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## Calorie labels on the restaurant menu: Is the use of weight-control behaviors related to ordering decisions?

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### Abstract

**Background**—There is emerging evidence that calorie information on restaurant menus does not similarly influence the ordering decisions of all population groups and may have unintended consequences for individuals that struggle with disordered eating or other weight-related concerns.

**Objective**—This study describes demographic patterns in the use of calorie information on restaurant menus and investigates relationships between using this information to limit calorie intake and measures of restaurant visit frequency and weight-related concerns and behavior.

**Design/participants**—There were 788 men and 1042 women (mean age=31.0±1.6 years) who participated in the fourth wave of the Project EAT study. Participants were initially recruited in

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**Author contributions:** NL managed the acquisition of data, performed all data analysis, and drafted the manuscript. AFH, CAR, and KAL were involved in planning the data analysis and interpretation of the results. DN-S conceived of the overall study and served as Principal Investigator for Project EAT-IV. All authors critically reviewed and approved of the manuscript.

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Minneapolis-St. Paul, Minnesota schools and completed EAT-IV surveys online or by mail in 2015–2016.

**Main Outcome Measures**—Participants self-reported weight-related concerns, restaurant eating, intuitive eating, dieting, healthy (e.g., exercise) and unhealthy (e.g., use laxatives) weight control behaviors, and binge eating.

**Statistical analyses performed**—Descriptive statistics and linear and logistic regression models accounting for demographics and weight status.

**Results**—Approximately half of participants (52.7%) reported they had noticed calorie information while purchasing a meal or snack in a restaurant within the past month. Among those who noticed calorie information, 38.2% of individuals reported they did not use it in deciding what to order. The most common use of calorie information was to avoid high calorie menu items (50.1%) or to decide on a smaller portion (20.2%). Using menu labels to limit calories was related to binge eating among women and was associated with more weight-related concerns, dieting, and unhealthy weight control behaviors among both women and men.

**Conclusions**—Nutrition and other health professionals should talk with clients who struggle with disordered eating or weight-related concerns to learn about their use of calorie information at restaurants, address any potential unintended consequences, and promote healthy uses of calorie information.

### Keywords

restaurants; menu labeling; binge eating; dieting; weight control

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The provision of calorie information on restaurant menus has been identified as one promising, cost-effective strategy for preventing obesity and related chronic diseases,<sup>1,2</sup> and is currently scheduled to become a federal requirement for U.S. chain restaurants in May 2018.<sup>3</sup> From an obesity prevention perspective, there is some evidence that menu labeling may encourage restaurants to offer lower calorie menu items.<sup>4,5</sup> Calorie labels may also lead consumers to select lower calorie choices in certain settings such as full-service restaurants,<sup>4,6</sup> but there is growing evidence of disparities in consumer use of menu labeling (e.g., used less by low-income consumers)<sup>7</sup> and potential unintended consequences for consumers with eating or weight-related concerns.<sup>8</sup> Although researchers did not observe any unintended consequences for eating behavior following the introduction of menu calorie labels in one cafeteria study,<sup>9</sup> a randomized-controlled, online study found that when individuals with anorexia nervosa or bulimia nervosa were asked to make hypothetical choices they ordered fewer calories and those with binge eating disorder ordered more in the presence of labels compared to no labels.<sup>8</sup> Given the limited state of the literature and mixed nature of results, more research is needed to understand the degree to which restaurant menu labeling may positively or negatively influence individuals with varying eating and weight-related concerns.

National survey data indicate that more than half of adults who report noticing calorie information at restaurants, also report using it to make ordering decisions.<sup>10</sup> Although prior research has identified demographic characteristics associated with reported use of menu

calorie labels, few population-based studies have examined reasons for using the information among those engaging in healthy and unhealthy weight-related behaviors.<sup>11–13</sup> On the one hand, restaurant calorie labels may negatively impact the eating or psychosocial health of individuals with weight concerns; on the other hand, the provision of information may reduce feelings of anxiety when eating out among those who struggle with disordered eating (i.e., a disturbed pattern of eating that involves unhealthy behaviors such as restrictive dieting, taking laxatives or diuretics to lose weight, or binge eating).<sup>14–17</sup> Calorie information on restaurant menus may also be less relevant for individuals that adhere to the philosophy of intuitive eating (i.e., to eat when one is hungry and stop when satiated). Finally, reasons for use may differ based on frequency of visiting restaurants and restaurant setting given that effects of restaurant menu labeling appear to be stronger in certain settings like full-service restaurants, coffee chains, and sandwich shops.<sup>4</sup>

The current study aimed to extend the evidence base by describing the use of calorie information on restaurant menus among a population-based young adult sample and investigating relationships between use of this information to limit calorie intake and measures of restaurant visit frequency and weight-related concerns and behavior. Specifically, the study examined overall concern about weight, use of an intuitive approach to eating, dieting to lose weight, use of various healthy and unhealthy weight control behaviors, and binge eating in relation to menu label use. It was hypothesized on the basis of prior research findings that greater concern about weight and use of weight-control behaviors would be related to a higher prevalence of using menu labels to limit calorie intake,<sup>8, 13</sup> but no hypotheses were made specifically regarding use of different types of weight control (i.e., healthy, unhealthy, or extreme) or binge eating. Evidence of this nature is important to help health providers and programs in developing strategies and messages to guide the public in using calorie labels at restaurants. Additionally, the results may have implications for refinements to the federal menu labeling requirements.

