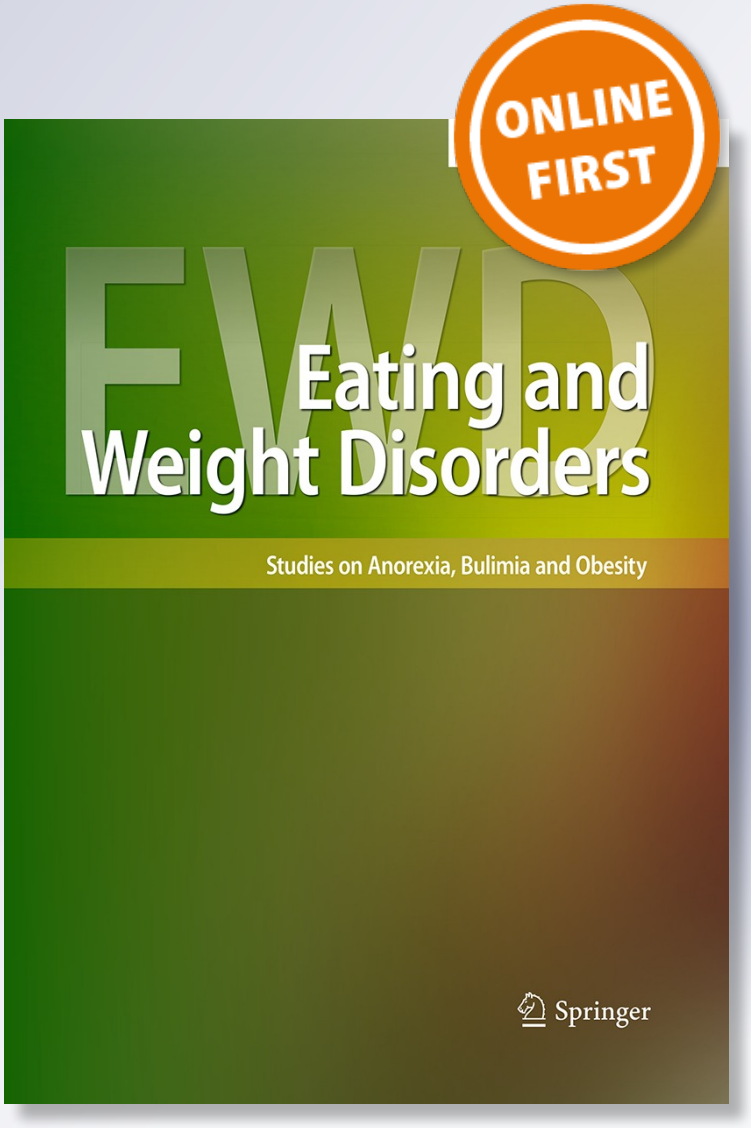
Calorie estimation accuracy and menu labeling perceptions among individuals with and without binge eating and/or purging disorders

Christina A. Roberto, Ann F. Haynos, Marlene B. Schwartz, Kelly D. Brownell & Marney A. White

Eating and Weight Disorders - Studies on Anorexia, Bulimia and Obesity
Official Journal of the Italian Society for the Study of Eating Disorders (SISDCA)

ISSN 1124-4909

Eat Weight Disord
DOI 10.1007/s40519-013-0035-x



Springer

Eat Weight Disord
DOI 10.1007/s40519-013-0035-x

ORIGINAL ARTICLE

Calorie estimation accuracy and menu labeling perceptions among individuals with and without binge eating and/or purging disorders

Christina A. Roberto · Ann F. Haynos · Marlene B. Schwartz · Kelly D. Brownell · Marney A. White

Received: 14 November 2011 / Accepted: 24 October 2012

Abstract Menu labeling is a public health policy that requires chain restaurants in the USA to post kilocalorie information on their menus to help consumers make informed choices. However, there is concern that such a policy might promote disordered eating. This web-based study compared individuals with self-reported binge eating disorder ($N = 52$), bulimia nervosa ($N = 25$), and purging disorder ($N = 17$) and those without eating disorders (No ED) ($N = 277$) on restaurant calorie information knowledge and perceptions of menu labeling legislation. On average, people answered 1.46 ± 1.08 questions correctly (out of 6) (25 %) on a calorie information quiz and 92 % of the sample was in favor of menu labeling. The findings did not differ based on eating disorder, dieting, or weight status, or race/ethnicity. The results indicated that people have difficulty estimating the calories in restaurant meals and individuals with and without eating disorders are largely in favor of menu labeling laws.

