Evaluation of a Voluntary Menu-Labeling Program in Full-Service Restaurants

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Objectives. We assessed whether labeling restaurant menus with information on the nutrient content of menu items would cause customers to alter their ordering patterns.

Methods. Six full-service restaurants in Pierce County, Washington, added nutrition information to their menus, and they provided data on entrée sales for 30 days before and 30 days after the information was added. We assessed the prelabeling versus postlabeling difference in nutrient content of entrées sold, and we surveyed restaurant patrons about whether they noticed the nutrition information and used it in their ordering.

Results. The average postlabeling entrée sold contained about 15 fewer calories, 1.5 fewer grams of fat, and 45 fewer milligrams of sodium than did the average entrée sold before labeling. Seventy-one percent of patrons reported noticing the nutrition information; 20.4% reported ordering an entrée lower in calories as a result, and 16.5% reported ordering an entrée lower in fat as a result.

Conclusions. The concentration of calorie reduction among 20.4% of patrons means that each calorie-reducing patron ordered about 75 fewer calories than they did before labeling. Thus, providing nutrition information on restaurant menus may encourage a subset of restaurant patrons to significantly alter their food choices. (*Am J Public Health.* 2010;100:1035–1039. doi:10.2105/AJPH.2009.174839)

Almost half of food expenditures in the United States occur in restaurants,[1] and meals eaten away from home tend to be higher in calories and fat[2]; thus, restaurant meals are an important target for arresting the rise in obesity. However, food descriptions on menus seldom provide enough information for a motivated diner to identify more healthful choices. Consumers are unable to determine which menu items contain the most calories,[3] and they tend to underestimate calorie content, particularly for high-calorie items.[4] For these reasons, the Surgeon General[5] and the Institute of Medicine[6] have pointed out a need for nutrition-information labeling on restaurant menus.

There is general support for menu labeling among consumers,[7] but the effectiveness of labeling in changing food selection or consumption has not been conclusively demonstrated. About one half of US chain restaurants provide nutrition information publicly, either on the premises or on a Web site,[8] but this information is often inconspicuously displayed and is largely unnoticed by customers.[9,10] Nutrition information displayed on the menu may have greater impact than when customers must take initiative to seek it out. Thus, many state and local governments have considered requiring restaurants to label their menus with information on calories and other nutrients,[11] and calorie labeling requirements for chain restaurants were included in the 2010 health care reform law.[12]

We evaluated a pilot menu-labeling program in full-service restaurants in Pierce County, Washington, located just south of the Seattle metropolitan area. This culturally and socioeconomically diverse county is home to 2 military installations. About 40% of the county's population of 800 000 is concentrated in Tacoma and adjacent municipalities, and just less than half the population lives in unincorporated areas. The goals of the evaluation were to determine whether the addition of nutrition information changed ordering patterns, to understand why ordering patterns did or did not change, and to identify ways in which the program could be improved. Our primary outcome was the prelabeling versus postlabeling difference in average nutrient value (i.e., calories, fat [g], sodium [mg], and carbohydrates [g]) per entrée sold.

METHODS

The SmartMenu program was developed by the Tacoma-Pierce County Health Department to provide nutrition information on menus so that diners could make informed choices of what to eat. This was a pilot project to assess the feasibility and effectiveness of a broader menu-labeling initiative. The program was delivered as a service to locally owned restaurants in the county. Because this was a voluntary program, implementation decisions usually represented a compromise between the interests of the health department and those of the restaurants.

We chose to work with locally owned restaurants for a number of reasons. First, these restaurants would have the authority to make and carry out decisions relatively quickly. Second, many chain restaurants already make nutrition available on a Web site or at the point of purchase.[8] Third, we wanted to provide a service to restaurants that were interested in promoting healthy eating but that didn't have the resources to perform menu analyses on their own.

Participants were recruited in a variety of ways from the county's 600 locally owned restaurants. Restaurants received publicity as an incentive. They provided health department staff with standardized recipes for all regular menu items. Nutrient values were estimated using The Food Processor SQL (ESHA Research, Salem, OR). Restaurants sometimes modified portion sizes or ingredients after seeing the results of their menu analyses, and in a few instances menu items were dropped or added.

