as having seen calorie information if they answered yes to either having seen calorie information that day or ever having seen calorie information for that chain. We used residential zip codes to obtain US census information^{14b} on neighborhood income, and we used these data to classify neighborhoods of respondents as high, medium, or low income. All analyses were performed by using SPSS 17.0 (SPSS Inc, Chicago, IL). We used SPSS Complex Samples to adjust for the clustering in the sample design, and we used the χ^2 statistic to test for significant differences in the dependent variables from pre- to post-enforcement. Differences among chains were examined relative to their posting methods pre-enforcement.

RESULTS

Surveys were administered at 45 sites representing 15 chains (3 locations per chain). At pre-enforcement, the participation rate was 48%, with an overall capture rate of 42%; at postenforcement, the participation rate was 52%, with an overall capture rate of 46%. A total of 1370 customers completed the pre-enforcement survey, and 1451 completed the postenforcement survey. After restricting the data to customers who had made a purchase for themselves, the final sample totaled 1188 customers at pre-enforcement and 1229 at postenforcement.

Change in Customer Calorie Awareness by Pre-Enforcement Posting Method

The majority of locations ($n=42$) had at least some calorie information available inside the store or on the Web during

pre-enforcement data collection. At postenforcement, all but 1 location in our sample (a Golden Krust) were in compliance with the regulation and listed calories on their menu boards. Figure 1 shows the proportion of customers who reported seeing calorie information at both time points when categorized by the location's pre-enforcement calorie-posting method. During the pre-enforcement period, customers were 3 times more likely to see calorie information when calories were posted on the full menu board compared with all other methods (61% vs 18%; $P < .001$; data not shown). At postenforcement, overall customer awareness of calorie information increased from 25% to 64% in the unweighted data ($P < .001$) (Table 1) and from 38% to 72% in the weighted analyses ($P < .001$; Table 2) after the stores posted calorie information on their menu boards.

Six locations representing 2 chains (Subway and Starbucks) complied with the regulation sooner than required and had calorie information on the full menu board. At these 2 chains, 74% of respondents reported seeing the calorie information at postenforcement, up

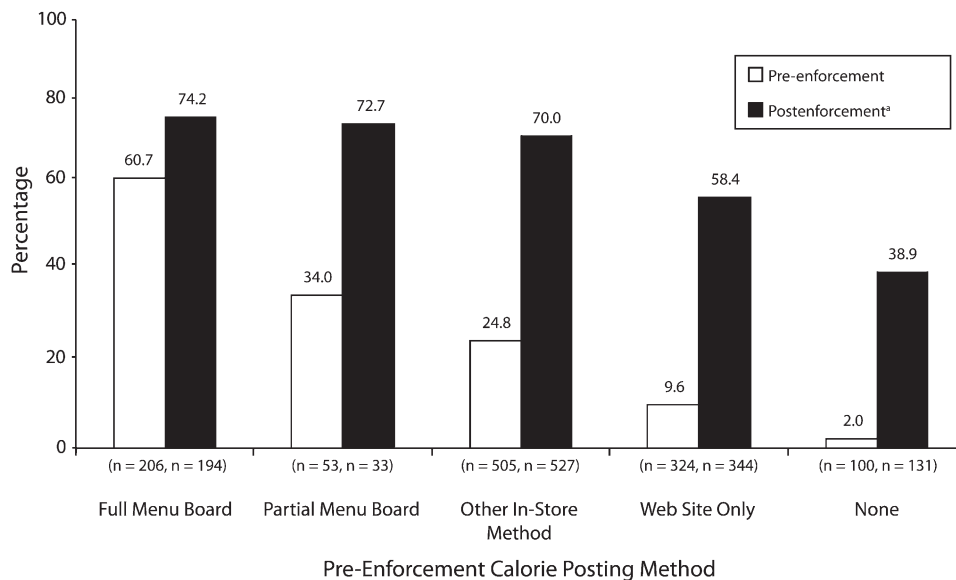
from 61% at pre-enforcement ($P < .005$). Two Dunkin' Donuts locations had calorie information posted for only a limited number of items during the pre-enforcement assessment (i.e., partial menu board). At postenforcement, when calories were posted for all items, 73% of customers reported seeing calorie information, compared with 34% who reported seeing calorie information at pre-enforcement ($P < .001$).

At pre-enforcement, almost half of the locations sampled ($n = 20$) had calorie information available to customers in some form other than on menu boards, such as posters, tray liners, food wrappers, or pamphlets, and 25% of customers reported seeing calorie information. After calorie information was posted on the menu boards, the percentage of customers who reported seeing calorie information at these same locations increased from 25% pre-enforcement to 70% postenforcement ($P < .005$). Several chains had calorie information available on Web sites ($n = 14$) at pre-enforcement; however, only 10% of customers at these chains reported ever seeing calorie information pre-enforcement. This proportion increased to

58% after these locations posted calorie information on their menu boards. One chain in our sample—Golden Krust, a small Caribbean food chain—did not report calorie information in any form at pre-enforcement. At postenforcement, 2 of the chain's 3 locations posted calorie information, and 39% of customers across the 3 locations reporting seeing it.