C. A. Roberto (✉)
Robert Wood Johnson Foundation Health & Society Scholar, Department of Social & Behavioral Sciences, Harvard School of Public Health, 9 Bow Street, Cambridge, MA 02138, USA
e-mail: croberto@hsph.harvard.edu

A. F. Haynos
Department of Psychology, University of Nevada, Reno, USA

M. B. Schwartz
Department of Psychology, Yale University, Box 208205, New Haven, CT 06520, USA

K. D. Brownell
Department of Psychology and School of Public Health, Yale University, New Haven, USA

M. A. White
Department of Psychiatry, Department of Psychology, School of Public Health, Yale University, New Haven, USA

Keywords Menu labeling · Eating disorders · Calorie estimation

Introduction

There is growing momentum behind a number of public health policies targeting obesity. However, there is concern that these efforts might inadvertently promote eating disorders (EDs) [1–3]. There is some evidence that obesity prevention efforts in schools do not increase the risk of developing ED symptoms and may, in fact, protect against them [4, 5], but little research has examined the impact of public health policies on ED symptoms. One policy that has generated concern from the ED activist community is menu labeling, which requires chain restaurants to post kilocalorie (calorie) information on menus so that it is visible at the point-of-purchase. There is a strong public health rationale for implementing menu labeling [6]. Research has shown that in comparison to food made at home, food purchased outside the home tends to be higher in calories, of poorer nutritional quality, and served in larger portions that promote overeating [7–11]. In addition, greater consumption of fast food is associated with higher levels of body fat [12] and being overweight [13]. Research has also demonstrated that people, including trained nutritionists [14], have great difficulty estimating the caloric content of restaurant meals [15]. Finally, national and local public opinion polls find that the majority of people are in favor of menu labeling in chain restaurants [16, 17].

Menu labeling is supposed to go into effect nationally in the USA as part of the Patient Protection and Affordable Care Act [18]. The research studies on menu labeling thus far have yielded mixed findings regarding its influence on

Published online: 16 May 2013

consumer behavior. Observational studies conducted in cities before and after the implementation of menu labeling did not detect differences in calories ordered by chain restaurant patrons [19–21]. However, results from a study in New York City that evaluated purchasing patterns at several chain restaurants found that the average calories purchased by customers at some restaurants decreased after the introduction of menu labeling [22]. A study examining purchasing data from Starbucks also detected a decrease in calories ordered post-menu labeling [23]. In addition, a randomized, controlled lab study of menu labeling found that adults ordered and consumed fewer calories for dinner and after dinner when calorie labels were accompanied by information about daily caloric requirements [24].

With obesity at the forefront of public health concerns, there is a logical and evidence-based rationale for menu labeling. However, no studies have examined perceptions of menu labeling among individuals with EDs or the impact these labels might have on them. Nonetheless, in the absence of data, Harvard University removed menu labels from their dining halls because parents voiced concern that they promote disordered eating [25]. There is research, however, which found that female undergraduates who were more likely to overestimate the caloric content of foods, had higher scores on a self-report measure of disordered eating [26].

As a first step to understanding the relationship between menu labeling and the possible promotion of disordered eating, we surveyed individuals with and without self-reported behaviors exhibited by individuals with EDs [binge eating disorder (BED), bulimia nervosa or purging disorder]. The goals of this study were to evaluate participants' ability to estimate calories in chain restaurant meals and assess their opinions about menu labeling.