The first labeled menu appeared in January 2007. Over the next 2 years, about 1 new restaurant per month launched a labeled menu. At the conclusion of the program in December 2008, 18 restaurants had printed nutrient information on their menus for every regular

food item. Details about restaurant recruitment, program implementation, and costs are available from the authors upon request.

Menu Labeling

Participating restaurants displayed calories, fat (g), sodium (mg), and carbohydrates (g) for every food item regularly on the menu, but not for beverages or daily specials. For entrées with a choice of side dish, the average nutrient value was displayed. Restaurants could format the nutrition information on menus as they wished. In most restaurants, labels consisted of 4 numbers separated by slashes, for example, 750\21\2300\45, corresponding to calories, fat (g), sodium (mg), and carbohydrates (g), respectively. A key on the menu explained what each number represented. In 2 restaurants (restaurants A and B; Table 1), descriptive labels accompanied the nutrition values (e.g., 750 calories, 21 grams fat, 2300 milligrams sodium, 45 grams carbohydrates). Restaurant menu boards and takeout menus were not always labeled.

Sales Data

Six restaurants had itemized historical sales data available and were willing to share these data with us. We expected that over time new patrons might be drawn to a restaurant because of the menu labeling (and possibly that others might be driven away for the same reason). We chose to study the 30-day periods just before and just after labeling debuted to avoid the influence of patron migration and thus to isolate the effect of nutrition information on the ordering patterns of usual restaurant patrons, as would be the case if menu labeling became mandatory. At restaurant E, there was a 9-month lag between the times when the lunch and dinner menus were labeled. Because there was significant overlap between items on these menus and the sales record did not distinguish between lunch and dinner sales, we used the first 30-day period when both menus were labeled; for comparison we used the same calendar period from the previous year, when neither menu was labeled.

Sales information consisted of how many of each menu item were sold in the 2 periods of interest. The information provided to us did not allow for multiple items to be grouped in a single order. We only examined sales of lunch and dinner entrées, including sandwiches and large salads, that had nutrition information on the printed menu. Sales records commonly included dishes not on the menu, such as daily specials or custom orders. Because these items were not labeled with nutritional information, they were not analyzed. Menus generally included options for which nutrient values were not listed, such as half orders or add-on items (e.g., salmon added to a Caesar salad). In analyses, half orders not labeled on the menu were treated as having half the nutrient values of a full order. If nutrient values for add-ons were unlisted, entrées ordered with an add-on were treated as though they had the same nutrient value as the entrée without the add-on.

TABLE 1—Characteristics of Evaluated Restaurants: Pierce County, WA, January 2007–December 2008

Restaurant	Type of Restaurant	No. of Entrées on Menu	Mean Entrée Price, $	Mean Entrée Calories (range)	Mean No. of Entrées Sold per Day
Restaurant A	Diner				46.6
Lunch		16	10.63	650 (440–870)	
Dinner		23	13.18	610 (430–870)	
Restaurant B	Cafe	19	9.16	880 (460–1570)	22.0
Restaurant C	Diner	45	8.88	1620 (400–3450)	14.0
Restaurant D	Thai	60	11.83	710 (230–1390)	90.3
Restaurant E	Diner				51.8
Lunch		32	8.16	720 (150–1520)	
Dinner		37	11.84	820 (220–1980)	
Restaurant F	Pub	16	8.25	620 (340–1110)	48.7

Survey Data

Restaurants were surveyed in the fall of 2008 and winter of 2009. Restaurants A and D were surveyed almost a year after their menus were labeled; other restaurants were surveyed less than 2 months after their menus were labeled. The survey was designed to assess each of the steps in the causal chain that we believed would connect menu labeling to behavior change. Questions asked whether patrons had seen the nutrition information, looked at the key, understood the information, and used the information in their ordering (Table 2).

We worked closely with restaurant managers to develop a survey protocol that would not disrupt service. Each restaurant was surveyed on 2 or 3 different weekdays during lunch or dinner, depending on the preference of the restaurant manager. In general, surveys were distributed to dining patrons with their bill at the conclusion of the meal, but the protocol varied slightly among the restaurants. The server would give a brief explanation of the survey and tell patrons that if they completed it, they would get a small incentive (a coupon for future dining, a pen, or a pedometer). All adult diners completing their meal during a 2-hour sampling period were offered a survey. Respondents completed the survey on their own and left completed surveys in a drop box when they were done.

