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Restaurant Menu Labeling Policy: Review of Evidence and Controversies

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Abstract

In response to high rates of obesity in the USA, several American cities, counties, and states have passed laws requiring restaurant chains to post labels identifying the energy content of items on menus, and nationwide implementation of menu labeling is expected in late 2016. In this review, we identify and summarize the results of 16 studies that have assessed the impact of real-world numeric calorie posting. We also discuss several controversies surrounding the US Food and Drug Administration's implementation of federally mandated menu labeling. Overall, the evidence regarding menu labeling is mixed, showing that labels may reduce the energy content of food purchased in some contexts, but have little effect in other contexts. However, more data on a range of ong-term consumption habits and restaurant responses is needed to fully understand the impact menu labeling laws will have on the US population's diet.

Keywords

Menu labeling; Calorie labeling; Obesity prevention; Food policy

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Conflict of Interest Eric M. VanEpps, Christina A. Roberto, Sara Park, Christina D. Economos, and Sara N. Bleich declare that they have no conflict of interest.

Human and Animal Rights and Informed Consent This article does not contain any studies with human or animal subjects performed by any of the authors.

Introduction

Although there is growing consensus among public health researchers, practitioners, and organizations that addressing global obesity in a cost-effective way will require policy changes [1–4], relatively few obesity-related policy changes have been introduced in the USA in the last 10 years. One of the most significant pieces of new legislation related to poor diet and obesity was the requirement for chain restaurants or similar retail food establishments with 20 or more locations to post the energy content (in kilocalories (calories)) on their menus.¹ As part of the Patient and Protection Affordable Care Act, the “Nutrition Labeling of Standard Menu Items in Restaurants and Similar Retail Food Establishments” amends the Federal Food, Drug, and Cosmetic Act of 1938 [5]. National menu labeling is expected to be implemented in December 2016 [6•]. In addition to requiring calorie (energy content) labels, the menus must also include a statement that additional nutrition information (e.g., information about saturated fat, trans-unsaturated fatty acids, sodium, fiber, sugars) is available upon request as well as a statement about recommended daily caloric intake [6•]. Restaurants are not required to provide information for items that do not appear on the menu or that are not standard items, such as condiments, daily specials, seasonal items, or custom orders [6•]. Menu labeling requirements apply to restaurants and similar retail food service establishments such as cafeterias (but not schools), convenience stores, coffee shops, and grocery stores. Restaurants not covered by the law are able to register voluntarily with the FDA to be subjected to the labeling requirements. The law also requires vending machine operators who own or operate 20 or more vending machines to disclose energy content for items which do not otherwise feature clearly displayed nutrition facts or calorie labels at the point of purchase [7]. Currently, some restaurants such as McDonald's and Starbucks have already voluntarily posted energy content labels and several American cities, counties, and states such as New York City, King County, Washington, and California implemented their own local menu labeling laws prior to the federal regulation [8].

Although nutrition information, including energy content, has been mandated to appear on packaged foods in the US for almost 25 years with the passage of the Nutrition Labeling and Education Act (NLEA) in 1990 [9] (implementation began in 1993), foods served in restaurants were previously exempt. However, over time, the public has increasingly consumed a large amount of food prepared outside the home. Currently, almost half of all food dollars are spent on “away-from-home” foods [10]. This has raised concerns because away-from-home foods tend to have higher energy, total and saturated fat, and sodium content, and less fiber than foods prepared inside the home [11–13]. Additionally, away-from-home foods are often served in large portions [14, 15], which promote overconsumption [16, 17]. Furthermore, people [18], including trained nutritionists [19], have difficulty estimating the energy content in restaurant foods. These data suggest that consumers were not making fully informed decisions when eating out and would benefit from restaurant disclosures. Unlike some other food-related policies, such as taxing or

¹Because this paper reviews studies in which energy content was labeled using calories as the unit of measurement, we report reductions or increases in energy content using calories as the unit of measurement.

limiting the portion sizes of sugary drinks, menu labeling has substantial public support [20–22].

