HHS Public Access
Author manuscript
Obesity (Silver Spring). Author manuscript; available in PMC 2014 May 01.

Published in final edited form as:
Obesity (Silver Spring). 2013 November ; 21(11): 2172–2179. doi:10.1002/oby.20550.

Calorie Labeling, Fast Food Purchasing and Restaurant Visits

Brian Elbel, PhD, MPH[1,2,*], **Tod Mijanovich, PhD**[3], **Beth Dixon, PhD**[3], **Courtney Abrams, MA**[1], **Beth Weitzman, PhD**[3], **Rogan Kersh, PhD**[4], **Amy H. Auchincloss, PhD**[5], and **Gbenga Ogedegbe, MD.**[1]

[1]Department of Population Health, New York University School of Medicine, New York, NY

[2]Wagner School of Public Service, New York University, New York, NY

[3]Steinhardt School, New York University, New York, NY

[4]Wake Forest University, Winston-Salem, NC

[5]Drexel University School of Public Health, Philadelphia, PA

Abstract

Objective—Obesity is a pressing public health problem without proven population-wide solutions. Researchers sought to determine whether a city-mandated policy requiring calorie labeling at fast food restaurants was associated with consumer awareness of labels, calories purchased and fast food restaurant visits.

Design and Methods—Difference-in-differences design, with data collected from consumers outside fast food restaurants and via a random digit dial telephone survey, before (December 2009) and after (June 2010) labeling in Philadelphia (which implemented mandatory labeling) and Baltimore (matched comparison city). Measures included: self-reported use of calorie information, calories purchased determined via fast food receipts, and self-reported weekly fast-food visits.

Results—The consumer sample was predominantly Black (71%), and high school educated (62%). Post-labeling, 38% of Philadelphia consumers noticed the calorie labels for a 33

*CORRESPONDING AUTHOR: Brian Elbel, 550 First Avenue, VZ30, Office 626, New York, NY 10016, Telephone: (212) 263-4283, Fax: (646) 501-2706, brian.elbel@nyumc.org.
Brian Elbel, PhD, MPH: Department of Population Health, New York University School of Medicine, New York, NY; Wagner School of Public Service, New York University, New York, NY; brian.elbel@nyumc.org
Tod Mijanovich, PhD: Steinhardt School, New York University, New York, NY; tm11@nyu.edu
Beth Dixon, PhD: Steinhardt School, New York University, New York, NY; beth.dixon@nyu.edu
Courtney Abrams, MA: Department of Population Health, New York University School of Medicine, New York, NY; courtney.abrams@nyumc.org
Beth Weitzman, PhD: Steinhardt School, New York University, New York, NY; beth.weitzman@nyu.edu
Rogan Kersh, PhD: Wake Forest University, Winston-Salem, NC; kersh@wfu.edu
Amy H. Auchincloss, PhD: Drexel University School of Public Health, Philadelphia, PA; aha27@drexel.edu
Gbenga Ogedegbe, MD: Department of Population Health, New York University School of Medicine, New York, NY; Olugbenga.Ogedegbe@nyumc.org

Competing interests: the authors have no competing interests. BE was involved in conceptualizing the study, design, analysis plan, interpretation of results, and writing. TM was involved in design, analysis, interpretation of results and writing, BD was involved with design, interpretation and writing; CA was involved in design and writing; RK was involved in design, interpretation and writing. AA was involved in design, interpretation and writing; GO was involved with interpretation and writing. All authors were involved in writing the paper and had final approval of the submitted version.

percentage point ($p<.001$) increase relative to Baltimore. Calories purchased and number of fast food visits did not change in either city over time.

Conclusions—While some consumer reports noticing and using calorie information, no population level changes were noted in calories purchased or fast food visits. Other controlled studies are needed to examine the longer term impact of labeling as it becomes national law.

Keywords

Calorie labeling; obesity; public policy; public health

INTRODUCTION

Obesity is a significant contributor to poor health. Multiple public health strategies have been proposed to address this problem, including the recent focus on altering the "food environment," specifically those locations where food and drink are purchased and consumed. A significant policy effort in this regard is calorie labeling of menus at fast food and other restaurants, which attempts to change the food environment by providing prominent information on the caloric content of menu items at the point of purchase.

Labeling legislation has been mandated in several cities and states, and the Food and Drug Administration has been tasked to set up a system nationally as part of the Patient Protection and Affordable Care Act (PPACA). Section 4205 of PPACA dictates that restaurant chains with 20 or more locations nationally must post the calorie content of all regular food and drink items on their menu board or printed menu[1] and other nutritional information must be disclosed, in writing, upon request. Policymakers' expected this large-scale change in the food environment would induce consumers to make healthier food choices, among other potential benefits.