Statistical Analysis

The primary outcomes of interest were the average calories, fat (g), sodium (mg), and carbohydrates (g) per entrée sold in the 30 days before and after menu labeling. If a recipe had been reformulated in response to the nutritional analysis, the same final nutrient values were used for analyzing sales in both before and after periods for that item.

Within each restaurant, lower-cost entrées tended to contain fewer calories and less fat than higher-cost entrées. The correlation between cost and calories ranged from 0.09 to 0.44 among restaurants. Because sales data were collected during a period of economic downturn, we were concerned that any observed decrease in calorie or fat content sold might be a result of economic factors. Therefore, we included entrée price as a covariate in statistical models of sales data. Both price and nutrient content were treated as continuous

TABLE 2—Items on Survey Presented to Restaurant Patrons After Nutrition Information Was Added to Menus: Pierce County, WA, January 2007–December 2008

Item	Response Choices
On your menu today, there were numbers like 770 / 24 / 520 / 18 for each menu item. Did you notice these numbers?	Yes No>>skip to demographic items
Did you look at the key that showed what these numbers mean?	Yes No>>skip to demographic items
The numbers showed nutrition information—calories, fat, sodium, and carbohydrates. Which one of the following statements best captures how understandable this nutrition information was?	I understood exactly what each number meant, and what it means for my health. I could tell if one entrée was healthier than another, but not if an item met recommended nutrition guidelines. I understood some of the numbers, but not all. I really didn't understand what any of the numbers meant.
Did you do anything differently because you saw the nutrition information? Please mark all that apply.	Yes, I chose an entrée that was lower in calories. Yes, I chose an entrée that was lower in fat. Yes, I chose an entrée that was lower in carbohydrates. Yes, I chose an entrée that was lower in sodium. Yes, I didn't order an appetizer. Yes, I didn't order dessert. Yes, I didn't finish my entire meal. Yes, I shared my meal. Yes, other. No, I didn't do anything differently.

variables. Restaurant-specific effects were estimated using ordinary least squares regression.

Survey data were constrained according to our causal model, which connected menu labeling to behavior change. That is, if a respondent reported that they had not noticed the nutrition information or had not consulted the key, but also indicated that they had ordered an entrée lower in calories, the marked behavior change was not counted. In addition, if a respondent marked a box for a behavior change but also marked the box saying "No, I didn't do anything differently," the behavior change was not counted.

We pooled data across restaurants by treating restaurant as a fixed effect. This approach produces a within-restaurant effect estimate that is a weighted average of the restaurant-specific estimates. Although restaurant characteristics are no doubt important predictors of response to nutrition labeling, our sample of restaurants was too small to explore these relationships. All calculations were performed using Intercooled Stata version 10.0 (StataCorp, LP, College Station, TX).

RESULTS

Six casual midrange restaurants participated in the evaluation (Table 1). About 16 000 entrées were purchased among the 6 restaurants in the 30 days before and after menu labeling was initiated. Prelabeling versus postlabeling differences in the average nutrient content of entrées sold varied among the restaurants (Table 3). In 4 restaurants, entrées sold in the postlabeling period contained significantly fewer calories; in 5 restaurants, postlabeling entrées contained less fat. On average, entrées purchased in the postlabeling period contained about 15 fewer calories, 1.5 fewer grams of fat, and 45 fewer milligrams of sodium than did entrées purchased in the prelabeling period. There was no before-and-after difference in the carbohydrates content of entrées purchased.

Survey response rates ranged from 51% to 87% among the 6 restaurants. Fifty-five percent of the 206 respondents were female. About 17% were aged 18 to 30 years, 31% were aged 31 to 45 years, 40% were aged 46 to 64 years, and 12% were aged 65 years or older. The most frequently reported actions taken as a result of seeing nutrition information were choosing entrées lower in calories (20.4% of respondents) and fat (16.5% of respondents; Table 4). About one third of patrons reported that they had made at least 1 behavior change because of seeing nutrition information on the menu.

In our causal model, for patrons to change their ordering behavior as a result of labeling information being added to the menu, they must notice the nutrition information, find and read the key explaining what the numbers mean, understand that explanation, and then make an ordering decision, in that order. Table 4 shows the percent of patrons who advanced through each step in this causal chain. There was attrition at each step, but the weakest links were the first and last steps. Just 71% of patrons noticed the nutrition information. Of these, 80% looked at the key, and 96% of patrons who noticed the information and looked at the key felt that they had understood the information well enough to identify healthier items. However, only 59% of those who noticed and understood the information acted on it in some way.