Given that menu labeling is one of the few policies that have been passed to help address obesity and poor diet, it has come under great scrutiny, with many wondering whether it “works.” Most agree that consumers have a right to know the content of their food, but the hope is that menu labeling will do more than just inform consumers. Ideally, it will *change* consumer and restaurant behavior. There are a number of likely ways in which menu labeling could have a positive impact on consumer food choices. First, it could motivate consumers to purchase and ultimately consume less energy. Second, it could educate people over time about the high energy content of restaurant foods and motivate them to eat at restaurants less often. Third, it could encourage consumers to dine exclusively or more frequently at restaurants with lower-energy options. Fourth, it could lead consumers to reduce energy intake at other meals before or after eating out. Fifth, it could motivate the restaurant industry to reformulate products so that they contain less energy.

It is also possible that restaurant menu labeling could have unintended consequences. The law could prompt restaurants to offer lower-energy items that are of worse nutritional quality overall than previously offered items. People who want to purchase the most energy for their dollar might use menu labels to help them make higher energy choices. In addition, people might have previously underestimated the energy they need per day and exposure to labels recommending a daily energy intake of 2000 calories might inadvertently promote over-consumption. Each of these possibilities needs to be evaluated to understand the full impact of menu labeling.

In this paper, we review the literature testing real-world restaurant menu labeling's effectiveness at reducing total energy purchased and consumed. This menu labeling takes the form of numeric calorie posting, identifying for each menu item the number of calories that item contains (e.g., Hamburger, 370 calories). Several reviews of menu labeling have been published in the last few years [23–29]. This paper differs from prior reviews by focusing only on real-world studies that have evaluated numeric calorie (energy) postings as required by US menu labeling laws. We also extend prior reviews by including papers published since May 2015, the date of the last published review [26]. In the second half of the paper, we discuss several of the major controversies the Food and Drug Administration (FDA) has grappled with regarding the implementation of menu labeling. Some of the hotly contested issues have dealt with the types of retail food service establishments required to comply and the presentation of energy content information for certain items. As we discuss in the controversies section of this paper, concerns about these issues have prompted some in congress to introduce the Common Sense Nutrition Disclosure Act (H.R. 2017) to limit the FDA's authority regarding the implementation of menu labeling [30]. Finally, we conclude the paper with a discussion of future directions for menu labeling research.

Methods

Search Strategy

We first searched PubMed through November 1, 2015, by entering the terms “menu labeling,” “calorie labeling,” and “point of purchase nutrition labeling” to identify peer-reviewed articles on restaurant menu labeling. We then employed a snowball search strategy by reviewing the references of each article identified in the PubMed search to find additional relevant papers. We only included studies that evaluated energy content labels in real-world restaurant settings. Studies of both adults and children were included. We included papers evaluating policies that also mandated restaurants to display information about additional nutrients such as sodium and fat. We identified 16 papers for inclusion.

Does Menu Labeling “Work”?

Of the 16 studies included in this review, 13 focused on adults’ purchases [31–43], while three focused on children’s or parents’ and children’s purchases [44–46]. Twelve [31–33, 37–41, 43–46] of the 16 real-world restaurant studies included comparison groups by either examining similar locations where menu labeling laws were not in effect or using a randomized-controlled design. The four studies [34–36, 42] without comparison groups examined changes in energy content of food purchased before labeling versus after labeling, but did not control for secular trends in food purchasing behavior. Overall, there was little evidence that energy content labels reduced energy content of food purchased at traditional fast-food restaurants like McDonald’s or Burger King for adults or children. However, the existing evidence suggests that menu labels may reduce energy content of food ordered at full-service restaurants and coffee stores. Results are summarized separately for adults and parents/children (Table 1).

Studies of Adults

Positive Effects of Menu Labeling—Three studies detected positive effects of menu labeling [31–33]. One study compared energy content of food purchased from two full-service chain restaurant locations displaying labels relative to five locations that did not [31]. Receipts and surveys were collected from 648 restaurant patrons after their evening meal and revealed that, on average, those eating at the labeled restaurants ordered 151 fewer calories ($p = .018$) after adjusting for age, gender, race/ethnicity, income, education, day of the week, frequency of dining out at full-service restaurant chains, and body size.