Despite the potential importance of this policy, there is limited empirical evidence from controlled, real world studies of calorie labeling. Those that do exist have found a small to nonexistent impact on calories purchased, though the results have been somewhat mixed.[2,3] However, prior studies of calorie labeling suffer significant methodological limitations or other shortcomings, including a small sample size, examining food choice in a laboratory rather than real-world setting, examining only a single chain, and/or lacking a comparison group.[2–10] Additionally, the outcomes examined have been very limited. No study has observed whether consumers were avoiding fast food altogether as a result of labeling, since all prior studies limited their data collection to customers eating at fast food restaurants. These studies have also generally not examined whether labeling is more or less effective for particular subgroups. Such data are critical to understanding the overall public health impact and effectively refine the policy and/or buttress it with additional efforts. Related, while research indicates that the proportion of meals purchased away from home has dramatically increased in recent years, there is little recent information on the prevalence of eating out at fast food chain restaurants, per se.[11,12] This information is needed in order to assess the potential impact of this menu labeling policy on overall nutrition and obesity.

This paper reports on an evaluation of calorie labeling that improves upon limitations of prior research by using both consumer and telephone-based samples to examine consumer responses to calorie labeling as it was implemented in Philadelphia, PA. In a controlled study, researchers provide data on an important public policy for the overall population and subgroups. Specifically, researchers evaluated whether calorie labeling was associated with 1) consumer awareness and reported use of calorie labeling; 2) number of visits made by consumers to fast food restaurants; and 3) amount of calories purchased.

METHODS AND PROCEDURES

Researchers utilized a difference-in-differences study design as the analytic framework. Two sets of data collection were conducted: a) a point-of-purchase receipt collection and brief interview at fast food restaurants and b) a telephone survey via random-digit dialing. Consumers' changes in fast-food purchasing behaviors were examined in Philadelphia before and after calorie labeling was implemented, and these outcomes were simultaneously compared to consumer purchases in a comparison city that did not implement labeling. Baltimore was selected as the city most comparable to Philadelphia by calculating Euclidean distances between Philadelphia and each of the largest 100 U.S. cities using standardized city-level measures derived from Census 2000 data, including population size, poverty, unemployment, education, race/ethnicity, and income measures. Data were collected in both cities simultaneously. Baseline data collection occurred in December 2009, two months before calorie labeling took effect in Philadelphia in February 2010. Follow-up data collection began four months later, in June 2010. This study was approved by the Institutional Review Boards of New York University School of Medicine.

For the consumer survey fast food restaurants in Philadelphia and Baltimore were matched based on the comparability of ZIP code-level demographics. Based on the top matches two of the largest fast food chains in the U.S. were selected:[13] McDonald's and Burger King. Initially 28 restaurants were selected; as some managers asked not to survey their customers, the final sample was from 23 of them.

Research staff stood outside the busiest doorway of each fast food restaurant during lunch (approximately 11:30am–2:30pm) or dinner (approximately 5:00pm–8:00pm) hours, and approached every customer appearing 18 years and older by asking them to bring their itemized receipt back to us in exchange for $2. Any customer aged 18 – 64 with any food or beverage purchased was eligible; older consumers were excluded as they are most likely to be on a special diet. For customers who returned with their receipt, research staff asked a short series of questions confirming: what food was ordered for the consumer in question (other food on the receipt was not considered); the exact nature of all food items (i.e., any customizations added to the order, cheese, mayonnaise, diet or regular drink, etc.); how frequently they visited "big chain" fast food restaurants in the last week (at breakfast, lunch, dinner and snack); whether they noticed calorie information in the restaurant; and if so, whether they used the information to purchase more or fewer calories than they otherwise would have at the restaurant. The receipt was used to assign calories to all items purchased based on the nutrition information provided on each restaurant's website (as of May 2010).

During the same time period as receipt collection, a professional survey firm conducted a random-digit-dialed landline telephone survey of residents within the city limits of Philadelphia and Baltimore. Any adult aged 18–64 who answered the phone was eligible. Residents of ZIP codes in the lower one-third of the income distribution were oversampled (to represent half the sample) in order to more precisely estimate effects on this high-risk group. The primary outcome variable collected in the telephone survey was the usual weekly frequency of visits to “big chain” fast food restaurants. Respondents were first asked whether they had consumed any “big chain” fast food within the last three months. If they had, they were asked a series of additional questions about their frequency of fast food consumption and demographic details, including their height and weight (from which body mass index (BMI) was calculated).

Data Analysis

Due to imperfect covariate balance by case status and time period (Supplement Table 1), the sample was weighted via inverse probability of treatment weights (IPTW). IPTW is a propensity scoring method, described elsewhere,[14] that is well-accepted for achieving an unbiased estimate of the average treatment effect. Treatment probabilities were estimated by multinomial logit with predictors: age, gender, race, education, homeownership (phone survey), and BMI (telephone survey) and BMI profile (point of purchase survey; Stunkard figure rating scale[15]) and then the weights were used in all subsequent analyses. For the phone survey, additional sampling weights were added to the IPTW to reflect the oversampling of residents in poorer ZIP codes and number of landlines. However, the results of unweighted models did not change the statistical inferences regarding program effects.