We performed exploratory analyses to better understand whether patron characteristics were associated with noticing menu labels and changing behavior. Among respondents aged 45 years and younger, 83% noticed the nutrition information, whereas only 60% of respondents aged 46 years and older noticed ($P<.001$). Gender was not associated with either outcome.

DISCUSSION

We have shown that the addition of nutrition information to restaurant menus was associated with a reduction in the calorie, fat, and sodium content of entrées ordered. Combining information from both sales records and patron surveys permits a richer understanding of this shift. On average, entrées ordered after labeling contained about 15 fewer calories, but survey data indicated that only about 20% of patrons chose an entrée lower in calories because of seeing nutrition information. This means that for every 100 postlabeling entrées

TABLE 3—Estimated Prelabeling vs Postlabeling Differences in Average Nutrient Value per Entrée Sold, Adjusted for Entrée Cost: Pierce County, WA, January 2007–December 2008

Restaurant	Change in Calorie Consumption	Change in Fat Consumption, g	Change in Sodium Consumption, mg	Change in Carbohydrate Consumption, g
Restaurant A	−16.8*	−2.53*	−22.7	−0.24
Restaurant B	−55.6*	−2.70*	−131.4*	−5.36*
Restaurant C	−53.6*	−4.25*	−11.8	−3.41
Restaurant D	−20.6*	−1.39*	−48.4	−1.52
Restaurant E	12.1	0.31	−41.2	1.99*
Restaurant F	−1.0	−1.01*	−33.0	2.30*
Mean (95% CI)	−15.0 (−23.1, −6.8)	−1.57 (−2.17, −0.97)	−45.7 (−74.5, −16.8)	−0.17 (−1.12, 0.78)

Note. CI = confidence interval.
*$P < .05$.

ordered, the 1500-calorie reduction was not distributed evenly among the 100 patrons; rather, the calorie reduction was concentrated among just 20 patrons. If 20 patrons were responsible for the 1500-calorie decrement, each patron must have ordered an entrée having roughly 75 fewer calories than before labeling. This estimate suggests that menu labeling could have a significant impact on meals ordered by some individuals.

To our knowledge, this is the first study of the effectiveness of providing nutrition information in full-service restaurants. Similar studies in cafeteria settings have yielded mixed results.[13–16] Restaurants, including cafeterias, vary widely across multiple dimensions (e.g., type of food, clientele, cost, ambience, management focus), and these differences may well contribute to the variation observed in patron response to nutrition information across studies. Indeed, we observed considerable heterogeneity in response to nutrition labeling among the restaurants we studied. This suggests that a different sample might have yielded a substantially different result. The small number of establishments represented in any single study, including ours, makes it difficult to understand the role of restaurant-level factors.

In some cases, restaurants modified their recipes or portion sizes after seeing their initial nutrient analysis. Menu revision is a second pathway by which menu analysis could affect the healthfulness of food ordered. This could produce significant public health benefit, because it affects all patrons who purchase the revised food item regardless of whether they see or use nutrition information. Unfortunately, we did not document menu revisions well enough to report how many calories or other nutrients were averted in this way.

TABLE 4—Percentage of Surveyed Patrons Who Acted Upon Nutrition Information Added to Menus: Pierce County, WA, January 2007–December 2008

Action Reported	% (95% CI)
Noticed nutrition information	71.4 (65.3, 77.4)
Looked at key	56.6 (50.1, 63.2)
Understood well enough to identify which menu items were healthier	54.2 (47.6, 60.9)
Chose an entrée lower in calories	20.4 (15.2, 25.6)
Chose an entrée lower in fat	16.5 (11.6, 21.4)
Chose an entrée lower in carbohydrates	9.2 (5.3, 13.2)
Chose an entrée lower in sodium	7.8 (4.1, 11.4)
Did not finish or shared meal	5.8 (2.6, 9.0)
Did not order dessert or appetizer	9.7 (5.8, 13.7)
Used nutrition information to change any behavior	33.7 (27.5, 39.8)

Note. CI = confidence interval.