## METHODS

### Sample and Study Design

Project EAT (Eating and Activity in Teens and Young Adults) is a large, population-based study on eating and weight-related outcomes that has followed young people from adolescence to adulthood. At the original assessment (1998–1999), a total of 4,746 adolescents enrolled at 31 public middle schools and senior high schools in the Minneapolis-St. Paul metropolitan area of Minnesota completed surveys and anthropometric measures.<sup>18, 19</sup>

Data for the cross-sectional analysis reported here are drawn from the fourth survey wave conducted in 2015–2016. Original participants who had responded to at least one previous follow-up survey wave were mailed letters inviting them to complete the EAT-IV survey. EAT-IV survey data were collected online, by mail, or by phone from 66.1% of those for whom current contact information was available (N=2,770), resulting in a final sample of 1,830 young adults.

All study protocols were approved by the University of Minnesota's Institutional Review Board Human Subjects Committee. Parental consent and written assent from participants was obtained in 1998–1999. For the fourth survey wave, participants were mailed a consent form with their paper survey or reviewed a consent form as part of the online survey. Completion of the follow-up survey implied written consent.

## Survey Development

The EAT-IV survey was based on surveys used in previous study waves but modified to assess age-appropriate topics and to explore issues of emerging interest. Given recent attention on the provision of calorie information on restaurant menus, measures were added to assess if this information was noticed and used in making ordering decisions. Focus groups involving 35 young adults were used to pre-test an initial draft of the survey and feedback was used to reword or eliminate problematic survey measures prior to fielding. Scale psychometric properties were examined in the full sample of responders to the EAT-IV survey and estimates of item test-retest reliability, reported below, were determined in a subgroup of 103 participants who completed the EAT-IV survey twice within a period of one to four weeks.

**Calorie information on restaurant menus**—To determine if participants noticed calorie information on restaurant menus, they were first asked the yes/no question: “In the past month, have you noticed any calorie information while purchasing a meal or snack in any type of restaurant (such as a coffee shop, fast food restaurant, fast casual restaurant, or sit-down restaurant)?” (test-retest agreement=83%). If participants responded yes, they were asked, “How did you use that calorie information when deciding what to order? Please mark all that apply.” Participants were given the options of indicating they had not used the calorie information or used the calorie information to “avoid ordering high calorie menu items”, “avoid ordering something that would leave them hungry”, “decide on a smaller portion size”, or “decide on a larger portion size” (test-retest agreement for individual items=75–98%). Additionally, participants could choose to write down some alternate way they had used the information and these responses were summarized or back coded when appropriate. Responses regarding use of calorie information were dichotomized for analysis such that those who reported they had used calorie information to avoid high calorie menu items or decide on a smaller portion size were coded as using menu labels to limit calorie intake.

**Restaurant use**—Frequency of eating food from full-service restaurants and six categories of fast-food restaurants (i.e., burger-and-fries, fried chicken, Mexican, Asian, pizza, sandwich/sub) was assessed with the question: “In the past month, how often did you eat something from the following types of restaurants (include take-out and delivery)?” Examples of quick-service and fast casual restaurant chains were provided for each type of fast food restaurant. Response options were “never/rarely,” “one to three times per month,” “one to two times per week,” “three to four times per week,” “five to six times per week,” and “one or more times per day.” To allow for comparison of mean frequencies, the response options were correspondingly assigned scores of 0, 2, 6, 14, 22, and 28 times per month. This measure was adapted from a screener previously developed to assess restaurant use among adolescents.<sup>20</sup> The test-retest reliability of reported frequencies among young adults

varied according to the type of food served at restaurants, ranging from  $r=0.52$  (Asian food, pizza) to  $r=0.73$  (full-service).

**Weight-related concern**—Weight-related concern was assessed by asking participants to indicate how strongly they agreed with four statements: 1) “I think a lot about being thinner”, 2) “I am worried about gaining weight”, 3) “I weigh myself often”, and 4) “I sometimes skip meals since I am concerned about my weight”.<sup>21</sup> Response categories for each item were “strongly disagree”, “somewhat disagree”, “somewhat agree”, and “strongly agree”; these responses were scored one to four and summed such that higher values indicated greater concern (Cronbach’s  $\alpha=0.77$ , test-retest reliability  $r=0.74$ ).

**Intuitive eating**—Use of an intuitive approach to eating was assessed with six items drawn from the Hunger and Satiety Cues subscale of the Intuitive Eating Scale and one additional item developed for the EAT-IV survey.<sup>22, 23</sup> Participants were asked to indicate how strongly they agreed with seven statements: “I stop eating when I feel full”, “I trust my body to tell me *when* to eat”, “I trust my body to tell me *what* to eat”, “I trust my body to tell me *how much* to eat”, “I rely on my hunger signals to tell me when to eat”, “I rely on my fullness (satiety) signals to tell me when to stop eating” and “I trust my body to tell me when to stop eating”. Response categories for each item were “strongly disagree”, “somewhat disagree”, “somewhat agree”, and “strongly agree”; these responses were scored one to four and summed such that higher values indicated greater reliance on internal signals to guide eating (Cronbach’s  $\alpha=0.87$ , test-retest reliability  $r=0.75$ ).