Methods

Participants

Three hundred and seventy-one individuals completed an online survey between September 2009 and 2010. Participants were recruited via Craigslist classified advertisements, which contained a link to an external website with questionnaires. An attempt was made to sample from a variety of geographic regions by advertising on Craigslist in major cities throughout the USA (e.g., New York, Washington DC, Philadelphia, Boston, Baton Rouge, Tulsa, Austin, Oklahoma City, Seattle, San Francisco). The advertisement text was varied on a weekly basis, and sought volunteers for an online survey on dieting, eating, weight, weight concerns, body image, and/or health behaviors. The advertisement specified that men and women of all weight ranges were needed. Participants were offered a "1 in 20" chance to win a $50 gift card in exchange for their participation. Informed consent was obtained and this study received institutional review board approval.

Measures

The Eating Disorder Examination Questionnaire (*EDE-Q*) [27] is the self-report version of the Eating Disorder Examination [28] that captures information about objective and subjective binge episodes (OBEs/SBEs) and purging behaviors. OBEs are defined as occasions when an individual eats an unusually large amount of food in a short period of time and experiences a loss of control. SBEs are defined as occasions when an individual eats a small or normal amount of food and experiences a loss of control. The EDE-Q assesses disordered eating over the past 4 weeks as opposed to the *Diagnostic and Statistical Manual of Mental Disorders Fourth Edition* (DSM-IV) [29] time frame of 3 months for BN and 6 months for BED. The EDE-Q also generates subscales assessing dietary restraint (R), and eating (EC), shape (SC) and weight concerns (WC). The EDE-Q has adequate test–retest reliability [30], good convergence with the EDE [31, 32] and superior ability to detect purging behaviors compared to the EDE interview [33, 34].

Restaurant Calorie Information Quiz [35] is a six-question quiz developed by the Center for Science in the Public Interest and adapted for this study. Participants were presented with different meal options at six different popular chain restaurants and asked to determine which meals had either the greatest or least number of calories. Correct quiz answers were summed to produce a total score, which was converted into a percentage correct score. The final question on the quiz asked participants if they were in favor of menu labeling laws in their state (see "Appendix" for quiz items).

Self-reported demographic information, height, current weight and current dieting status were also collected.

Statistical methods

Power analysis

Little prior research has examined the ability of individuals with EDs to estimate calories. Therefore, we based an a priori power analysis on an effect size observed in a study comparing caloric estimates of a yogurt shake made by underweight patients with anorexia nervosa (AN) versus normal weight control participants [36]. Based on a moderate effect size ($f = 0.25$), a two-tailed test with an alpha level of 0.05, and four comparison groups, it was determined

that a total of 180 participants would be necessary to achieve 80 % power to detect an effect among groups.

Creation of study groups

Survey respondents were categorized into four groups [BN, BED, purging disorder (PD) [37], and no eating disorder (No ED)] based on the core behavioral criteria for EDs, which was ascertained via the EDE-Q. Based on research suggesting few differences between those engaging in twice-weekly and once-weekly behaviors [38–40], ED groups were formed based on once-weekly behavioral criteria. The BN group was composed of individuals self-reporting at least once-weekly OBEs and purging behaviors, while the BED group was composed of individuals reporting once-weekly OBEs without compensatory behaviors. Those in the PD group reported at least once-weekly purging behaviors without any OBEs. The final group was composed of individuals who did not meet the behavioral criteria for an ED (No ED).

Statistical analyses

Study groups were compared for differences on age, BMI and EDE-Q subscale scores using one-way ANOVAs and post hoc Tukey tests. Groups were also compared on race/ethnicity and gender using Chi-square tests. The two primary outcomes of interest were total score on the restaurant calorie information quiz and proportion of individuals supporting menu labeling. A series of one-way ANOVAs were conducted to examine potential differences in quiz scores among all four study groups, among the ED groups only and among the different racial/ethnic groups. Four independent samples, t tests were conducted to examine potential differences on total quiz score based on ED (No ED vs. any ED), current dieting and support of menu labeling status and gender. A Pearson correlation was performed to evaluate the relationship between BMI and quiz score. Chi-square tests were then conducted to examine differences in the proportion of individuals in support of menu labeling among these same groups. For the purpose of analysis, individuals who reported strongly or somewhat supporting menu labeling were classified as supporters and those strongly or somewhat opposing it were classified as non-supporters. Eta squared and Cohen's d effect sizes are reported.