One of the most rigorously designed and well-powered studies examined over 100 million transactions over 14 months at Starbucks locations before and after menu labeling implementation in New York City compared to transactions at control sites in Boston and Philadelphia [32]. Menu labeling was associated with a significant 6 % decrease in energy content per transaction (food and drink combined). This decrease in overall energy content was driven largely by changes in food purchases (average food energy per transaction fell by 14 %). The policy did not negatively affect Starbucks revenue during this time; researchers estimated a 3 % increase in revenue among stores within 100 m of Dunkin’ Donuts, one of Starbucks’ main competitors. One interesting question these authors investigated was whether customers learn from exposure to energy content information. To answer this, they

examined transaction data from 884 card-holders who shopped at NYC stores after the implementation of menu labels, but who made at least 20 % of their transactions in nearby stores outside of the city that were unlabeled. Consistent with a learning account, the authors observed reductions in the energy content of transactions made at these unlabeled stores among customers who had previously been to a store with energy content postings.

Wisdom et al. conducted two studies of actual meal selections [33] using a randomized-controlled design in a semi-real world experiment. Across the two studies, 638 customers entering a fast-food sandwich restaurant at lunchtime were asked to complete a survey. They were told they would receive a free meal for completing the survey and ordering a meal from a menu. Participants were then provided with a coupon with their order to give to the restaurant and a gift card for participating. Participants were randomized to receive a menu with or without energy content labels that either did or did not also include a statement of recommended daily energy intake. Additionally, these menus were structured to either make convenient the selection of healthy sandwiches, unhealthy sandwiches, or a mix of healthy and unhealthy sandwiches. Data were collapsed across the two studies, which only differed in the strength of the convenience manipulation. Both energy content labels and daily energy recommendation statements on their own caused participants to order meals with significantly less energy; moreover, the combination of labels and a statement led consumers to order almost 100 fewer calories on average.

Mixed Effects of Menu Labeling—Three studies found mixed effects of menu labeling [34–36]. One study displayed energy content labels plus fat, sodium, and carbohydrate information for every food item on the menu except for beverages and daily specials at six full-service restaurants [34]. The authors examined nearly 16,000 entrée transactions during the period 30 days before and 30 days after labeling. Four of the six restaurants saw significant declines in the energy content of foods ordered; on average, across restaurants, there was a reduction of 15 entrée calories post-labeling, but the authors were unable to examine the energy content of food ordered in addition to the entrée.

A study of menu labeling in King County, Washington, analyzed receipts from 7325 customers at 50 locations (40 restaurants, 10 coffee shops) from 10 chain restaurants before labeling and 18 months after [35]. There was a non-significant ($p = .06$) decrease of 38 calories on average among all restaurant purchases and a significant decline in the energy content of meals ordered at taco restaurants (113 calorie reduction, $p < 0.001$) and coffee chains (22 calorie reduction, $p < 0.002$); purchases from burger and sandwich restaurants did not significantly change.

A study that gathered receipts and surveys from 7309 fast-food patrons in New York City before labeling and 8489 participants after labeling across 11 fast-food chains at 168 locations [36] did not detect a significant difference in average energy content of foods purchased. However, when individual restaurants were examined, they observed a significant decline at McDonald's (44 fewer calories on average), Au Bon Pain (80 fewer calories purchased), and KFC (59 fewer calories purchased), but not at other chains. The energy content of meals purchased at Subway significantly increased by an average of 133 calories after labeling. Although the authors suggest this increase in energy content was likely

attributable to Subway launching a promotion for “\$5 foot-long” sandwiches during that time period rather than labels driving up the energy content of meals purchased, the actual cause of this energy increase remains unknown. In general, the absence of control restaurants for the studies in this section makes their results difficult to interpret.