**Weight-control behaviors**—*Dieting* was assessed with the question “How often have you gone on a diet during the last year? By ‘diet’ we mean changing the way you eat so you can lose weight.” Responses included “never”, “one to four times”, “five to ten times”, “more than ten times,” and “I am always dieting”. These responses were dichotomized into nondieters (responded never) and dieters (other responses) (test-retest agreement=89%).<sup>24</sup> *Healthy weight control behaviors* were assessed with the question: “How often have you done each of the following things in order to lose weight or keep from gaining weight during the past year?”. The healthy behaviors assessed were 1) exercise, 2) ate more fruits and vegetables, 3) ate less high-fat foods, 4) ate less sweets, 5) drank less soda pop (not including diet pop), and 6) watched my portion sizes (serving sizes). Responses were dichotomized and combined such that those reporting the use of one or more healthy behavior “sometimes” or “on a regular basis” were coded as using healthy weight control behaviors and those indicating “never” or “rarely” for each behavior were coded as nonusers (test-retest agreement=96%). *Unhealthy weight control behaviors* were assessed with the question: “Have you done any of the following things in order to lose weight or keep from gaining weight during the past year?” (yes/no for each method). The methods categorized as unhealthy weight control behaviors included 1) fasted, 2) ate very little food, 3) used a food substitute (powder or a special drink), 4) skipped meals, 5) smoked more cigarettes, 6) took diet pills, 7) made myself vomit, 8) used laxatives, and 9) used diuretics. For analysis, those who responded “yes” for one or more unhealthy behaviors were coded as users (test-retest agreement=86%). Additional analysis focused on the use of *extreme weight control behaviors*, and those who responded “yes” to one or more of the behaviors taking diet pills,

making oneself vomit, using laxatives, and using diuretics were coded as users (test-retest agreement= 96%).

**Binge eating**—Participants were asked the question: “In the past year, have you ever eaten so much food in a short period of time that you would be embarrassed if others saw you (binge eating)?” (yes/no).<sup>25</sup> If participants responded yes, they were asked, “During the times when you ate this way, did you feel you couldn’t stop eating or control what or how much you were eating?” (yes/no). Those who responded yes to both questions were categorized as engaging in binge eating (test-retest agreement=94%). Additionally, participants were asked “How often, on average, did you have times when you ate this way – that is, large amounts of food plus the feeling that your eating was out of control?”.

**Weight status**—Weight status was assessed using self-reported height and weight, from which body mass index (BMI, kg/m<sup>2</sup>) was calculated. Self-report of height (test-retest r=0.98) and weight (test-retest r=0.97) were previously validated in a subsample of 62 female and 63 male participants as part of a 10-year follow-up assessment.<sup>26</sup> Results showed very high correlations between self-reported BMI and measured BMI in females (r=0.98) and males (r=0.95). An overweight or obese weight status was defined according to current guidelines for adult weight status (BMI ≥ 25 kg/m<sup>2</sup>).<sup>27</sup>

**Demographic characteristics**—Demographic characteristics were self-reported and included sex, age, educational attainment, household income, and parental status. Educational attainment was assessed with the question: “What is the highest level of education that you have completed?” (test-retest agreement=97%) and the response options provided were “middle school or junior high”; “some high school”; “high school graduate or GED”; “vocational, technical, trade or other certification program”; “associate degree”; “bachelor degree”; “graduate or professional degree (MS, MBA, MD, PhD, etc)”; and “other”. Household income was assessed with the question: “What was the total income of your household before taxes in the past year?” (test-retest r=0.94) and the response options provided were “less than \$20,000”, “\$20,000–\$34,999”, “\$35,000–\$49,999”, “\$50,000–\$74,999”, “\$75,000–\$99,999”, and “\$100,000 or more”. Parental status was based on report of living with one or more child of your own for the majority of the past year. Ethnicity/race was based on self-report on the original school-based survey (test-retest κ=0.70–0.83). Response categories for educational attainment, household income, and ethnicity/race were collapsed for analysis based on the distribution of responses.

## Statistical Analysis

Descriptive statistics were calculated to describe patterns of noticing calorie information on restaurant menus and use of menu labels to limit calorie intake. Chi-square tests were first used to examine unadjusted differences in awareness and use of labels according to participant characteristics. Associations of awareness and use of menu labels with demographic characteristics were also examined in a model simultaneously including all characteristics. Likewise, associations of awareness and use of menu labels with frequency of eating at different types of restaurants were examined using linear regression models adjusted for the identified demographic correlates (sex, age, educational attainment,

household income, and ethnicity/race). Similarly, associations of awareness and use of menu labels with weight-related concerns and behaviors were examined using separate linear (for weight concern and intuitive eating approaches) and logistic (for dieting, type of weight-control behaviors, and binge eating) regression models adjusted for the same demographic characteristics. Models were also examined with additional adjustment for weight status but, as the results were similar, it was decided to include in the tables only the results based on the models described above. In order to determine if observed associations of menu label use with weight-related concerns and behaviors were consistent across sex, interaction terms were added to each regression model. For each case where the *P* value for an interaction term was <0.10 and provided some evidence of effect modification, sex-stratified models were examined. A 95% confidence level was used to interpret the statistical significance of all other probability tests.

All analyses were conducted using the Statistical Analysis System (version 9.3, 2011, SAS Institute Inc., Cary, NC) and weighted because attrition from the original school-based sample did not occur at random. The data were weighted using the response propensity method.<sup>28</sup> Response propensities (i.e., the probability of responding to the EAT-IV survey) were estimated using a logistic regression of EAT-IV response on a large number of predictor variables from the school-based survey. The weighting method resulted in estimates representative of the demographic make-up of the original school-based sample, thereby allowing results to be more fully generalizable to the population of young people in the Minneapolis-St. Paul metropolitan area in 1998–1999.

## RESULTS

### Description of Sample and Reported Use of Menu Labels to Limit Calorie Intake

The participant sample had a mean age of 31.0±1.6 years (range: 28–36 years) and 56.9% identified as female. Ethnic/racial backgrounds identified by the sample were 48.2% white, 18.8% African American, 19.4% Asian, 5.7% Hispanic, 3.4% Native American, and 4.5% mixed or other ethnicity/race. The sample was also well-distributed across levels of educational attainment: 30.1% up to the equivalent of a high school degree; 27.2% two-year vocational, technical or associate degree; 29.4% 4-year bachelor's degree, and 13.3% graduate or professional degree.