Results

Participant characteristics

Eighty-six percent of respondents were female. The racial/ethnic distribution for the total sample was 80 % Caucasian, 6 % Hispanic, 5 % African American, 5 % Asian, and 4 % reporting "Other." The mean age was 33.2 ± 12.1 years and the mean BMI was 28.82 ± 8.97 kg/m^2. Approximately 54 % of the sample was classified as overweight/obese based on a BMI of >25 kg/m^2. Fourteen percent of participants were categorized in the BED group, 6.7 % in the BN group, 4.6 % in the PD group, and 74.7 % in the No ED group. The four study groups did not differ significantly by gender [$\chi^2(3) = 7.52$, $p = 0.057$]. There was one male in the BN group and 3, 13 and 36 males in the PD, BED and No ED groups, respectively. The groups also did not differ based on race [$\chi^2(12) = 15.25$, $p = 0.228$], age [$F(3,308) = 1.91$, $p = 0.128$], or BMI [$F(3,365) = 0.82$, $p = 0.486$]. The groups differed significantly on EDE-Q subscale scores in expected ways based on ED status (see Table 1).

Primary outcomes

In the total sample, the mean score on the calorie quiz was 24.35 ± 17.97 % correct. This score translates to <2 questions correct on average out of a possible 6. Overall, 92 % ($N = 340$) of individuals were in support of menu labeling laws. Sixty-eight percent strongly supported and 24 % somewhat supported menu labeling while 5.7 % somewhat opposed and 1.6 % strongly opposed.

There were no significant differences in the total quiz score among the four groups (BN, BED, PD, No ED) [$F(3,367) = 0.88$, $p = 0.453$, $\eta^2 = 0.01$] (see Table 1). When the ED groups were collapsed into one group ($N = 94$) and compared to the No ED group ($N = 277$), there were still no significant differences on the quiz score [1.42 ± 1.09 (24 %) questions correct for the No ED group and 1.59 ± 1.05 (26 %) correct for the ED group; $t(369) = -1.293$, $p = 0.197$, $d = -0.16$]. There were also no differences in total quiz score among the ED groups only [$F(2,91) = 0.50$, $p = 0.608$, $\eta^2 = 0.01$]. There were no significant differences in quiz knowledge based on support of menu labeling ($t(365) = -0.28$, $p = 0.783$, $d = -0.06$), dieting status [$t(368) = -0.87$, $p = 0.386$, $d = -0.09$), gender [$t(368) = -0.21$, $p = 0.838$, $d = -0.03$] or race/ethnicity [$F(4,365) = 1.72$, $p = 0.144$, $\eta^2 = 0.02$]. Finally, there was no correlation between BMI and quiz total ($r = 0.004$, $p = 0.945$).

There were no significant differences in the proportion of individuals in favor of menu labeling among the four groups [$\chi^2(3) = 3.64$, $p = 0.303$]. 94 % of the No ED group, 92 % of the BN group, 90 % of the BED group and 82 % of the PD group supported menu labeling. There were also no significant difference between the ED versus No ED groups in support of menu labeling [$\chi^2(1) = 2.11$, $p = 0.147$]. When comparing the ED groups only, there were no differences in support of menu labeling [$\chi^2(2) = 1.09$, $p = 0.581$].

Table 1 Comparison of no eating disorder versus eating disorder groups on restaurant calorie quiz and other variables

	No eating disorder (no ED) ($N = 277$)		Bulimia nervosa (BN) ($N = 25$)		Binge eating disorder (BED) ($N = 52$)		Purging disorder (PD) ($N = 17$)		*df*	*F*	*p*	η^2
	Mean	SD	Mean	SD	Mean	SD	Mean	SD				
Age (years)	33	12.2	31.7	9.16	36.62	12.63	28.31	10.98	3,308	1.91	0.128	0.02
Body mass index (kg/m^2)	28.79	8.94	27.62	10.41	30.2	7.83	26.87	10.54	3,365	0.82	0.486	0.01
Restaurant calorie quiz total	1.42	1.09	1.64	1.19	1.63	1.1	1.35	0.61	3,367	0.88	0.453	0.01
Eating Disorder Examination Questionnaire												
Restraint[a,c,d]	2.2	1.52	4.28	1.08	2.58	1.49	3.28	1.55	3,359	16.44	0	0.12
Eating concerns[a,b,c,d,e]	1.2	0.97	3.16	0.99	1.76	1.02	2.26	1.02	3,357	36.6	0	0.002
Shape concerns[a,b]	2.77	1.39	4.24	0.85	3.62	1.12	3.58	1.17	3,347	14.47	0	0.11
Weight concerns[a,b,c]	2.42	1.49	4.5	0.82	3.58	1.35	3.67	1.31	3,361	25.18	0	0.17