Null Effects of Menu Labeling—Seven studies found null effects for menu labeling [38–43]. One of the first and best-designed studies of menu labeling evaluated the impact of the New York City policy by collecting receipts and surveys from 1156 adult fast-food restaurant patrons eating in low-income neighborhoods in New York City versus Newark, New Jersey, before and after labeling was implemented [37]. No effect of labeling was detected, although it is possible that if the study was conducted in higher-income areas, effects would have been detected, as studies have linked use of energy content labels to higher-income levels [47]. Using a similar design, the study was repeated with McDonald's and Burger King locations in Philadelphia versus Baltimore ($n = 2083$) and again no effect was detected [38]. This study also extended previous work by conducting random-digit-dialed landline telephone surveys to determine whether people would report visiting large chain fast-food restaurants less in the presence of energy information. The results revealed no change in self-reported visits to fast-food restaurants. Recently, Cantor et al. published a 5-year follow-up of their original study in New York City and Newark. They examined receipts and surveys from 7699 customers at four fast-food chains and found no changes in energy content of meals purchased or frequency of visiting fast-food restaurants between the two cities [39]. Another study examined transaction data over 14 months from seven locations of a Mexican fast-food chain in King County which implemented menu labeling versus seven locations near King County without labels and found no change in energy content of purchased food [40].

Ellison et al. conducted a randomized-controlled experiment over 2 weeks in a full-service restaurant on a university campus [41]. One hundred thirty-eight customers were randomized to either a menu without energy content labels, one with numeric calorie labels or one with numeric calorie labels plus green, yellow, and red traffic lights denoting low, medium, and high energy options, respectively. No differences were detected, but the study was limited by a small sample size.

Finally, two studies that did not control for secular trends also found null effects of menu labeling. One study analyzed transaction data at a Chinese fast-food chain [42]. The study design involved two sets of data collection periods, each of which lasted 3 weeks. During each set, there was a baseline period, followed by an intervention asking customers to downsize their order and save \$0.25, followed by another baseline period. During the first data collection period, there were no energy content labels. During the second period, labels were introduced. There was a 2-week break between data collection periods with and without menu labeling. Data for 399 participants was analyzed, and no effect of labels was observed on the energy content of meals ordered.

Another study gathered pre- and post-labeling data 1 month before and 1 month after New York City's menu labeling implementation at two McDonald's locations (one in Brooklyn and one in Manhattan). Within that study, the authors also randomized 1094 adults entering

the restaurants to one of three groups: (1) handed a slip with recommended daily calories (2000 for women, 2400 for men), (2) handed a slip with recommended per meal calories (650 or 800), or (3) given no recommendation. Menu labeling was not associated with lower energy content of meals over time, and there was no impact of the additional recommended daily energy statements on the energy content of purchased food [43].

Studies of Children

We identified three real-world studies of parent or child purchases in response to menu labeling [44–46]. Elbel and colleagues conducted a secondary analysis of a small sample of children's and adolescents' (age 1–17) purchases ($N=349$) from their New York City data and found no effect of labeling [44]. Another study in King County sent gift cards to 75 parent-child pairs in King County (implemented labeling) and 58 in San Diego County (where labeling was not implemented) [45]. The gift cards were for restaurants that the parents typically dined at with their children. Parents were asked to order a typical meal and send back their receipt before and after labeling; questions about what was purchased were clarified with a follow-up phone survey. The authors did not observe any differences in energy content of meals purchased for children or parents. However, both of these studies are limited by a small sample size. Another study used sales data to track purchases from a children's menu at a full-service restaurant operated in a private club [46]. They presented one of four menus for 2 months each, including a control menu without energy content labels, a menu with numeric calorie and fat information, a menu with an apple symbol next to three healthier meal combos, and a menu highlighting nutrition bargain pricing to help patrons select best nutritional value for their dollar. During the study period, 1257 children's meals were ordered, and none of the labels were associated with significantly lower total energy purchased.

Menu Labeling Regulation Controversies

Several controversial issues emerged while the FDA worked to finalize the menu labeling regulations. These included debates about whether supermarkets, convenience stores, and pizza chains should be included, as well as how best to present certain information on the menu boards.