Approximately half of participants (52.7% of 1,830) reported they had noticed calorie information while purchasing a meal or snack in a restaurant within the past month. Greater likelihood of calorie information awareness was related to female sex (*P*<0.001), higher household income (*P*<0.001), higher educational attainment (*P*<0.001), and white ethnicity/race (*P*=0.007) in unadjusted analyses (see Table 1 for percentages). One third of participants with annual household incomes under \$20,000 were aware of calorie information compared to 63.9% in households with an annual income over \$100,000 (*P*<0.001). Similarly, 42.8% of participants with up to the equivalent of a high school degree reported noticing calorie information compared to approximately 60% of participants that reported at least four years of post-secondary education (*P*<0.001).

Among those who had noticed calorie information in the past month (n=1,044), the types of use reported by the most participants were to help avoid high calorie menu items (50.1%) and to help decide on a smaller portion (20.2%) on one or more occasion. Relatively few participants reported using the information to help avoid menu items that would leave them hungry (6.4%) or to help decide on a larger portion size (3.4%). A small percentage (2.7%) of participants reported using calorie information for other reasons that were not provided as response options such as tracking total calorie intake, planning other meals and snacks later in the day, and gauging how much food is in the meal. More than one third of participants who noticed calorie information reported they did not use it when deciding what to order on one or more occasions. Similar to the associations observed for awareness of calorie information, unadjusted analyses indicated that greater likelihood of using menu labels to limit calorie intake was related to female sex ( $P<0.001$ ), higher educational attainment ( $P<0.001$ ), higher household income ( $P<0.001$ ), and self-identification as white or Asian American ethnicity/race ( $P=0.03$ ) (see Table 1 for percentages).

Most observed associations between demographic characteristics and reports of awareness and use of menu information to limit calorie intake were similar to adjusted models including all of the characteristics in Table 1. However, ethnicity/race was unrelated to awareness or use of menu information in models that accounted for other characteristics. In the adjusted models, weight status was also related to both awareness and use of menu information to limit calorie intake. Awareness and use of menu information to limit calorie intake were reported by a slightly higher percentage of participants who were overweight versus not overweight ( $P=0.002$ ).

In models adjusting for demographic characteristics, awareness and use of menu information to limit calorie intake were further examined in relation to patterns of restaurant use (Table 2). Neither the overall frequency of restaurant eating nor frequency of eating at fast food restaurants was related to awareness or use of menu information to limit calorie intake. Multiple associations were however observed when frequency of eating at other specific types of restaurants was examined. In particular, awareness of menu calorie information was related to eating more frequently at sit-down restaurants, Mexican restaurants, and sandwich/sub restaurants and conversely to eating less often at fried chicken restaurants. Use of menu labels to limit calorie intake was related to eating more frequently at sit-down restaurants and sandwich/sub restaurants and conversely to eating less often at burger-and-fries restaurants.

### **Weight-related Concern, Intuitive Eating, and Use of Menu Labels to Limit Calorie Intake**

In models adjusting for demographic characteristics, use of menu labels to limit calorie intake was related to reports of higher weight-related concern (based on strength of agreement with four statements, range 4–16) and lower use of intuitive eating approaches (based on strength of agreement with seven statements, range 7–28) among those who reported noticing the labels. The average score for weight concern among participants using menu labels to limit calorie intake was 10.4 (standard error [SE]=0.1) and was 8.8 (SE=0.1) among those who noticed the labels but did not use them for this purpose ( $P<0.001$ ). Although a statistically significant association was also observed for intuitive eating, the



magnitude of difference was much smaller; the average score was 20.0 (SE=0.2) among participants using menu labels to limit calorie intake and 20.7 (SE=0.2) among those who noticed the labels but did not use them for this purpose ( $P=0.006$ ). There was no significant interaction between sex and use of menu labels in regards to weight-related concern or intuitive eating.

### **Weight-related Behaviors Associated with Using Menu Labels to Limit Calorie Intake**

Models adjusting for demographic characteristics showed that participants reporting use of menu labels to limit calorie intake were more likely than others who noticed menu labels to also report dieting and the use of various specific weight control behaviors (Table 3). The analysis used categories of weight control behaviors based on designations of healthy or unhealthy and showed that the proportion of participants using menu labels to limit calorie intake was higher among those using any unhealthy weight control behaviors (66.7%, SE=2.5%) than it was among those using exclusively healthy behaviors (57.2%, SE=3.0%;  $P=0.009$ ). Similar results were found in models that focused on the use of any more extreme unhealthy weight control behaviors such as taking diet pills or diuretics.

Models including an interaction term indicated that observed associations for weight control behaviors did not differ by sex; however, the interaction term in the model for binge eating provided evidence of effect modification by sex ( $\chi^2=5.1$ ,  $P=0.02$ ). In sex-stratified models, binge eating was related to greater reported use of menu labels to limit calorie intake among women but there was no association among men. The percentage of women reporting use of menu labels to limit calorie intake was 78.9% (SE=4.6%) among those who reported binge eating in the past year and in comparison the percentage that had used menu labels to limit calorie intake was 66.3% (SE=2.8%) among those who did not report binge eating ( $P=0.02$ ).