Differences in Customer Awareness Among Brands

Customers varied by chain in reporting having seen calorie information (Table 1). At postenforcement, customers were most likely to report having seen calorie information at McDonald's (87%), Subway (77%), Wendy's (73%), Dunkin' Donuts (71%), and Starbucks (70%); the lowest postenforcement rates for this variable were found among customers at Domino's (20%), Papa John's (39%), and Carvel (33%). At both pre- and postenforcement, among those who reported seeing calorie information, 27% said they had used that information in making their menu choice (data not shown). Because the number of customers who reported seeing calorie



Note. Subway and Starbucks provided the full menu board. Two Dunkin' Donuts locations provided the partial menu board. McDonald's, Burger King, Wendy's, Kentucky Fried Chicken, Baskin Robbins, Carvel, 1 Dunkin' Donuts location, and 1 Taco Bell location displayed other in-store posting methods. Blimpie's, Popeye's, Domino's, Papa John's and 2 Taco Bell locations provided information via their Web site only. Golden Krust did not display calorie information.

^a44 of 45 locations posted calories on their menu board.

FIGURE 1—Survey counts and percentages of fast-food customers who reported seeing calorie information, before and after menu-labeling enforcement, by pre-enforcement calorie-posting method: New York, NY, 2008.

TABLE 1—Survey Counts and Percentages of Customers Who Reported Seeing Calorie Information Before and After Menu-Labeling Enforcement, by Restaurant Chain: New York, NY, 2008

	Pre-enforcement			Postenforcement		
	Completed Surveys, No.	Total Valid Surveys, No.	Saw Calories, No. (%)	Completed Surveys, No.	Total Valid Surveys, No.	Saw Calories, No. (%)
Total	1370	1188	301 (25.3)	1451	1229	789 (64.2)
Hamburger						
McDonald's	150	137	40 (29.2)	146	133	115 (86.5)
Burger King	105	95	16 (16.8)	85	72	50 (69.4)
Wendy's	106	100	47 (47.0)	150	141	103 (73.0)
Chicken						
Kentucky Fried Chicken	112	94	6 (6.4)	116	105	61 (58.1)
Popeyes	150	127	5 (3.9)	151	129	86 (66.7)
Pizza						
Domino's	14	13	2 (15.4)	29	25	5 (20.0)
Papa John's	53	33	3 (9.1)	51	33	13 (39.4)
Tex-Mex						
Taco Bell	95	89	13 (14.6)	92	74	43 (58.1)
Caribbean						
Golden Krust	125	100	2 (2.0)	150	131	51 (38.9)
Sandwich						
Subway	148	136	80 (58.8)	150	122	94 (77.0)
Blimpie	100	84	12 (14.3)	137	112	67 (59.8)
Coffee						
Starbucks	79	70	45 (64.3)	89	72	50 (69.4)
Dunkin' Donuts	79	70	22 (31.4)	64	51	36 (70.6)
Ice cream						
Baskin Robbins	27	22	5 (22.7)	38	26	14 (53.8)
Carvel	27	18	3 (16.7)	3	3	1 (33.3)

Note. Analyses are limited to customers who had made a food purchase for themselves at the sampled restaurant just prior to being surveyed.

information increased in the postenforcement period, the percentage of all customers reporting that calorie information had affected their purchase doubled from 10% to 20% ($P < .001$; data not shown).

Customer Characteristics and Self-Reports of Calorie Posting Observation and Use

At postenforcement, younger customers were somewhat more likely to report seeing calorie information. More than three fourths (77%) of customers aged 18 to 24 years, 74% of those aged 25 to 44 years, and 65% of customers aged 45 to 64 years reported seeing calorie information (Table 2). Among

those who saw calorie information, customers between the ages of 25 and 44 years were more likely to say that the information had affected their purchase (32% of customers aged 25–34 years; 33% of customers aged 35–44 years) compared with both younger (25% of those aged 18–24 years) and older (22% of those aged 45–64 years) customers. Overall, 1 in 4 adults (aged 25–44 years) and 1 in 5 (19%) young adults (aged 18–24 years) reported using calorie information when making fast-food purchases. For those between the ages of 45 and 64 years, the rate was lower: only 14% reported using calorie information when deciding on fast-food purchases.