Should Supermarkets, Convenience Stores, and Pizza Chains be Included?—

One major controversy is whether supermarkets and convenience stores should be included in the regulation. The regulations, which are significantly broader than the proposed rule, currently specify that the following retail food establishments are included:

Bakeries, cafeterias, coffee shops, convenience stores, delicatessens, food service facilities located within entertainment venues (such as amusement parks, bowling alleys, and movie theatres), food service vendors (e.g., ice cream shops and mall cookie counters), food take-out and/or delivery establishments (such as pizza take-out and delivery establishments), grocery stores, retail confectionary stores, superstores, quick service restaurants, and table service restaurants [6•].

A primary goal of the Common Sense Nutrition Disclosure Act is to exempt supermarkets from the regulation. Industry groups advocating for supermarkets and convenience stores to

be excluded have argued that menu labeling regulations place a disproportionate burden on such retailers relative to restaurants. In contrast, the National Restaurant Association supports the inclusion of grocery and convenience stores, arguing that they should be subjected to the same menu labeling regulations given that restaurants directly compete with supermarkets serving prepared foods [48]. The state and local menu labeling regulations that have been enacted in the USA generally do not apply to grocery stores and thus there are no data on how energy content labeling of prepared items in supermarkets influences real-world purchasing decisions. Given that consumers are increasingly purchasing prepared foods at supermarkets [49], it makes sense from a public health perspective to subject them to the same regulations as restaurants serving similar foods. The influence of energy content labels in supermarket settings is an important area for future research.

Pizza chains have also expressed concern over the existing menu labeling regulations. A coalition of pizza chains, called the American Pizza Community, which includes Domino's, Papa John's, Little Caesars, Godfather's Pizza, and Pizza Hut, argues that they should not have to pay for displaying menu boards in their stores when most people will not see the information before ordering [50]. In one news interview, an industry spokesperson argued that "90 percent of their orders are placed online and over the phone" [51]. In response to these concerns, the Common Sense Nutrition Disclosure Act would allow restaurants where the majority of orders are placed online or by phone to only provide nutrition information on remote-access menus (e.g., delivery or Internet menus).

Presentation of Energy Content Information—The pizza coalition has also raised concern about the presentation of energy content information. First, they are worried that it would be too difficult to put information for all the potential offerings on one menu board. Second, the FDA requires that when a dish is customizable, a plausible range of calories must be displayed, but such ranges can vary widely for pizza, diminishing the usefulness of energy information and potentially overstating energy content for more typical selections. Instead, the coalition argues that consumers should be able to use online tools to obtain nutrition information [50].

The pizza coalition is also concerned about current requirements that require them to display energy content information for an entire pizza, arguing that consumers on average eat 2.1 slices. Right now, the regulation states that energy content should be displayed for a standard menu item as it is usually prepared and offered for sale, but the Common Sense Nutrition Disclosure Act proposes an amendment so that energy content could be displayed in one of three ways: calories for a whole item, as calories per serving and number of servings, or number of calories per the common unit division of the standard menu item (i.e., calories per pizza slice).

Another issue regarding the presentation of information relates to the inclusion of a succinct daily recommended calorie statement. The final menu labeling regulations indicate that energy content information must be provided adjacent to the name of the menu item so that it is clearly associated with that item. The menus and menu boards must also display a statement that reads: "2,000 calories a day is used for general nutrition advice, but calorie needs vary." [6•] The statement is meant to help consumers place the energy content

information in the context of an overall diet. Restaurants can also use one of the following statements for children's menus: "1,200 to 1,400 calories a day is used for general nutrition advice for children ages 4 to 8 years, but calorie needs vary," or "1,200 to 1,400 calories a day is used for general nutrition advice for children ages 4 to 8 years and 1,400 to 2,000 calories a day for children 9 to 13 years, but calorie needs vary" [6•].