## **DISCUSSION**

This study described the use of calorie information on restaurant menus among a population-based sample of young adults and investigated relationships between using this information to limit calorie intake and measures of restaurant eating frequency and weight-related concerns and behavior. More than half of survey respondents were aware of calorie information on menus even before national implementation of menu labeling requirements, but population subgroups at greatest risk for obesity and nutrition-related chronic disease (i.e., individuals with lower household incomes and less formal education) were least likely to notice. Another potential concern is that the most common reported use of this information - to guide ordering decisions that would limit calorie intake - was associated among women with reports of binge eating and related to higher weight-related concerns, dieting, and other weight control behaviors among both women and men. In particular, it is noteworthy that the use of menu labels to limit calorie intake was highest among participants using unhealthy weight control behaviors versus only healthy behaviors.

The results of the current study align with and extend previous research that has examined demographic patterns in the use of menu labels and how menu label use may be related to eating at different types of restaurants. National survey data and research in convenience samples of adults have similarly shown that women, individuals with higher household

incomes, college graduates, and individuals who identify as non-Hispanic white tend to report use of calorie information more often when this information is available in a restaurant.<sup>11, 12, 29</sup> As part of the current study, these demographic patterns also were found to align specifically with the use of menu labels to limit calorie intake. Additionally, the current study found that reports of both noticing and using menu labels to limit calorie intake were related to eating more often at sandwich/sub and sit-down restaurants. These findings are consistent with prior empirical evidence that menu labels encourage lower calorie choices at sandwich shops and full-service restaurants, but may have more limited effects at typical fast-food restaurants.<sup>4</sup>

Prior studies addressing perceptions of calorie labels on menus have focused on post-secondary students and geographically diverse adults recruited to participate in an online survey.<sup>30, 31</sup> In public opinion polls the vast majority of people support menu labeling policy, but study participants have also expressed concerns about the potential for menu labels to exacerbate disordered eating.<sup>32</sup> For example, a study of undergraduate students attending an urban university found that nearly all participating students, and particularly young women, were in favor of having nutrition information posted in dining halls and many reported that calorie labels influence their food choices at least some of the time.<sup>30</sup> Even though most students did not report being concerned that nutrition labels would promote the development of eating disorders, approximately one third of students felt the labels could aggravate existing eating problems and a similar proportion felt the labels would make it difficult to recover from an eating disorder.<sup>30</sup> In line with these concerns, Haynos and Roberto found that, although labels did not differentially influence those with and without disordered eating symptoms, labels did lead those with more severe symptoms of anorexia nervosa and bulimia nervosa to hypothetically order fewer calories and individuals with binge eating disorder to order significantly more calories.<sup>8</sup> These results taken together with the current study suggest a need for health professionals to ask about the use of calories labels when caring for individuals that struggle with disordered eating. Additionally, the results emphasize the need for research to further explore the extent to which individuals that use unhealthy weight control behaviors restrict their energy intake or experience negative reactions in response to calorie information in restaurants.

The existing literature includes only a small number of previous studies that have examined linkages between weight-related concerns of adults and either their response to menu labels or reported use of menu labels in cafeterias<sup>9, 33</sup> and restaurants.<sup>8, 12, 33</sup> These studies have reported mixed findings regarding the potential influence of menu labeling on individuals with weight-related concerns and use of labels among those with different weight-related eating behaviors. The divergent findings might in part be explained by differences in sampling, settings (cafeterias versus various types of restaurants), and methods used to assess menu ordering behavior (e.g., hypothetical versus retrospective report of actual decisions) and weight-related concerns and behavior. For instance, among a national sample, Bleich and Wolfson reported differences in the likelihood of using menu labels at fast food restaurants according to whether adults were pursuing any weight loss activities and most types of weight loss activities; however, those using unhealthy methods (e.g., prescription diet pills, laxatives) were no more likely to use menu labels.<sup>13</sup> The current study adds to the evidence base by examining the relationship between self-reported use of menu labels across

several restaurant types and a broad range of healthy and unhealthy weight-control behaviors. Moreover, the current study represents one of the first to explore associations of menu label use with intuitive eating and binge eating. Given the state of the literature on intuitive eating behavior it is not possible to assess whether the small observed difference in the behavior score may be meaningful at the population level. More research is needed to explore use of menu labels in relation to these behaviors and for further exploration of whether labels are helpful to those who use unhealthy weight-related behaviors or exacerbate their tendencies to restrict or overeat.

This study has a number of strengths and limitations. Strengths include the assessment of eating at several different types of restaurants, multiple measures of weight-related intentions and behaviors, and large and population-based sample. Few population-based studies to date have collected detailed information on weight-related behaviors along with reported use of menu calorie information, and the participants involved in this study were diverse in terms of household income, educational attainment, ethnicity/race, parental status, weight status, and use of restaurants. This study's focus on adults in their twenties and thirties is both a strength and limitation. There is a timely need to understand the use of menu calorie information among populations in their twenties and thirties as the impact of eating at restaurants on energy intake tends to be greater for populations in this life stage than for older adults and the menu ordering behaviors of parents within this population group may also have a secondary impact on the intake of their children.<sup>34</sup> However, the study population did not capture use of menu labels among young people in their late teens and early twenties or use by older adults that may benefit from menu label information to manage chronic diseases. The diverse nature of the sample provided the opportunity to build understanding of menu label use among young adult population subgroups; however, some caution should be used in generalizing the results to populations outside the Midwest. Additionally, some care should be used in interpreting the observed associations between use of menu labels and weight-related intentions given the timing of the survey and cross-sectional design. The EAT-IV survey was conducted far before the scheduled national implementation of the U.S. Food and Drug Administration's menu labeling rule and it is possible that individuals respond differently to calorie information after repeated and more frequent exposure.<sup>3</sup> The cross-sectional survey design further limits what can be concluded regarding the temporality of observed associations. Additionally, the measure of reasons for using calorie information did not include a response option to specifically capture the potential unintended consequence of using the information to select items higher in calories than one would otherwise order without labels.