How best to present nutrition information—what information to present, and where and how to display it—is likely to play an important role in whether information is noticed, understood, and used. Others have shown that chain restaurant patrons rarely consulted information presented on Web sites or in the restaurant via wall posters or pamphlets.[9,10] Information on Subway deli cases was noticed by about 30% of customers, whereas about 70% of patrons in our study noticed the information when it was printed on the menu.[9] These data suggest that the closer nutrition information is to the places where customers typically look when ordering food, the greater the likelihood that it will be seen.

Most restaurants in the SmartMenu program chose to use numbers and slashes to display the information; this display had little meaning unless one consulted a key. The type size of the nutrition information text was usually smaller than that for food description and cost, and we suspect that the age-dependence of noticing nutrition labels in our sample may have reflected the inability of older patrons to visually resolve the smaller print. Larger, clearer labeling might have improved program performance.

Although this was not a focus of the study, we observed that within a restaurant, higher entrée cost was associated with higher levels of calories and fat. At first blush this may seem anomalous, considering the inverse relationship between energy density and energy cost in freely chosen diets.[17] The association we observed, however, concerned total calories and total cost, which are quantity-dependent measures, and it seemed to be driven at least in part by entrée size. For example, a bacon double cheeseburger cost more than a plain hamburger, and it also contained more calories and fat. Low-cost, low-calorie foods were frequently senior portions or half orders of regular entrées; high-cost, high-calorie foods were large entrées such as surf-and-turf platters.

Our study is subject to several important limitations. First, although sales data are

objective and not subject to social desirability bias, as are survey data, they do not fully capture the outcome of true interest: the nutrient value of food consumed. If patrons consumed appetizers, desserts, or beverages in addition to an entrée, the entrées sold would underrepresent consumption. Conversely, if diners shared their entrée or did not eat it all, entrées sold would overrepresent consumption. Survey data indicate that about 6% of diners limited their intake in these ways.

Second, we used a pretest–posttest design with no concurrent comparison group; this design does not control for secular trends that may have coincided with the period of assessment. However, we do not believe that this is a major concern. First, the time interval between prelabeling and postlabeling periods was relatively brief. Second, the most important secular trend that might have influenced our results was the economic recession, but adjusting our data for entrée cost minimized any impact this trend may have had. If there had been growing concern about food intake in the postlabeling period, however, this may have interacted with the intervention to produce the effects we observed.

Finally, we studied a small convenience sample of restaurants, and the applicability of these results to other restaurants is unclear. All restaurants in our study shared certain characteristics that made them atypical: all of them voluntarily placed nutrition information on their menus, shared sales data with us, and allowed us to survey their customers. The managers and owners of these restaurants were particularly interested in serving healthful food. This sense of stewardship may have contributed to consumer responses to menu labeling. In addition, the results we observed in these midrange family restaurants may not generalize to other types of restaurants, such as fine-dining or fast-food establishments.

In a provocative review of the psychological literature on eating behavior, Cohen argued convincingly that eating is a behavior that is carried out with little regard to intention or self-regulation.[18] Deliberating over a menu, however, seems to be an occasion when cognition plays a role and thus when rational food decisions might be made. Menu descriptions alone, however, are inadequate for guiding nutrient-based food decisions. People are predictably biased in judging which foods are obesigenic.[19] In addition, there can be considerable variation among restaurants in the nutrient content of similar-sounding menu items. For instance, 4 of the 6 restaurants in our study served a Reuben sandwich. The nutrient values of these 4 Reuben sandwiches varied from 480 to 1730 calories, 19 to 83 grams fat, 1770 to 4990 milligrams sodium, and 39 to 182 grams carbohydrates, owing to differences in side dish, portion size, and ingredients. For these reasons, menu labeling would permit health-based food choices in restaurants, but its absence makes such choices virtually impossible. ■

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This article was accepted September 22, 2009.

Contributors

E. Pulos designed the study, analyzed the data, and led the writing of the article. K. Leng supervised data collection and contributed to interpretation of results and the writing of the article.

Acknowledgments

We are grateful to Kirsten Frandsen, Diane Evans, Eileen Finnigan, Acacia Larson, and John Britt for their support of this project, and to the many nursing students who helped collect the survey data. We are also indebted to the managers and owners of participating restaurants for their cooperation.

Human Participant Protection

No protocol was necessary because this study was determined to be exempt by the Washington State institutional review board.

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