In our review of real-world studies, two examined the inclusion of a daily energy intake statement [33, 43]. One found positive effects for such a statement, and one found null effects. Other lab-based research has found that a daily energy statement prevented compensatory overeating after a dinner meal where adults were exposed to energy content labels that reduced their energy intake at dinner [52]. These data suggest some benefit of placing energy information in context. Although there is not yet strong evidence of such information having unintended consequences, some have expressed concern that many consumers are not aware of daily energy requirements and mistakenly think the recommended amount is much less than 2000 calories [53]. In Elbel and colleagues' survey of NYC and Newark fast-food patrons, approximately one third believed that adults should eat fewer than 1500 calories daily [53]. This raises a concern that providing contextual information might correct a mistaken belief that was previously biased in such a way that it actually *promoted* health. Correcting this biased belief might in turn encourage people to eat more than they previously would have. Future research should further investigate potential unintended consequences of such a statement or whether other types of messaging, such as traffic light labels or accompanying public service campaigns, might increase consumer use of menu labels.

Conclusion

At the beginning of the paper, we outlined several outcomes that would suggest menu labeling is likely to be successful in improving people's diets. The existing research begins to answer some of these questions, but not all. The first indicator of success would be evidence that consumers are purchasing foods that contain less energy or consuming less food overall. The evidence to date on the effects of menu labeling on consumer food choices is mixed. The strongest data evaluating purchases at typical fast-food restaurants like McDonald's and Burger King suggests labels do not alter consumer purchases. However, there is evidence that labels do encourage lower energy purchases in other settings such as coffee chains, full-service restaurants, or certain fast-food restaurants (e.g., sandwich shops), though more data from these different contexts are needed. In addition, no real-world studies measured actual consumption. One randomized-controlled lab study had participants order dinner from Subway and found no effect of menu labeling on the energy content of meals ordered, but did find that labels reduced actual consumption, although this may have been observed because the food was provided at no cost [54]. Without measuring actual consumption, we cannot know if labels are influencing consumers to consume less energy after making purchases. It is possible that menu labeling exerts heterogeneous effects in different restaurant settings because these different restaurant categories differ in the types of patrons they attract. For example, high-income people are more likely to notice and use menu labeling [47•], and full-service chains or stores like Starbucks might attract higher-income patrons on average. This possibility is supported by the Starbucks study, which

found that energy content declines were greater among Starbucks stores located in zip codes with higher income and education levels [32].

A second indicator of success for menu labeling policies would be the emergence of evidence that people are becoming more educated about energy content of food-away-from-home over time and are choosing to eat out less often. The Starbucks study did find evidence that those consumers exposed to labels in NYC bought lower energy items in non-labeled restaurants outside of NYC [32], but no other studies have investigated learning effects. Elbel and colleagues [38] have examined whether self-reported frequency of fast-food visits has declined in NYC and Philadelphia after labeling and found no evidence that patronage of fast-food restaurants has changed, but it would be valuable to gather these data for other restaurants, especially full-service restaurant chains. A third indicator of success would be if consumers chose to dine exclusively or more frequently at restaurants with lower energy options, shifting their restaurant expenditures toward these healthier restaurants. Thus far, no studies have examined such shifts in customer patterns.

A fourth indicator of success would be evidence that menu labels have an impact on consumer behavior at other meals. This compensatory eating could be either negative or positive. No real-world studies have examined this question. One lab study did not detect any compensatory eating after having a lunch meal that was ordered from a menu with numeric calorie labels and a statement about recommended daily energy in-take [55]. Another found that when consumers were exposed to energy content labels alone, they ate meals with lower energy content at dinner relative to a no label control group, but compensated for the reduction in dinner energy intake by eating more after dinner [52]. However, when a statement about daily energy intake was on the menu, participants ate less at dinner, but did not consume more energy after, suggesting the presence of the daily energy statement-prevented compensatory consumption later.

A fifth indicator of success is evidence that the restaurant industry is offering less energy-dense foods without diminishing the overall nutritional quality of items offered. One study examined changes in mean energy content of items at 37 chain restaurants before and 18 months after King County implemented menu labeling. The authors observed that after labeling, restaurant entrée items contained, on average, 41 calories fewer than the entrée items from before labeling [56]. It will be important to examine trends in the energy content of available restaurant items after menu labeling is implemented nationally.