[a] Significant difference between no ED and BN at $p < 0.05$ level

[b] Significant difference between no ED and BED at $p < 0.05$ level

[c] Significant difference between no ED and PD at $p < 0.05$ level

[d] Significant difference between BED and BN at $p < 0.05$ level

[e] Significant difference between BN and PD at $p < 0.05$ level

Support of menu labeling also did not differ based on weight status [$\chi^2(1) = 0.30$, $p = 0.585$], dieting status [$\chi^2(1) = 1.06$, $p = 0.303$] or race/ethnicity [$\chi^2(4) = 7.20$, $p = 0.126$], but women were more likely to support menu labeling (94 %) than men (85 %) [$\chi^2(1) = 5.40$, $p = 0.02$].

Discussion

The study results indicated that the majority of individuals surveyed support menu labeling, the requirement of posting calorie information on menus in chain restaurants, regardless of ED, weight or dieting status. The data also confirmed previous studies documenting people's poor ability to estimate calories when eating at restaurants [15]. Those with EDs performed no better or worse on the quiz and quiz score was not related to BMI, dieting status, gender, or race/ethnicity, suggesting that the population as a whole might benefit from calorie labels. Consistent performance across the study groups on the restaurant calorie quiz might be explained by the fact that people, regardless of body weight, have difficulty estimating the number of calories in larger meals relative to smaller meals [41]. Given that restaurant meals are often served in large portions, estimating calories in those meals appears to be particularly difficult.

While this study suggests individuals with BN, BED or PD favor menu labeling, it remains unknown whether such labels can be detrimental to recovery from an ED or promote ED behaviors. Research has found that individuals who binge eat report increased feelings of loss of control when dining out at restaurants [42], consume significantly more calories on days when they eat at restaurants [42] and report having half of their binge eating episodes in restaurant settings [43]. Therefore, future research should examine whether access to nutrition information in restaurants promotes a greater sense of control over eating for individuals with EDs.

On the other end of the ED spectrum, research has found that those with AN overestimated consumption of a single-item meal by an average of 460 calories when underweight and by an average of 112 calories following weight restoration [36]. By contrast, control subjects underestimated caloric intake by an average of 60 calories. Thus, menu labels may provide important feedback to individuals with AN regarding the accuracy of calorie perceptions and thereby help them maintain an appropriate weight. Alternatively, it could be argued that those with EDs support menu labeling because it better enables them to control their eating in a pathological way or avoid certain restaurants. Further research on the effects of menu labeling on food intake for individuals with EDs is needed to distinguish between these two hypotheses.

The present study has several limitations including a small sample size for the ED groups, suggesting the findings might not generalize well to larger populations. A second limitation was the use of the EDE-Q to classify participants. The EDE-Q has been found to overestimate the frequency of OBEs in some instances [38], while other research has found that it captures fewer OBEs compared to the EDE when administered with BN [44] and BED patients [45]. Since the EDE-Q is a widely used instrument

with adequate validity and increased ability to detect purging disorders [34], we believe individuals were adequately assigned to diagnostic groups. In addition, the differences in EDE-Q subscale scores between the groups provide evidence of correct group classification.