Categorical variables are presented descriptively as frequency cross-tabulations with city and time period, along with chi-square tests of statistical independence. To test seeing and using calorie labels logistic regression was used; for number of times eating at fast food restaurants negative binomial was used; and for number of calories purchased ordinary least squares was used. The key test in these regression models of the effectiveness of calorie labeling policies is the coefficient on the interaction term between city (Philadelphia versus Baltimore) and the time period (post-versus pre-labeling) while also including these two main effect variables. All regression models included the demographic variables listed above as covariates, and restaurant chain (in the point–of-purchase survey).

Standard errors were adjusted for clustering of observations at the restaurant or zip code level. Marginal effects derived from these models are presented for each city and time period, along with within-city differences between time periods, and the net impact of labeling (e.g., the difference between the cities’ calorie-consumption changes over time). This study was approved by the Institutional Review Boards of New York University School of Medicine.

RESULTS

Table 1 presents propensity score weighted characteristics of consumer survey sample (in Table S1 we present the unweighted results). The total usable sample size was 2,083 observations across both cities and data collection periods, or an average of 91 per restaurant. Sample members were roughly evenly distributed by age, with slightly more males (51% – 56%, depending on city and time period) than females. The sample was predominantly Black (70%), and the majority of sample members had a high school education or lower. The telephone survey only reports results for those who had been to a fast food restaurant in the past 3 months (59% of those screened), had a response cooperation rate of 11%, a contact rate of 35%[16] and a sample size of 2,815. This sample was slightly older than the customer survey and more likely to be female and white.

Consumer Survey: Influence of Labeling on Awareness and Reported Use

No restaurants in the study presented calories on their menu board before the labeling regulation officially began (though calories may have been on food wrappers, tray liners or other less prominent places), and all restaurants in Philadelphia adopted this policy afterwards. Philadelphia residents interviewed after calorie labeling took effect were significantly more likely to report seeing calorie information than those interviewed before enactment of the policy (Table 2), with 38% reporting that they had seen calorie information in the restaurant versus 9% – 14% who said they had seen calorie information in Philadelphia before, or in Baltimore either before or after, calorie labeling began in Philadelphia. The overall difference-in-differences impact in this measure was 33 percentage points (pp) (p<.001). The change in consumers' reported awareness of calorie information is substantial for every subgroup analyzed, though with notable variation. Calorie labels were less visible to those who had high school or lower education (28 pp impact; p<.001), as opposed to those with at least some college education (42 pp impact; p<.001). White respondents reported an increase in noticing labeling information at a higher rate than did Black respondents (43 pp vs. 31 pp increase, respectively; p<.001 for both values).

Calorie labeling appears to be associated with the frequency with which participants reported using the information to purchase fewer calories, with 10% overall indicating this to be true in Philadelphia after labeling began (or 26% of those who saw the labels), for an 8 pp total increase (p<.001). This effect was fairly consistent across subgroups, with the notable exception being among whites (15 pp increase, p=.006) vs. blacks (5 pp increase, p=.003). In addition to this effect, calorie labeling was associated with a 4 pp increase (p<.001) in self-reported use of the information to purchase more calories.

Consumer Survey: Influence of Labeling on Visiting Fast Food Restaurants

The mean number of times consumers reported eating fast food per week was between 5.58 and 7.38 (Table 3). No difference-in-difference impact was noted for a change in fast food visits at the 95% level, but a .91 time per week visit increase in Philadelphia was noted at p=.070. The subgroups that reported similar trends include males (1.14 increase per week, p=.073), adults aged 25–39 years (1.93, p=.019), Black respondents (1.47, p=.013) and adults with less than a high school degree (1.56, p=.020).

Consumer Survey: Influence of Labeling on Calories Purchased

Mean calories purchased in Philadelphia after labeling were 904, and the number of calories purchased did not change over time in either city (Table 4). Both overall and for all subgroups, there was no net impact of the policy on total calories purchased. The policy also had no net impact on the purchase of just food or just beverage calories considered separately (results not shown).

Telephone Survey: Influence of Labeling on Visits to Fast Food Restaurants

When focused at the population level with data from the telephone survey, consumers in Philadelphia averaged 1.4 visits per week after enactment of the calorie labeling policy (Table 5). No statistically significant change in number of fast food visits per week were recorded at the 95% level, and the only subgroup effects that were significant in the difference-in-difference results were those for Blacks (an increase of .74 of a visit per week, p=.023), and for 50–64 year olds (.65, p=.007).

DISCUSSION

This examination of responses to calorie labeling in fast food restaurants includes objective receipt data from a diverse sample of individuals. Included are a comparison group, and a reasonable time period after the policy's introduction to allow for behavior change. Additionally, not just actual purchases were examined, but also changes in the reported utilization of fast food restaurants from a separate telephone survey, conducted simultaneously in the both cities. Researchers also examined for a differential impact on a number of important subgroups. The estimates produced from this study substantially improve on past work evaluating the public health influence of calorie labeling.[3]

After the policy was introduced an increase was found in consumers reporting seeing labels (net 33 pp) and a small increase in both self-reported use of labels to purchase fewer calories (net 8pp) and use of labels to purchase more calories (net 4 pp). However, researchers found no difference in calories purchased after labeling was introduced and no evidence of a decrease in fast food visits after the introduction of the policy.