Neighborhood income was not associated with seeing or using calorie information (Table 2). There were no gender differences observed; 71% of men and 73% of women reported seeing calorie information at postenforcement. However, among customers who reported seeing calorie information, men were more likely than were women to report that the posted calorie information affected their purchase (32% vs 23%; $P < .05$). In addition, among all customers, men were slightly more likely to report using calorie information (22% vs 17%; $P < .05$). The data also showed a slight postenforcement increase in customers' use of calorie information when making any kind of food choice. The percentage of customers who reported that they often considered calorie information when making any kind of food choice increased from 32% at pre-enforcement to 38% at postenforcement ($P < .05$; data not shown).

DISCUSSION

Six months after all regulated fast-food chain restaurants in New York City were required to post calorie information, and 3 months after full enforcement (including monetary fines) was in place, 72% of customers at the 15 fast-food chains in our study reported seeing calorie information, and 27% of these customers said they had considered that information when making their food choices. If 1 in 4 adults eats fast food on any given day in New York,² this finding would translate to more than 1 out of 6 million adults seeing calorie information—and 280 000 adults using that information to make food choices—every day.

Customer observation of calorie information greatly increased across all the fast-food chains we surveyed after full enforcement. Methods of providing calorie values elsewhere in the store (e.g., pamphlets or posters) instead of on the menu board at the point of purchase were far less effective at communicating this information to consumers. At chain restaurants where nutrition information was available on tray liners, food wrappers, or pamphlets pre-enforcement, the proportion of customers reporting that they had seen the information increased almost 3-fold, from 25% in the pre-enforcement period to 70% when calorie information was posted on menu boards. Even at

TABLE 2—Customers Who Reported Seeing and Using Calorie Information at Postenforcement, by Age, Gender, and Neighborhood Income (Weighted): New York, NY, 2008

	Customers Who Saw Calorie Information, % (SE; 95% CI)	Customers Who Used Calorie Information as a Percentage of Those Who Saw Information, % (SE; 95% CI)	Customers Who Used Calorie Information as a Percentage of All Customers, % (SE; 95% CI)
Age, y			
18–24	77.4 (2.5; 72.0, 82.0)	24.8 (5.4; 15.4, 37.4)	19.0 (4.2; 11.8, 29.0)
25–34	73.9 (2.7; 68.0, 79.0)	31.5 (3.8; 24.3, 39.6)	23.3 (2.5; 18.6, 28.7)
35–44	74.2 (3.6; 66.3, 80.8)	32.7 (5.9; 21.9, 45.7)	24.2 (4.1; 16.9, 33.2)
45–64	64.8 (2.4; 59.9, 69.4)	21.8 (2.8; 16.7, 28.1)	14.1 (2.2; 10.2, 19.2)
≥ 65	64.4 (7.2; 48.7, 77.5)	15.2 (8.9; 4.1, 42.5)	9.4 (4.8; 3.2, 24.5)
Gender			
Men	70.5 (2.8; 64.4, 75.9)	31.9 (3.4; 25.3, 39.2)	22.3 (2.8; 17.1, 28.5)
Women	73.1 (2.4; 68.0, 77.7)	22.9 (1.9; 19.2, 27.1)	16.7 (1.3; 14.2, 19.5)
Neighborhood income ^a			
Low	70.1 (1.9; 66.2, 73.7)	23.5 (2.4; 18.9, 28.8)	16.4 (1.8; 13.1, 20.5)
Moderate	74.1 (3.4; 66.5, 80.4)	27.4 (4.4; 19.4, 37.1)	20.1 (2.9; 14.9, 26.6)
High	71.8 (4.4; 62.1, 79.9)	24.2 (5.2; 15.3, 36.3)	17.3 (4.0; 10.5, 27.1)
Total	71.8 (2.1; 67.4, 75.9)	27.2 (2.4; 22.5, 32.4)	19.4 (1.7; 16.1, 23.2)

Note. CI = confidence interval. Analyses are limited to customers who had made a food purchase for themselves at the sampled restaurant just prior to being surveyed.

^aPer the 2000 Census, neighborhood income is defined as follows: low income neighborhoods have >45% of households with incomes below twice the national poverty level; moderate income with 25%–45% of households, and high income with <25% of households with incomes below twice the national poverty level.

chains that posted calorie information on menu boards pre-enforcement, the proportion of customers reporting they had seen the information increased by 23%, from 61% to 74%. Chain restaurants not offering nutrition information in any form pre-enforcement had the lowest rates of postenforcement customer awareness; these low rates may be attributable to the limited menu options and the popularity of phone and online ordering before pickup at the pizza chains included in this group.