There are still many questions left unanswered with respect to the long-term effects of restaurant menu labeling. Studies are still needed to evaluate menu labeling in different contexts, to understand how it influences other compensatory eating and restaurant-related behaviors, and how national labeling will impact restaurant industry offerings with respect to energy content and overall nutritional quality. There is also a need for research on the presentation of energy content information and accompanying nutrition information on menus. Finally, research is needed on potential communication campaigns to raise consumer awareness of numeric calorie labels and encourage their consideration when eating at restaurants.

Restaurant menu labeling should not be expected to reduce energy consumption by enough to address obesity on its own, but it should be viewed as a reasonable place to start. With a problem as complicated as obesity, no one policy will be enough. Instead, addressing obesity in a cost-effective manner will require a collection of policies to encourage healthier food choices. The evidence-to-date suggests little effect of menu labeling on traditional fast-food purchases, but it may be encouraging lower calorie purchases for some people in some contexts.

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Table 1

Summary of articles included in review

Authors	Participant type	Comparison for energy content label posting?	Type of restaurant	Effect of labeling
Auchincloss et al. 2013 [31]	Adults	Yes; cross-sectional analysis of unlabeled locations of same restaurant chain	Full-service restaurant chain	Reduced energy content of purchases
Bollinger et al. 2011 [32]	Adults	Yes; unlabeled locations of same restaurant chain before and after labeling	Starbucks coffee chain	Reduced energy content of overall purchases (specifically food purchases)
Wisdom et al. 2010 [33] ^a	Adults	Yes; control group in experiment	Fast-food sandwich restaurant	Reduced energy content of meals selected
Pulos & Leng 2010 [34]	Adults	No; before-and-after design	Full-service restaurants	Reduced energy content of entrees at 4 of 6 restaurants
Krieger et al. 2013 [35]	Adults (16 years and older)	No; before-and-after design	Variety of restaurant chains	Non-significant overall effect; reduced energy content of orders from taco restaurants and coffee stores
Dumanovsky et al. 2011 [36]	Adults	No; before-and-after design	Fast-food chains	Non-significant overall effect; reduced energy content at McDonald's, Au Bon Pain, and KFC; increased energy content at Subway
Elbel et al. 2009 [37]	Adults	Yes; unlabeled locations of same restaurant chain	Fast-food chains	No effect of labeling
Elbel et al. 2013 [38]	Adults	Yes; unlabeled locations of same restaurant chain before and after labeling	Fast-food chains	No effect of labeling
Cantor et al. 2015 [39]	Adults	Yes; unlabeled locations of same restaurant chain before and after labeling	Fast-food chains	No effect of labeling
Finkelstein et al. 2011 [40]	Adults	Yes; unlabeled locations of same restaurant chain before and after labeling	Mexican fast-food chain	No effect of labeling
Ellison et al. 2013 [41]	Adults	Yes; control group in experiment	Full-service restaurant	No effect of labeling (small sample size)
Schwartz et al. 2012 [42]	Adults	No; before-and-after design	Chinese fast-food restaurant	No effect of labeling
Downs et al. 2013 [43]	Adults	No; before-and-after design	McDonald's (fast-food restaurant)	No effect of labeling
Elbel et al. 2011 [44]	Children/Adolescents	Yes; unlabeled locations of same restaurant chain before and after labeling	Fast-food chains	No effect of labeling (small sample size)
Tandon et al. 2011 [45]	Parent-Child Pairs	Yes; unlabeled locations of same restaurant chain before and after labeling; same participants at both time points	Variety of restaurants	No effect of labeling
Holmes et al. 2013 [46]	Children	No; before-and-after design	Full-service restaurant	No effect of labeling on children's entrees purchased

^a Although this study was conducted in a real-world setting, participants placed orders outside the restaurant and did not have to pay for their meals.