This study affirms much recent research[3] in finding no change in calories purchased, either for the sample as a whole or for various subgroups. One notable distinction as compared to past work: only 38% of consumers in Philadelphia reported noticing the calorie labels after they were posted, smaller than past results of 57% to 64% in NYC over a generally similar time period.[4,17] This relatively low percentage may contribute to limiting the effectiveness of labeling. The exact reasons for these differences are not clear, given that labeling regulations are similar and anecdotally appear to have been implemented similarly. However, the researchers note differences between consumers who reported seeing calorie information at McDonald's (34%) and Burger King (49%), which could explain some difference in local implementation or in customers. In NYC, mandatory labeling was implemented in 2008 after 1.5 years of legal challenges[18] which garnered much media attention. In contrast, Philadelphia's implementation went largely unchallenged and had less media coverage which perhaps contributed to the lower proportion of consumers who reported noticing the information. Also important is that most of the consumer sample had only a high-school education and consumers with low educational attainment are least likely to report seeing or using nutrition information, though education is controlled for in the analysis.[19] Those in the consumer sample were, however, getting a rather large "dose" of exposure to labels in Philadelphia, given that they averaged dining at fast food chains approximately 6 times per week.

A trend was noted among some groups in Philadelphia to increase their fast food visits relative to the comparison group, a finding that requires further examination. There may be heretofore unanticipated mechanisms by which calorie labeling could have a deleterious impact – not by changing calories purchased per visit, but by changing visit frequency. This could occur for a for a number of reasons, including that consumers regard more calories as better “value” for their dollar or the presence of labels legitimates the healthfulness of the food, even if much of the food purchased is not healthier. A related experimental study found that the mere introduction of healthier foods into the choice set increased the purchasing of unhealthy food items.[20] However, less than 40% saw the labels and even fewer indicated they were influenced by them, thus increases in visits could be due to increased marketing by Philadelphia area fast food locations in response to labeling, or other trends that did not result from consumers’ response to labeling.

An important limitation of this study is the possibility of selection bias, in terms of restaurants chosen or consumers who choose to take part in the survey. While data were not collected on consumer survey response rates, other studies have reported 60% participation.[9] Any bias should be addressed by using the same data collection procedures before and after labeling, and in both cities. The same is true for the telephone survey; while the response rate is low, the goal of the survey is not to produce a population level estimate, but to examine for a difference over time and across cities. In terms of generalizability, the problem should be no less acute, and by some measure much less so, than the similar issues contended with based on who opts into or is even offered a randomized controlled trial.[21]

Consumers could have purchased differently as a result of the survey or incentive ($2), but given that the data collection procedures were consistent across all periods and locations this should not influence the impact estimates. Researchers also looked at a limited set of consumer outcomes—purchasing practices, along with number of times these restaurants were visited. They did not examine any potential supply-level changes, including whether restaurants might have changed their menus to include healthier products or a reformulation of products as a result of labeling.[22,23] Changes in the positive direction could increase the overall impact of these policies. Additionally, only two fast food restaurant chains were included, and consumers at other restaurants could respond differently. Researchers were not able to observe whether consumers only consumed part of their meals in the presence of calorie labeling, though another study has found this not to be the case after the introduction of labeling,[24] and consumers generally eat all the food placed in front of them.[25] Finally, researchers conducted a relatively large set of sub-group comparisons and interpreted the p-values cautiously.

Despite these limitations, the data provide a robust examination of menu labeling. The findings indicate that many consumers, particularly vulnerable groups, do not report seeing calorie labeling information and very few report using labeling to purchase fewer calories. No large scale population levels changes in fast food visits are noted. In terms of policy enhancements to increase the impact, the researchers offer two related possibilities. The context and significance of calorie information could be better conveyed to consumers, enabling labeling to resonate more powerfully. Simultaneously, labels themselves could be made easier to interpret.[26] An Institute of Medicine panel that examined front-of-package food labeling recommended moving away from a numeric labeling system to one featuring simple, heuristic-based symbolic systems[27,28] while other work suggests utilizing "negative" labels highlighting "unhealthy" food;[29] both have been successful in experimental settings and such systems could be useful to consider as a supplement or alternative to calorie labeling. At the same time, given the limits of labeling reported here and in other studies, other policy responses to obesity must be sought out that rely less on consumers responding to the presentation of numerical information. More substantial changes to the food environment could have a larger impact.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

This study was funded by National Institutes of Health (R01HL095935). The study sponsor had no role in study design.