In conclusion, the results suggest that nutrition educators and other health professionals should be aware of and ask young adults with weight concerns about their use of calorie information at restaurants. The associations observed between patterns of menu label use and eating at different types of restaurants further may be helpful in targeting educational messages to the public and providing guidance to clients with weight concerns. Providing calorie information on restaurant menus may prove to be a useful tool for weight management, especially if it promotes the reformulation of menu items and improved access to lower-calorie, nutrient-dense options.<sup>1, 2, 4</sup> However, health professionals that provide care for patients with weight-related concerns should consider assessing patients for anxiety

around eating in restaurants, increased use of unhealthy weight control behaviors in response to calorie information, and excessive concern with calorie information that interferes with eating an overall nutritionally adequate diet. Findings of the current study indicate there is a need for additional longitudinal research to explore how weight-related concerns and the use of unhealthy weight control behaviors may change in response to repeated exposure to calorie information on restaurant menus. Following the deadline for chain restaurants to fully implement federal menu labeling requirements, it will be important for research to further address how often calorie information is used by various population subgroups and in different situations as well as potential negative reactions to this information so that public education campaigns and future refinements to labeling requirements will be well informed. For example, future research might evaluate whether the inclusion of additional nutrition information (e.g., saturated fat, sodium) on menus helps consumers to balance concerns about weight and overall health.

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## References

1. Gortmaker S, Wang Y, Long M, et al. Three interventions that reduce childhood obesity are projected to save more than they cost to implement. *Health Aff.* 2015; 34(11):1932–1939.
2. Sinclair S, Cooper M, Mansfield E. The influence of menu labeling on calories selected or consumed: a systematic review and meta-analysis. *J Acad Nutr Diet.* 2014; 114(9):1375–1388. [PubMed: 25037558]
3. Food and Drug Administration, Department of Health and Human Services. Food labeling: nutrition labeling of standard menu items in restaurants and similar retail food establishments; extension of compliance date; request for comments. 82 FR 20825: Federal Register. 2017:20825–20829.
4. VanEpps E, Roberto C, Park S, Economos C, Bleich S. Restaurant menu labeling policy: review of evidence and controversies. *Curr Obes Rep.* 2016; 5(1):72–80. [PubMed: 26877095]
5. Bleich S, Wolfson J, Jarlenski M. Calorie changes in large chain restaurants from 2008 to 2015. *Prev Med.* 2017; 100:112–116. [PubMed: 28389331]
6. 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]
7. Sarink D, Peeters A, Freak-Poli R, et al. The impact of menu energy labeling across socioeconomic groups: A systematic review. *Appetite.* 2016; 99:59–75. [PubMed: 26723238]
8. Haynos A, Roberto C. The effects of restaurant menu calorie labeling on hypothetical meal choices of females with disordered eating. *Int J Eat Disord.* 2017; 50(3):275–283. [PubMed: 28130796]
9. Lillico H, Hanning R, Findlay S, Hammond D. The effects of calorie labels on those at high-risk of eating pathologies: a pre-post intervention study in a University cafeteria. *Public Health.* 2015; 129(6):732–739. [PubMed: 25931435]
10. Lee-Kwan S, Pan L, Maynard L, Kumar G, Park S, Centers for Disease Control and Prevention. Restaurant menu labeling use among adults—17 states, 2012. *MMWR Morb Mortal Wkly Rep.* 2014; 63(27):581–584. [PubMed: 25006823]
11. Lee-Kwan S, Pan L, Maynard L, McGuire L, Park S. Factors associated with self-reported menu-labeling usage among US adults. *J Acad Nutr Diet.* 2016; 116(7):1127–1135. [PubMed: 26875022]