This study is also limited by the use of a convenience sample based on Internet volunteers responding to advertisements about eating and dieting. This could account for the large proportion of overweight respondents among the ED groups. However, an increase over time in comorbid obesity and EDs has been observed in some populations [46]. Given that menu labels are arguably geared toward helping those who are overweight/obese and/or those currently dieting, the higher BMI of this sample could also be considered a study strength. The sample was also composed largely of women, limiting the generalizability of the findings, although women are more likely to develop EDs [47]. It is also possible that those responding to a study about eating and dieting might be more likely to favor menu labeling. In addition, people were asked whether they support menu labeling after being presented with a calorie estimation quiz, which might have persuaded some participants who would not have otherwise supported menu labeling. However, the percentage of people in favor of menu labeling was similar to results from other polls [14, 15]. Finally, the study is limited because the quiz questions contained items from a small number of chain restaurants that might have been unfamiliar to participants. However, we believe the quiz mimics decision making in real-world restaurant settings where individuals are often provided only with the description of menu items and they must choose among several options.

Despite these limitations, this is the first study to evaluate the opinions of individuals with EDs on menu labeling legislation. The results indicated that people had difficulty estimating the calories in restaurant meals and were largely in favor of menu labeling laws, irrespective of ED, body weight or dieting status. While these results suggest that individuals with EDs want menu labels, more research is needed to understand how menu labeling might impact disordered eating.

Acknowledgments Marney A. White is supported by National Institutes of Health Grant K23 DK071646, which provided funding for this study. The authors would like to thank Margo Wootan, D.Sc. and the Center for Science in the Public Interest for permission to use their restaurant calorie information quiz. The authors would also like to thank the Robert Wood Johnson Foundation Health & Society Scholars program for its financial support.

Conflict of interest The authors declare that they have no conflict of interest.

Contributors C.A. Roberto originated the study idea and design, performed data analysis and led the writing. A.F. Haynos, M.B. Schwartz and K.D. Brownell helped interpret the results and provided critical feedback on drafts of the manuscript. M.A. White gave input on the study design, helped interpret the results and provided critical feedback on drafts of the manuscript.

Appendix

1*Denotes correct answer

1. **At Denny's, which breakfast item has the least number of calories?**
   a. Ham & Cheddar Omelet (595 calories)
   *b. **Country fried steak & eggs (464 calories)**
   c. An order of French toast with syrup & margarine (3 slices) (1,000 calories)
   d. An order of pancakes (3) with syrup & margarine (650 calories)

2. **Which sandwich from the restaurant Cosi has more than 700 calories?**
   a. Turkey Rustica (619 calories)
   b. Tuscan Pesto Chicken (571 calories)
   c. Tandoori Chicken (633 calories)
   *d. **Grilled Chicken T.B.M. (791 calories)**
   e. Sesame Ginger Chicken (508 calories)

3. **Which item at Dunkin' Donuts has the fewest number of calories?**
   a. Sesame bagel with cream cheese (570 calories)
   *b. **2 Jelly filled donuts (420 calories)**
   c. Banana walnut muffin (540 calories)
   d. A medium (24 oz.) strawberry banana smoothie (550 calories)

4. **Which grande (16 oz.) Starbucks drink has the fewest calories?**
   a. Frappuccino Blended Coffee with whipped cream (420–550 calories)
   b. Frappuccino Blended Crème (490–580 calories)
   c. Chai Tea Latte (290 calories)
   d. Caramel Macchiato (310 calories)
   *e. **Cappuccino (even, if made with whole milk) (150 calories)**

5. **Which item at McDonald's has the most calories?**
   a. Big Mac (560 calories)
   b. 2 Sausage McGriddles (840 calories)
   *c. **Large chocolate shake (1,160 calories)**
   d. 4 Hamburgers (1,040 calories)

6. **Which item at Chili's Grill & Bar is <1,000 calories?**
   a. Southwestern Cobb salad (1080 calories)
   *b. **Chili's Cheesesteak (880 calories)**

c. Honey–Chipotle ribs (1,270 calories)
d. Fire Grilled Chicken Fajita Quesadilla (1,480)
e. Chicken Ranch Sandwich (1,170)

7. **Should your state require fast-food and other chain restaurants like McDonald's, Starbucks Denny's, Cosi and Chili's to display the calorie content of their foods on menus and menu boards?**

a. Yes, I strongly support that
b. Yes, I somewhat support that
c. No, I somewhat oppose that
d. No, I strongly oppose that