References

1. 111th Congress. Patient Protection and Affordable Care Act. 2010. H.R. 3590, PL 111–148, sec. 4205(b)(i)–(iii).
2. Harnack LJ, French SA, Oakes JM, Story MT, Jeffery RW, Rydell SA. Effect of point-of-purchase calorie labeling on restaurant and cafeteria food choices: a review of the literature. Int J Behav Nutr Phys Act. 2008; 5:63. [PubMed: 19061510]
3. Swartz JJ, Braxton D, Viera AJ. Calorie menu labeling on quick-service restaurant menus: an updated systematic review of the literature. Int J Beh Nutr Phys Act. 2011; 8(1):135.
4. Chu YH, Frongillo CA, Jones SJ, Kaye GL. Improving patrons' meal selections through the use of point-of-selection nutrition labels. Am J Public Health. 2009; 99:2001–5. [PubMed: 19762664]
5. Elbel B, Kersh R, Brescoll BL, Dixon LB. Calorie labeling and food choices: a first look at the effects on low-income people in New York City. Health Aff. 2009; 28:w1110–w1121.
6. Pulos E, Leng K. Evaluation of a voluntary menu-labeling program in full-service restaurants. Am J Public Health. 2010; 100(6):1035–9. [PubMed: 20395577]
7. Roberto C, Larsen P, Agnew H, Baik J, Brownell K. Evaluating the impact of menu labeling on food choices and intake. Am J Public Health. 2010; 100:312–318. [PubMed: 20019307]
8. Bollinger B, Leslie P, Sorensen A. Calorie Posting in Chain Restaurants. Am Econ J Econ Policy. 2011; 3(1):91–128.
9. Dumanovsky T, Huang CY, Nonas CA, Matte TD, Bassett MT, Silver LD. Changes in energy content of lunchtime purchases from fast food restaurants after introduction of calorie labelling: cross sectional customer surveys. BMJ. 2011; 343:d4464. [PubMed: 21791497]
10. Finkelstein EA, Strombotne KL, Chan NL, Krieger J. Mandatory menu labeling in one fast-food chain in King County, Washington. Am J Prev Med. 2011; 40(2):122–7. [PubMed: 21238859]
11. Larson N, Neumark-Sztainer D, Laska MN, Story M. Young adults and eating away from home: associations with dietary intake patterns and weight status differ by choice of restaurant. JADA. 2011; 111(11):1696–703.
12. Powell LM, Nguyen BT. Fast-Food and Full-Service Restaurant Consumption Among Children and Adolescents: Effect on Energy, Beverage, and Nutrient Intake. Arch Pediatr Adolesc. 2013; 167(1):14–20.

13. Technomic, Inc. [Accessed November 16, 2012] Technomic Top 500 Annual Report Details Signs of Improvement in Chain Restaurant Growth. Available at: http://www.technomic.com/Pressroom/Releases/dynRelease_Detail.php?rUID=156
14. Austin PC. An introduction to propensity score methods for reducing the effects of confounding in observational studies. Multivariate Behav Res. 2011; 46(3):399–424. [PubMed: 21818162]
15. Stunkard AJ, Sorensen T, Schulsinger F. Use of the Danish Adoption Register for the study of obesity and thinness. Res Publ Assoc Res Nerv Ment Dis. 1983; 60:115–120. [PubMed: 6823524]
16. American Association for Public Opinion Research. [Accessed January 9, 2013] Standard definitions: final dispositions of case codes and outcome rates for surveys. 72011. Available at: http://www.aapor.org/ethics/stddef.html
17. Dumanovsky T, Huang CY, Bassett MT, Silver LD. Consumer awareness of fast-food calorie information in New York City after implementation of a menu labeling regulation. Am J Public Health. 2010; 12:2520–5. [PubMed: 20966367]
18. Center for Science in the Public Interest. [Accessed January 9, 2013] Nutrition labeling in chain restaurants: state and local bills/regulations—2007–2008. Available at: http://www.cspinet.org/nutritionpolicy/MenuLabelingBills2007-2008.pdf
19. Campos S, Doxey J, Hammond D. Nutrition labels on pre-packaged foods: a systematic review. Public Health Nutr. 2011; 14(8):1496–506. [PubMed: 21241532]
20. Wilcox K, Vallen B, Block L, Fitzsimmons GJ. Vicarious goal fulfillment: When the mere presence of a healthy option leads to an ironically indulgent decision. J Cons Res. 2009; 36(3):380–393.
21. Berger, V. Selection bias and covariate imbalances in randomized clinical trials (statistics in practice). Hoboken, NJ: Wiley; 2005.
22. Saelens BE, Chan NL, Krieger J, et al. Nutrition-labeling regulation impacts on restaurant environments. Am J Prev Med. 2012; 43(5):505–511. [PubMed: 23079173]
23. Bruemmer B, Krieger J, Saelens B, Chan N. Energy, Saturated Fat, and Sodium Were Lower in Entrées at Chain Restaurants at 18 Months Compared with 6 Months Following the Implementation of Mandatory Menu Labeling Regulation in King County, Washington. J Acad Nutr Diet. 2012; 112(8):1169–1176. [PubMed: 22704898]
24. Schwartz J, Riis J, Elbel B, Ariely D. Inviting consumers to downsize fast-food portions significantly reduces calorie consumption. Health Aff. 2012; 31(2):399–407.
25. Wansink B, Painter JE, North J. Bottomless bowls: why visual cues of portion size may influence intake. Obesity. 2005; 13(1):93–100.
26. Cohn EG, Larson EL, Araujo C, Sawyer V, Williams O. Calorie postings in chain restaurants in a low-income urban neighborhood: measuring practical utility and policy compliance. J Urban Health. 2012; 89(4):587–97. [PubMed: 22350515]
27. Institute of Medicine. [Accessed on August 25, 2012] Front-of-package nutrition rating systems and symbols: promoting healthier choices. National Academy of Sciences. 2011. Available at http://iom.edu/Reports/2011/Front-of-Package-Nutrition-Rating-Systems
28. Liu PJ, Roberto CA, Liu LJ, Brownell KD. A test of different menu labeling presentations. Appetite. 2012; 59(3):770–777. [PubMed: 22918176]
29. Elbel B, Taksler G, Mijanovich T, Abrams C, Dixon LB. Promotion of healthy eating through public policy: a controlled experiment. Am J Prev Med. In Press.