12. Oh A, Nguyen A, Patrick H. Correlates of reported use and perceived helpfulness of calorie information in restaurants among US adults. *Am J Health Promot.* 2016; 30(4):242–249. [PubMed: 27404059]
13. Bleich S, Wolfson J. Differences in consumer use of food labels by weight loss strategies and demographic characteristics. *BMC Public Health.* 2015; 15:1275. [PubMed: 26690655]
14. Ferrer-García M, Gutiérrez-Maldonado J, Caqueo-Urizar A, Moreno E. The validity of virtual environments for eliciting emotional responses in patients with eating disorders and in controls. *Behav Modif.* 2009; 33(6):830–854. [PubMed: 19822737]
15. Gutiérrez-Maldonado J, Ferrer-García M, Caqueo-Urizar A, Moreno E. Body image in eating disorders: the influence of exposure to virtual-reality environments. *Cyberpsychol Behav Soc Netw.* 2010; 13(5):521–531. [PubMed: 20950176]
16. Timmerman G. Restaurant eating in nonpurge binge-eating women. *West J Nurs Res.* 2006; 28(7): 811–824. [PubMed: 17056775]
17. Van Dyke N, Drinkwater E. Relationships between intuitive eating and health indicators: literature review. *Public Health Nutr.* 2014; 17(8):1757–1766. [PubMed: 23962472]
18. Neumark-Sztainer D, Story M, Hannan P, Moe J. Overweight status and eating patterns among adolescents: Where do youth stand in comparison to the Healthy People 2010 Objectives? *Am J Pub Health.* 2002; 92(5):844–851. [PubMed: 11988458]
19. Neumark-Sztainer D, Croll J, Story M, Hannan PJ, French SA, Perry C. Ethnic/racial differences in weight-related concerns and behaviors among adolescent girls and boys: findings from Project EAT. *J Psychosom Res.* 2002; 53(5):963–974. [PubMed: 12445586]
20. Nelson M, Lytle L. Development and evaluation of a brief screener to estimate fast-food and beverage consumption among adolescents. *J Am Diet Assoc.* 2009; 109(4):730–734. [PubMed: 19328271]
21. Neumark-Sztainer D, Wall M, Story M, Perry C. Correlates of unhealthy weight control behaviors among adolescent girls and boys: Implications for the primary prevention of disordered eating. *Health Psychol.* 2003; 22(1):88–98. [PubMed: 12558206]
22. Tylka T. Development and psychometric evaluation of a measure of intuitive eating. *J Couns Psychol.* 2006; 53(2):226–240.
23. Tylka T, Kroon Van Diest AM. The Intuitive Eating Scale-2: item refinement and psychometric evaluation with college women and men. *J Couns Psychol.* 2013; 60(1):137–153. [PubMed: 23356469]
24. Neumark-Sztainer D, Wall M, Guo J, Story M, Haines J, Eisenberg M. Obesity, disordered eating, and eating disorders in a longitudinal study of adolescents: How do dieters fare five years later? *J Am Diet Assoc.* 2006; 106(4):559–568. [PubMed: 16567152]
25. Yanovski S. Questionnaire on Eating and Weight Patterns—Revised (QEWP-R). *Obes Res.* 1993; 1:319–324.
26. Quick V, Wall M, Larson N, Haines J, Neumark-Sztainer D. Personal, behavioral and socio-environmental predictors of overweight incidence in young adults: 10-yr longitudinal findings. *Int J Behav Nutr Phys Act.* 2013; 10(37)
27. Jensen M, Ryan D, Apovian C, et al. 2013 AHA/ACC/TOS guideline for the management of overweight and obesity in adults: a report of the American College of Cardiology/American Heart Association Task Force on Practice Guidelines and The Obesity Society. *Circulation.* 2014; 129(25 Suppl 2):S102–S138. [PubMed: 24222017]
28. Little R. Survey nonresponse adjustments for estimates of means. *Int Stat Rev.* 1986; 54(2):139–157.
29. Green J, Brown A, Ohri-Vachaspati P. Sociodemographic disparities among fast-food restaurant customers who notice and use calorie menu labels. *J Acad Nutr Diet.* 2015; 15(7):1093–1101.
30. Martinez O, Roberto C, Kim J, Schwartz M, Brownell K. A survey of undergraduate student perceptions and use of nutrition information labels in a university dining hall. *Health Educ J.* 2012; 72(3):319–325.
31. Roberto C, Haynos A, Schwartz M, Brownell K, White M. Calorie estimation accuracy and menu labeling perceptions among individuals with and without binge eating and/or purging disorders. *Eat Weight Disord.* 2013; 18(3):225–261.

32. Morain S, Mello M. Survey finds public support for legal interventions directed at health behavior to fight noncommunicable disease. *Health Aff (Millwood)*. 2013; 32(3):486–489. [PubMed: 23459727]
33. Fawkes K, Levy J, Terry K, Edelstein S. Female college students' attitudes about body image and food labels and how they affect purchasing behavior. *Top Clin Nutr*. 2010; 25(2):165–171.
34. Nguyen B, Powell L. The impact of restaurant consumption among US adults: effects on energy and nutrient intakes. *Public Health Nutr*. 2014; 17(11):2445–2452. [PubMed: 25076113]

## RESEARCH SNAPSHOT

### Research Question

Is the use of restaurant menu labels for limiting calorie intake (i.e., to help avoid high calorie menu items or decide on a smaller portion) linked to weight-related concern and behavior among young adults?

### Key Findings

A 2015–2016 population-based survey showed 52.7% of respondents were aware of menu calorie information made available prior to national implementation of labeling requirements. Results indicated that using menu labels to limit calories is related to binge eating among women ( $P=0.02$ ) and associated with more weight-related concerns, dieting, and unhealthy weight control behaviors among both women and men (all  $P < 0.01$ ).

Awareness and use of calorie information on restaurant menus among young adults in 2015–2016: unadjusted and adjusted associations with demographic characteristics and weight status

Table 1

	N	Aware of labels (%) <sup>a,b</sup>	N	Used labels to limit calories (%) <sup>a,b</sup>
<b>Overall</b>	1830	52.7	1044	57.5
<b>Sex</b>				
Males	788	47.4	405	49.1
Females	1042	58.2	639	64.6
		$P < 0.0001$		$P < 0.0001$
<b>Age<sup>c</sup></b>				
<30 years	441	49.4	244	57.9
30–36 years	1389	53.8	800	57.3
		$P = 0.10$		$P = 0.87$
<b>Parental status</b>				
No children	1095	51.0	613	58.6
1+ child	726	55.4	425	55.8
		$P = 0.06$		$P = 0.39$
				$P_{\text{adj}} = 0.44$
<b>Household income</b>				
<\$20,000	133	32.3	52	31.7
\$20,000–49,999	519	49.2	278	53.5
\$50,000–99,999	712	55.8	411	58.0
\$100,000	435	63.9	286	70.9
		$P < 0.0001$		$P < 0.0001$
				$P_{\text{adj}} = 0.01$
<b>Educational attainment</b>				
High school degree or below	415	42.8	196	43.2
2-year college degree	446	52.6	241	52.4
4-year college degree	654	60.4	406	64.9
Graduate/professional degree	305	59.1	196	74.4
		$P < 0.0001$		$P < 0.0001$
				$P_{\text{adj}} < 0.0001$
<b>Ethnicity/race</b>				