A comparison of these results to findings from our earlier study, conducted in spring 2007 before the effective date of the first Board of Health regulation,¹⁴ suggests that consumer awareness of calorie information has been increasing since that time. For example, that study found that at McDonald's, the largest fast-food chain—where calorie information was available in 2007 on the Web and on tray liners and food packaging in stores—the proportion of customers who reported seeing calorie information was 5%¹⁷; this figure rose to 29% in

our study's pre-enforcement survey, although the placement of in-store calorie information did not change during this time period. We can only speculate on why these 2 findings are so different; perhaps the substantial publicity that accompanied New York City's calorie labeling efforts increased awareness. In any case, the data reported in the current study suggest that calorie labeling on menus and menu boards has a substantial impact on customer awareness and use of calorie information, even at places where calories were already posted elsewhere in the store.

Another study in low-income neighborhoods just after calorie posting took effect found similar results: 54% of customers in that study reported seeing calorie information, and 28% of those customers said it had informed their purchase, although no significant difference in mean calories purchased was seen in this group.¹⁸ The increase in calorie awareness in settings where the information was already posted as required suggests that as customers become more familiar with the calorie

counts over time, they may be more likely to factor calories into their food choices, and this may be reflected in changes in purchasing patterns.

In our study, young adults (aged 18–24 years) were somewhat less likely to report using calorie information when making purchases than were customers aged 25 to 44 years. Although 1 in 4 fast-food customers aged 25–44 years reported that the posted calorie information had affected their purchase, just 1 in 5 young adults said that the posted information had affected their purchase. Because fast food is a large part of young adults' diets,^{19,20} there may be a need to strengthen efforts intended to increase awareness and understanding of calories among this age group. Although growing numbers of New York City's fast-food customers reported using calorie information to make menu selections, 80% of the city's fast-food customers continued to make their selections without considering this information. The proportion of customers using calorie information may increase over time; however, this study also highlighted the fact that calorie posting may not help all customers reduce the excessive calorie intake associated with fast food, for which large portion size and low cost drive high calorie intake. Other strategies, such as improving the healthfulness of menu offerings, are needed to further reduce the negative health effects of fast food.

This study had several limitations. First, customer volume varied across the 15 restaurant chains. Hamburger, chicken, and sandwich chains came close to the target of 50 surveys per location, but pizza and ice cream chains fell far short of the target. Pizza and ice cream chains also had the lowest percentage of customers reporting seeing calorie information, but this finding must be interpreted with caution because of the small numbers of participants at those restaurants. Second, customers choosing to participate may differ from other customers; however, participation rates varied inversely with customer volume, suggesting random nonparticipation because of data collectors' inability to approach all individuals at high-volume locations. Third, customer profiles across chains were not identical. Certain chains may specifically cater to customers who are more or less calorie-conscious;

furthermore, customers at specialty chains, such as coffee and ice cream, might be making different purchasing decisions from those made by lunchtime customers.

Fourth, the study included only 3 locations of each fast-food chain. The locations were randomly sampled from across the city, but this was done for a relatively small number of locations and may not have reflected the diversity of fast-food consumers in the city. In addition, because some chains were compliant or partially compliant during the pre-enforcement period, the estimates of change in customer awareness reported here are likely to be conservative. Finally, we asked customers whether they had used calorie information, but we had no data to verify what effect, if any, this use of information might have had on their food choices or eating behaviors. Positive responses may reflect a bias toward answering affirmatively; however, our earlier study did show a correlation between self-reported use of calorie information and lower-calorie purchases.¹⁴

Our study demonstrated that prominent posting of calorie information on fast-food menu boards greatly increases customers' awareness of calorie information. Our study also showed that other methods used to provide this information prior to enforcement were far less effective. Since the New York City Health Department first proposed calorie-posting regulations for chain restaurants in December 2006, many jurisdictions have followed suit by introducing similar regulations. More recently, there has been interest in standardizing these requirements, with much of this debate moving to the state and federal levels. This rapid pace of proposal and adoption of calorie-posting requirements signals a strong consensus that providing calorie information at the point of purchase can increase consumer awareness of the caloric content of the foods they eat and give consumers the opportunity to make less caloric choices.

As calorie-labeling regulations become more widespread, so will the capacity to assess the effectiveness of this strategy by means of broader population-level measures, such as purchasing patterns, frequency of fast-food consumption, and obesity rates. Our findings suggest that menu calorie labeling can have a beneficial effect on customers' awareness of

calorie information, which, in turn, may inform their food choices. ■

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Contributors

All authors jointly conceptualized and designed the study. T. Dumanovsky and C.Y. Huang supervised data collection and data entry and analyzed the data. All authors contributed to interpretation of the data and to writing and revising the article.

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Human Participant Protection

The institutional review board of the New York City Department of Health and Mental Hygiene determined that protocol approval was not needed because the study was an evaluation of a public health intervention.

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