What is already known about this subject

- Prior results on the impact of calorie labeling are somewhat mixed
- Many prior studies have limitations
- As a result, the overall impact of labeling is not clear

What this study adds

- Difference in difference study design utilizing a consumer sample recruited at restaurants and one recruited via a random digit dial telephone survey.
- A look at key subgroups
- The influence of labeling on restaurant visits

Table 1

Sample Characteristics: Propensity Score Weighted.[a]

Point of Purchase (Consumer) Sample		Philadelphia Pre (N=599)	Philadelphia Post (N=570)	Baltimore Pre (N=433)	Baltimore Post (N=481)	Total
Age	18–24	18.60%	19.80%	20.00%	21.90%	20.10%
	25–39	30.60%	31.10%	31.70%	30.00%	30.80%
	40–49	22.80%	21.60%	20.60%	22.60%	21.90%
	50–64	28.00%	27.50%	27.70%	25.50%	27.20%
		Pearson: Uncorrected $chi^2(9) = 3.1377$, p=0.982				
Gender	Male	56.00%	55.90%	54.60%	51.20%	54.40%
	Female	36.80%	37.70%	38.30%	41.50%	38.60%
	Missing	7.20%	6.40%	7.10%	7.40%	7.00%
		Pearson: Uncorrected $chi^2(6) = 3.5406$, p=0.875				
Race	Black	69.70%	70.00%	70.60%	70.60%	70.20%
	White	20.00%	19.40%	19.30%	20.00%	19.70%
	Latin/Other	10.30%	10.60%	10.10%	9.40%	10.10%
		Pearson: Uncorrected $chi^2(6) = 0.5238$, p=0.995				
Education	HS or Less	61.70%	61.00%	62.00%	59.40%	61.00%
	Some College or More	35.50%	35.90%	35.80%	35.70%	35.70%
	Missing	2.80%	3.00%	2.20%	4.80%	3.20%
		Pearson: Uncorrected $chi^2(6) = 6.7996$, p=0.658				
Telephone Survey Sample		**Pre (N=723)**	**Post (N=672)**	**Pre (N=760)**	**Post (N=655)**	**Total**
Age	18–24	7.6%	7.3%	7.6%	7.0%	7.4%
	25–39	20.2%	20.1%	20.2%	20.4%	20.2%
	40–49	23.1%	22.7%	22.8%	22.2%	22.7%
	50–64	48.2%	48.7%	48.5%	49.7%	48.8%

Point of Purchase (Consumer) Sample		Philadelphia Pre (N=599)	Philadelphia Post (N=570)	Baltimore Pre (N=433)	Baltimore Post (N=481)	Total
	Missing	0.9%	1.1%	1.0%	0.8%	0.9%
		Pearson: Uncorrected chi^2 (12) = 1.0271, p=1.000				
Gender	Male	35.0%	35.1%	35.2%	34.7%	35.0%
	Female	65.0%	64.9%	64.8%	65.3%	65.0%
		Pearson: Uncorrected $chi^2(3)$ = 0.0534, p=0.997				
Race	Black	42.8%	43.0%	42.7%	42.9%	42.8%
	White	46.6%	46.9%	46.7%	46.7%	46.7%
	Other	10.7%	10.2%	10.6%	10.4%	10.5%
		Pearson: Uncorrected $chi^2(6)$ = 0.1347, p=1.000				
Education	HS or Less	40.3%	39.8%	40.1%	39.3%	39.9%
	More than HS	59.7%	60.2%	59.9%	60.7%	60.1%
		Pearson: Uncorrected $chi^2(3)$ = 0.1700, p=0.986				
Income	<$20K	19.2%	19.9%	17.6%	17.7%	18.6%
	$20K–$39K	21.8%	23.2%	22.1%	20.8%	22.0%
	$40K–$59K	16.3%	19.5%	17.0%	18.0%	17.7%
	$60–$79K	12.6%	11.4%	12.0%	12.8%	12.2%
	$80K+	19.4%	13.7%	20.6%	22.2%	19.0%
	Missing	10.7%	12.3%	10.6%	8.5%	10.5%
		Pearson: Uncorrected $chi^2(15)$ = 25.6440, p=0.125				
BMI Category	Normal	31.4%	31.5%	31.3%	31.1%	31.3%
	Overweight	33.2%	33.3%	33.2%	33.6%	33.3%
	Obese	35.5%	35.2%	35.4%	35.3%	35.3%
		Pearson: Uncorrected $chi^2(6)$ = 0.0564, p=1.000				

[a] Observations were propensity score weighted to balance demographic characteristics across cities and time periods.