References

1. O'Dea JA (2005) Prevention of child obesity: 'First, do no harm'. Health Educ Res 20:259–265
2. Cogan JC, Smith JP, Maine MD (2008) The risks of a quick fix: a case against mandatory body mass index reporting laws. Eat Disord 16:2–13
3. Black R (2011) Michelle Obama under fire for mentioning daughter Malia's weight during obesity remarks. http://www.nydailynews.com/lifestyle/2010/02/05/2010-02-05_michelle_obama_under_fire_for_mentioning_daughters_during_obesity_remarks.html
4. Austin SB, Field AE, Wiecha J et al (2005) The impact of a school-based obesity prevention trial on disordered weight-control behaviors in early adolescent girls. Arch Pediatr Adolesc Med 159:225–230
5. Austin SB, Kim J, Wiecha J et al (2007) School-based overweight preventive intervention lowers incidence of disordered weight-control behaviors in early adolescent girls. Arch Pediatr Adolesc Med 161:865–869
6. Roberto CA, Schwartz MB, Brownell KD (2009) Rationale and evidence for menu-labeling legislation. Am J Prev Med 37:546–551
7. Lin BH (1996) Diets of America's children: influence of dining out, household characteristics, and nutrition knowledge, agricultural economic report #726, Washington, DC
8. Guthrie J, Biing-Hwan L, Frazao E (2002) Role of food prepared away from home in the American diet, 1977–78 versus 1994–96: changes and consequences. J Nutr Educ Behav 34:140–150
9. Young LR, Nestle M (2007) Portion sizes and obesity: responses of fast-food companies. J Public Health Policy 28:238–248
10. Ello-Martin J, Ledikwe J, Rolls B (2005) The influence of food portion size and energy density on energy intake: implications for weight management. Am J Clin Nutr 82:236S–241S
11. Rolls B, Morris E, Roe L (2002) Portion size of food affects energy intake in normal-weight and overweight men and women. Am J Clin Nutr 76:1207–1213
12. McCrory MA, Fuss PJ, Hays NR et al (1999) Overeating in America: association between restaurant food consumption and body fatness in healthy adult men and women ages 19 to 80. Obes Res 7:564–571
13. Pereira M, Kartashov A, Ebbeling C et al (2005) Fast food habits, weight gain, and insulin resistance (the CARDIA study) 15-year prospective analysis. Lancet 365:36–42
14. Backstrand J, Wootan MG, Young LR et al (1997) Fat chance. Center for Science in the Public Interest, Washington, DC
15. Burton S, Creyer EH, Kees J et al (2006) Attacking the obesity epidemic: the potential health benefits of providing nutrition information in restaurants. Am J Public Health 96:1669–1675
16. Rudd Center for Food Policy and Obesity (2008) Menu labeling in chain restaurants: opportunities for public policy. Rudd Center for Food Policy and Obesity, New Haven. http://www.yaleruddcenter.org/resources/upload/docs/what/reports/RuddMenuLabelingReport2008.pdf
17. Center for Science in the Public Interest (2009) Summary of polls on nutrition labeling in restaurants. http://www.cspinet.org/new/pdf/census_menu_board_question.pdf
18. Nutrition Labeling of Standard Menu Items at Chain Restaurants Sec 4205. HR 3590, 2010
19. Elbel B, Kersh R, Brescoll VL et al (2009) Calorie labeling and food choices: a first look at the effects on low-income people in New York City. Health Aff (Millwood) 28:1110–1121
20. Finkelstein EA, Strombotne KL, Chan NL et al (2011) Mandatory menu labeling in one fast-food chain in King County, Washington. Am J Prev Med 40:122–127
21. Tandon PS, Zhou C, Chan NL et al (2011) The impact of menu labeling on fast-food purchases for children and parents. Am J Prev Med 41:434–438
22. Dumanovsky T, Huang CY, Nonas CA et al (2011) Changes in energy content of lunchtime purchases from fast food restaurants after introduction of calorie labeling: cross sectional customer surveys. BMJ 343:1–11
23. Bollinger B, Leslie P, Sorensen A (2010) Calorie posting in chain restaurants, Mimeo, Stanford GSB. http://www.gsb.stanford.edu/news/StarbucksCaloriePostingStudy.pdf. Accessed 30 Jan 2011
24. Roberto CA, Larsen PD, Agnew H et al (2010) Evaluating the impact of menu labeling on food choices and intake. Am J Public Health 100:312–318
25. Hu M (2008) Calorie cards removed from dining halls. The Harvard Crimson. http://www.thecrimson.com/article/2008/9/24/calorie-cards-removed-from-dining-halls/
26. Stanton AL, Tips TA (1990) Accuracy of calorie estimation by females as a function of eating habits and body mass. Int J Eat Disord 4:387–393
27. Fairburn CG, Beglin SJ (1994) Assessment of eating disorders: interview or self-report questionnaire? Int J Eat Disord 16:363–370
28. Fairburn C, Wilson GT (1993) Eating disorder examination. In: Fairburn CG, Wilson GT (eds) Binge eating: nature, assessment and treatment. Guilford Press, New York, pp 333–360
29. American Psychiatric Association (1994) Diagnostic and statistical manual of mental disorders, 4th edn. American Psychiatric Association, Washington, DC
30. Luce KH, Crowther JH (1999) The reliability of the Eating Disorder Examination-Self-Report Questionnaire Version (EDE-Q). Int J Eat Disord 25:349–351
31. Reas DL, Grilo CM, Masheb RM (2006) Reliability of the Eating Disorder Examination-Questionnaire in patients with binge eating disorder. Behav Res Ther 44:43–51
32. Grilo CM, Masheb RM, Wilson GT (2001) A comparison of different methods for assessing the features of eating disorders in patients with binge eating disorder. J Consult Clin Psychol 69:317–322
33. Mond JM, Hay PJ, Rodgers B et al (2004) Validity of the Eating Disorder Examination Questionnaire (EDE-Q) in screening for eating disorders in community samples. Behav Res Ther 42:551–567
34. Mond J, Hay P, Rodgers B et al (2007) Self-report versus interview assessment of purging in a community sample of women. Eur Eat Disord Rev 1:403–409
35. Center for Science in the Public Interest (2009) Restaurant quiz. http://www.cspinet.org/nutritionpolicy/restaurant_quiz.html