	N	Aware of labels (%) <sup>a,b</sup>	N	Used labels to limit calories (%) <sup>a,b</sup>	<i>P</i> <sub>adj</sub>
White	1241	56.5	724	60.4	
Black or African American	154	47.4	74	53.8	
Asian American	268	48.1	148	59.9	
Mixed/other	153	53.9	92	47.0	<i>P</i> <sub>adj</sub> =0.56
		<i>P</i> =0.007		<i>P</i> =0.03	
<b>Weight status</b>					
Not overweight	700	50.2	381	56.7	
Overweight (BMI ≥ 25 kg/m) <sup>2</sup>	1026	54.7	607	58.4	
		<i>P</i> =0.07		<i>P</i> =0.62	<i>P</i> <sub>adj</sub> =0.02

<sup>a</sup>All percentages are weighted to reflect the probability of responding to the EAT-IV survey; sample numbers reflect the unweighted size of the participant group.

<sup>b</sup>*P* values represent testing for independence of sociodemographic categorization and past month awareness or use of menu calorie labels by the  $\chi^2$  test. Adjusted *P* values (*P*<sub>adj</sub>) reflect models including all of the demographic characteristics within the table and weight status.

<sup>c</sup>Participants were ages 28–36 years.

Adjusted mean frequency (standard error) of eating at restaurants in the past month by awareness of calorie information on restaurant menus and use of these labels to limit calorie intake among young adults<sup>a,b</sup>

Table 2

	Aware of labels (n=1044)		Used labels to limit calories (n=637)		P value
	Yes	No	Yes	No	
Overall: times/week					
Any restaurant	4.3 (0.1)	4.0 (0.1)	4.2 (0.1)	4.1 (0.1)	0.41
Fast food restaurant	3.2 (0.1)	3.1 (0.1)	3.0 (0.1)	3.1 (0.1)	0.61
Type: times/month					
Sit-down restaurant	3.9 (0.1)	3.4 (0.1)	4.3 (0.2)	3.4 (0.2)	0.003
Burger and fries	3.1 (0.1)	3.1 (0.1)	2.5 (0.1)	3.4 (0.2)	<0.001
Asian	1.5 (0.1)	1.5 (0.1)	1.4 (0.1)	1.4 (0.1)	0.65
Mexican	2.3 (0.1)	1.9 (0.1)	2.4 (0.1)	2.0 (0.1)	0.06
Fried chicken	0.9 (0.1)	1.3 (0.1)	0.7 (0.1)	0.9 (0.1)	0.15
Sandwich or sub	2.8 (0.1)	2.3 (0.1)	3.0 (0.1)	2.4 (0.2)	0.02
Pizza	2.4 (0.1)	2.3 (0.1)	2.3 (0.1)	2.4 (0.1)	0.54

<sup>a</sup>Model includes sex (male, female), age (continuous), household income (<\$20K; \$20K-49,999; \$50K-99,999; >\$100K), educational attainment (high school degree or below, 2-year college degree, 4-year college degree, graduate/professional degree), and ethnicity/race (White, Black or African American, Asian American, Mixed/other).

<sup>b</sup>Estimated mean frequency of eating at a restaurant is based on the assignment of values to correspond to the response categories of “never/rarely,” “one to three times per month,” “one to two times per week,” “three to four times per week,” “five to six times per week,” and “one or more times per day.”

**Table 3**

Percentages (standard error) of young adults that use restaurant menu labels to limit calorie intake by reports of dieting, use of unhealthy and healthy weight-control strategies, and binge eating (n=1044)<sup>a</sup>

	n	<u>Labels used to limit calories</u>	<u>Labels not used to limit calories</u>
Dieting			
Never	383	44.2 (3.2)	55.7 (3.2)
1+ times	691	67.9 (2.2)	32.0 (2.2)
		<i>P</i> <0.001	
Weight control behaviors			
No behaviors	68	24.4 (6.1)	75.6 (6.1)
Any behaviors	968	63.1 (2.1)	36.8 (2.1)
		<i>P</i> <0.001	
Type of weight control behaviors <sup>b,c</sup>			
Only healthy	464	57.2 (3.0)	42.8 (3.0)
Any unhealthy	501	66.7 (2.5)	33.3 (2.5)
		<i>P</i> =0.009	
Extreme unhealthy weight control <sup>d</sup>			
No extreme behaviors	905	58.2 (2.2)	41.8 (2.2)
Any extreme behaviors	132	70.5 (4.1)	29.5 (4.1)
		<i>P</i> =0.01	
Binge eating <sup>*</sup>			
Females			
No	527	66.3 (2.8)	33.7 (2.8)
Yes	111	78.9 (4.6)	21.1 (4.6)
		<i>P</i> =0.02	
Males			
No	363	52.3 (3.2)	47.7 (3.2)
Yes	41	43.8 (8.3)	56.2 (8.3)
		<i>P</i> =0.31	

<sup>a</sup>Model includes age, sex, household income, educational attainment, and ethnicity/race.

<sup>b</sup>Healthy weight control behaviors included exercise, ate more fruits and vegetables, ate less high-fat foods, ate less sweets, drank less soda pop (not including diet pop), and watched my portion sizes.

<sup>c</sup>Unhealthy weight control behaviors included fasted, ate very little food, used a food substitute, skipped meals, smoked more cigarettes, took diet pills, made myself vomit, used laxatives, and used diuretics

<sup>d</sup>Extreme weight control behaviors included diet pills, making oneself vomit, using laxatives, and using diuretics.

<sup>\*</sup>Gender-stratified results are presented as the interaction of binge eating and sex had a *P*value = 0.02.