Table 2

Results for the Consumer Sample: Propensity Score Weighted[a]

		Philadelphia				Baltimore					
		Pre	**Post**	**Change**	**P**	**Pre**	**Post**	**Change**	**P**	**Impact**	**P**
Reported seeing calorie information in the restaurant	Full sample	0.09	0.38	0.29	p<.001	0.14	0.10	−0.04	0.076	0.33	p<.001
	Male	0.09	0.34	0.24	p<.001	0.13	0.10	−0.03	0.291	0.28	p<.001
	Female	0.11	0.43	0.32	p<.001	0.16	0.10	−0.06	0.142	0.38	p<.001
	18–24	0.13	0.36	0.22	p<.001	0.14	0.04	−0.10	0.034	0.33	p<.001
	25–39	0.09	0.40	0.31	p<.001	0.17	0.09	−0.08	0.054	0.39	p<.001
	40–49	0.12	0.40	0.28	p<.001	0.11	0.14	0.02	0.614	0.25	.001
	50–64	0.05	0.36	0.31	p<.001	0.12	0.13	0.01	0.902	0.30	p<.001
	Black	0.11	0.36	0.25	p<.001	0.14	0.08	−0.06	0.019	0.31	p<.001
	White	0.06	0.49	0.43	p<.001	0.20	0.21	0.00	0.944	0.43	p<.001
	<=HS	0.08	0.32	0.24	p<.001	0.14	0.09	−0.05	0.103	0.28	p<.001
	>HS	0.12	0.51	0.39	p<.001	0.14	0.12	−0.02	0.551	0.41	p<.001
Reported buying fewer calories as a result of seeing calorie information	Full sample	0.02	0.10	0.08	p<.001	0.01	0.02	0.00	0.581	0.08	p<.001
	Male	0.01	0.08	0.07	p<.001	0.01	0.04	0.03	0.089	0.04	0.052
	Female	.	.	.	.	.	.	.	.	.	.
	18–24	.	.	.	.	.	.	.	.	.	.
	25–39	0.01	0.07	0.06	0.007	0.01	0.03	0.03	0.093	0.03	0.240
	40–49	0.01	0.14	0.13	p<.001	0.03	0.03	0.00	0.936	0.12	0.006
	50–64	0.02	0.11	0.10	0.001	0.03	0.02	−0.01	0.692	0.10	0.003
	Black	0.01	0.07	0.06	p<.001	0.02	0.02	0.00	0.737	0.06	0.002
	White	0.03	0.18	0.16	0.001	0.01	0.03	0.02	0.383	0.14	0.009
	<=HS	0.02	0.08	0.07	p<.001	0.02	0.02	0.00	0.932	0.06	0.001
	>HS	0.02	0.14	0.12	p<.001	0.01	0.02	0.01	0.534	0.11	0.001
Reported buying more calories as a result of seeing calorie information	Full sample	0.00	0.03	0.03	p<.001	0.01	0.00	−0.01	0.108	0.04	p<.001
	Male	.	.	.	.	.	.	.	.	.	.
	Female	0.01	0.04	0.03	0.045	0.02	0.01	−0.01	0.659	0.03	0.089

	Philadelphia				Baltimore					
	Pre	Post	Change	P	Pre	Post	Change	P	Impact	P
18–24	.	.	.	.	.	.	.	.	.	.
25–39	.	.	.	.	.	.	.	.	.	.
40–49	.	.	.	.	.	.	.	.	.	.
Black	0.00	0.03	0.03	0.005	0.02	0.01	−0.02	0.104	0.04	0.002
<=HS	0.00	0.03	0.02	0.033	0.02	0.01	−0.02	0.113	0.04	0.012
<HS	.	.	.	.	.	.	.	.	.	.

[a]Above marginal effects are derived from logistic regression models controlling for gender, age, race, education, restaurant chain, and being overweight or obese.

Observations were propensity score weighted to balance demographic characteristics across cities and time periods. P values were calculated using robust standard errors. Missing marginal effects are due to perfect prediction for subgroups defined by combinations of covariates.

Table 3

Average number of times consumer sample members reported eating from a big chain fast food restaurant each week: Propensity Score Weighted [a]

	Philadelphia				Baltimore					
	Pre	Post	Change	P	Pre	Post	Change	P	Impact	P
Full sample	5.58	6.79	1.21	p<.001	7.08	7.38	0.30	0.448	0.91	0.070
Male	6.16	7.17	1.01	0.013	7.60	7.47	−0.13	0.789	1.14	0.073
Female	4.59	5.90	1.31	0.001	6.54	7.12	0.57	0.409	0.74	0.356
18–24	6.59	7.98	1.39	0.045	6.93	8.68	1.75	0.115	−0.36	0.778
25–39	5.76	6.86	1.10	0.034	7.28	6.45	−0.83	0.195	1.93	0.019
40–49	5.22	6.01	0.79	0.230	7.63	7.06	−0.57	0.349	1.36	0.123
50–64	4.97	6.53	1.56	0.003	6.58	7.58	1.00	0.139	0.56	0.523
Black	5.57	7.34	1.76	p<.001	7.42	7.72	0.30	0.501	1.47	0.013
White	4.98	4.82	−0.15	0.804	7.05	6.60	−0.45	0.557	0.30	0.753
<=HS	5.86	7.43	1.57	p<.001	7.80	7.82	0.02	0.974	1.56	0.020
>HS	5.06	5.81	0.76	0.097	5.60	5.99	0.39	0.473	0.37	0.601

[a] Above marginal effects are derived from negative binomial regression models controlling for gender, age, race, education, restaurant chain, and being overweight or obese.