36. Sysko R, Walsh BT, Schebendach J et al (2005) Eating behavior among women with anorexia nervosa. Am J Clin Nutr 82:296–301
37. Keel P, Haedt A, Edler C (2005) Purging disorder: an ominous variant of bulimia nervosa? Int J Eat Disord 38:191–199
38. Crow SJ, Agras WS, Halmi K et al (2002) Full syndromal versus subthreshold anorexia nervosa, bulimia nervosa, and binge eating disorder: a multicenter study. Int J Eat Disord 32:309–318
39. le Grange D, Binford R, Peterson C et al (2006) DSM-IV threshold versus subthreshold bulimia nervosa. Int J Eat Disord 39:462–467
40. Roberto CA, Grilo CM, Masheb RM et al (2010) Binge eating, purging, or both: eating disorder psychopathology findings from an internet community survey. Int J Eat Disord 43:724–731
41. Wansink B, Chandon P (2006) Meal size, not body size, explains errors in estimating the calorie content of meals. Ann Intern Med 145:326–332
42. Timmerman GM (2006) Restaurant eating in nonpurge binge-eating women. West J Nurs Res 28:811–824
43. Allison S, Timmerman GM (2007) Anatomy of a binge: food environment and characteristics of nonpurge binge episodes. Eat Behav 8:31–38
44. Carter JC, Aime A, Mills J (2001) Assessment of bulimia nervosa: a comparison of interview and self-report questionnaire methods. Int J Eat Disord 30:187–192
45. Wilfley D, Schwartz MB, Spurrell EB et al (1997) Assessing the specific psychopathology of binge eating disorder patients: interview or self-report? Behav Res Ther 35:1151–1159
46. Darby A, Hay P, Mond J, Quirk F et al (2009) The rising prevalence of comorbid obesity and eating disorder behaviors from 1995 to 2005. Int J Eat Disord 42:104–108
47. Smink FRE, Hoeken D, Hoek HW (2012) Epidemiology of eating disorders: Incidence, prevalence and mortality rates. Cur Psychiatry Rep 14:406–414