Observations were propensity score weighted to balance demographic characteristics across cities and time periods. P values were calculated using robust standard errors.

Table 4

Average total calories purchased by consumer sample members (from receipt data): Weighted[a]

	Philadelphia				Baltimore					
	Pre-Period	**Post-Period**	**Change**	**P**	**Pre-Period**	**Post-Period**	**Change**	**P**	**Impact**	**P**
Full sample	959	904	−55	0.167	992	940	−52	0.276	−3.84	0.951
Male	964	955	−9	0.879	998	999	1	0.981	−10.21	0.912
Female	979	886	−93	0.122	996	856	−140	0.062	47.48	0.612
18–24	879	895	16	0.819	1146	972	−174	0.141	190.23	0.152
25–39	1041	1049	8	0.915	970	971	1	0.994	7.67	0.949
40–49	866	813	−53	0.555	948	947	−1	0.989	−52.20	0.654
50–64	978	823	−155	0.052	934	893	−41	0.631	−114.56	0.319
Black	936	866	−70	0.129	1014	878	−137	0.011	66.84	0.341
White	1048	951	−97	0.283	902	950	48	0.607	−145.32	0.238
<=HS	944	861	−83	0.105	999	979	−20	0.755	−63.25	0.436
>HS	1019	987	−31	0.667	976	947	−29	0.680	−2.11	0.983

[a] Above marginal effects are derived from ordinary least squares regression models controlling for gender, age, race, education, restaurant chain, and being overweight or obese.

Observations were propensity score weighted to balance demographic characteristics across cities and time periods. P values were calculated using robust standard errors.

Table 5

Average times telephone sample ate fast food in the seven days prior to interview: Propensity Score Weighted[a]

	Philadelphia				Baltimore					
	Pre	**Post**	**Change**	**P**	**Pre**	**Post**	**Change**	**P**	**Impact**	**P**
Full sample	1.33	1.40	0.07	0.588	1.84	1.57	−0.26	0.056	0.33	0.076
Male	1.32	1.54	0.23	0.333	1.94	1.62	−0.32	0.209	0.54	0.118
Female	1.31	1.35	0.03	0.836	1.78	1.55	−0.23	0.143	0.26	0.228
18–24	1.92	1.62	−0.30	0.523	1.88	1.63	−0.25	0.592	−0.05	0.937
25–39	1.68	1.35	−0.33	0.289	2.04	2.11	0.07	0.832	−0.40	0.361
40–49	1.28	1.78	0.50	0.099	1.72	1.83	0.11	0.696	0.39	0.360
50–64	1.10	1.24	0.14	0.376	1.80	1.28	−0.52	0.005	0.65	0.007
Black	1.54	1.98	0.45	0.039	2.26	1.97	−0.29	0.225	0.74	0.023
White	1.02	0.90	−0.13	0.391	1.40	1.17	−0.22	0.119	0.10	0.645
<=HS	1.56	1.71	0.15	0.483	2.05	1.90	−0.15	0.545	0.30	0.351
>HS	1.18	1.22	0.04	0.774	1.67	1.36	−0.31	0.053	0.35	0.112
Normal weight	1.20	1.19	−0.01	0.979	1.74	1.35	−0.39	0.115	0.38	0.240
Overweight	1.33	1.64	0.31	0.175	1.52	1.59	0.07	0.739	0.24	0.447
Obese	1.41	1.39	−0.02	0.915	2.19	1.80	−0.39	0.101	0.37	0.230
<$20K income	1.71	1.78	0.07	0.827	2.24	2.47	0.24	0.581	−0.16	0.765
$20K–$39K income	1.43	1.77	0.34	0.193	1.89	1.85	−0.04	0.891	0.39	0.347
<$40K–$59K income	1.47	0.84	−0.63	0.028	1.97	1.37	−0.60	0.039	−0.02	0.952
<$60K–79K income	1.13	1.71	0.58	0.110	1.76	1.57	−0.19	0.610	0.77	0.131
≥$80K+ income	1.04	1.09	0.05	0.852	1.43	1.24	−0.18	0.445	0.24	0.524

[a]Above marginal effects are derived from negative binomial regression models controlling for gender, age, race, education, income, and BMI category calculated from self-reported height and weight.

Observations were propensity score weighted to balance demographic characteristics across cities and time periods. P values were calculated using robust standard errors. Sample is the 59% of consumer who report eating at a fast food restaurant in the last 3 months.