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Article in International Journal of Eating Disorders · December 2017
DOI: 10.1002/eat.22813

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Questionnaire-based problematic relationship to eating and food is associated with 25 year body mass index trajectories during midlife: The Coronary Artery Risk Development In Young Adults (CARDIA) Study

Cynthia Yoon MS1 | David R. Jacobs Jr PhD1 | Daniel A. Duprez MD, PhD1 | Gareth Dutton PhD, MA2 | Cora E. Lewis MD, MSPH2 | Dianne Neumark-Sztainer PhD, MPH, RD1 | Lyn M. Steffen PhD, MPH, RD1 | Delia S. West PhD, MS3 | Susan M. Mason PhD, MPH1

1University of Minnesota, Minneapolis, Minnesota
2University of Alabama, Birmingham, Alabama
3University of South Carolina, Columbia, South Carolina

Correspondence
Cynthia Yoon, University of Minnesota, Minneapolis, MN.
Email: yoonx065@umn.edu

Funding information
National Heart, Lung, and Blood Institute (NHLBI); University of Alabama at Birmingham, Grant/Award Number: HHSN268201300025C and HHSN268201300026C; Northwestern University, Grant/Award Number: HHSN268201300027C; University of Minnesota, Grant/Award Number: HHSN268201300028C; Kaiser Foundation Research Institute, Grant/Award Number: HHSN268201300029C; Johns Hopkins University School of Medicine, Grant/Award Number: HHSN268200900041C; National Institute on Aging (NIA), Grant/Award Number: AG0005

Abstract

Objective: Problematic eating behaviors and attitudes are of public health concern. Questionnaire-based assessment of these behaviors is important for large-scale research on eating behaviors. The questionnaire on eating and weight patterns-revised (QEWP-R) measures potential problematic behaviors and attitudes toward food (including anxieties, compensatory actions, overeating and loss of control, dieting, and shape concerns) that in aggregate may indicate diagnosable eating disorders. An important question regards the prevalence of these issues and their longitudinal associations with body mass index (BMI) in generally healthy middle aged adults.

Method: Based on eight constructs measured on QEWP-R, we created a new problematic relationship to eating and food (PREF) scale by assigning a point for each construct endorsed. Analyses were conducted in 3,892 black and white men and women participating in the community-based Coronary Artery Risk Development in Young Adults (CARDIA) Study. The QEWP-R was administered in CARDIA year 10, when participants were aged 27–41 years. We used linear regression to model the relationship of individual constructs and the PREF scale to BMI over CARDIA follow-up.

Results: Fifty-five percent of participants had 1–5 points and 4% had 6–8 points on the PREF scale. Each separate construct was positively associated with BMI, except concern about weight and shape. Adjusting for age, race, sex, education, and study center, mean BMI at CARDIA year 10, the time of PREF assessment, was approximately 1.0–2.5 kg/m² higher per PREF category.

Conclusion: In middle age, problematic behaviors and attitudes toward food were common and associated with higher BMI.

KEYWORDS
body mass index, cohort studies, eating, surveys and questionnaires, middle aged

1 INTRODUCTION

The current diagnostic and statistical manual of mental disorders (DSM-V) dichotomously classifies eating disorders into either present or absent (Goyal, Balhara, & Khandelwal, 2012), based on the severity of symptoms. This current “all or none” approach does not address individual and aggregated eating behaviors and attitudes that do not fulfill the strict DSM-V defined eating disorders criteria. In the United States,
the prevalence of individual problematic behaviors and attitudes related to eating and food in young adults (18–35 years) has been found to range from 3.1 to 29.6% in women and 1.5 to 26.0% in men (Stiegel-Moore, Silberstein, & Rodin, 1986). In Finland, the prevalence of individual components relevant to binge-eating disorders varied from 7.4 to 44.7% in women and 2.5 to 48.9% in men (Mustelin, Bulik, Kaprio, & Keski-Rahkonen, 2017). Although the prevalence of subclinical eating disorders among middle-aged women was reportedly <5% (Mangweth-Matzek et al., 2014), the prevalence of individual and aggregated components of disordered eating patterns was substantial (Hudson, Hiripi, Pope, & Kessler, 2007). Several studies considered the association of constructs relevant to binge-eating disorders with weight status among young adults (Mustelin et al., 2017; Neumark-Sztainer, Wall, Haines, Story, & Eisenberg, 2007; Neumark-Sztainer, Wall, Story, & Standish, 2012). However, this type of analysis has not typically been done within large studies that focus on obesity and cardiovascular disease. The database of the large Coronary Artery Risk Development in Young Adults (CARDIA) offers an opportunity to examine individual and aggregated eating behaviors starting in middle-age, across 25 years of follow-up. Subclinical eating behaviors and attitudes in middle-age are important as they may be linked with adverse emotional (Zeiler et al., 2016) and physical health (Neumark-Sztainer et al., 2006) and are problematic as they may progress to full-blown eating disorders. In aggregate, these subclinical eating behaviors and attitudes may reflect a problematic relationship to eating and food (PREF). These problematic attitudes and behaviors toward food are likely to occur along a continuum of severity, ranging from normal eating, through behaviors and attitudes that do not rise to the level of a psychiatric condition, to clinically diagnosable eating disorders.

The questionnaire on eating and weight patterns-revised (QEWP-R) was self-administered in CARDIA when participants were aged 27–41 years old assesses a range of potential problematic behaviors and attitudes related to eating and food that are likely associated with obesity, even among those whose behaviors fall short of full-blown eating disorders (Spitzer, Yanovski, & Marcus, 1994). Using these data, we first aim to characterize problematic behaviors and attitudes and explore their prevalence in this nonclinical population. We focused on eight individual QEWP-R constructs and created a new scale by assigning a point for each construct endorsed (PREF points). Our second aim is to study reliability of PREF in the aspect of diet, given that the psychometric characteristics of the QEWP-R have not been thoroughly assessed. Our third aim is to examine the association of PREF with BMI trajectories and categories of BMI ranging from underweight to class III obesity. We hypothesize that higher PREF assessed in CARDIA year 10 (1995–1996) is associated with greater BMI up to 15 years of follow-up. Further, we hypothesize that behaviors and attitudes measured by PREF are likely long-standing and thus there is an association of PREF with BMI in the earlier years of CARDIA. Because people with multiple problematic behaviors (6–8 points) may have diagnosable eating disorders that have already been more extensively researched, our primary interest is in those with subclinical behaviors, that is, those in the range of 1–5 PREF points.

2 | METHOD

2.1 | Study sample

CARDIA is a prospective cohort in Birmingham, AL, Chicago, IL, Minneapolis, MN, and Oakland, CA. The study recruited 5,115 black and white adults aged between 18 and 30 years old at CARDIA baseline (designated year 0) in 1985 and 1986 (Friedman et al., 1988). The follow-up rates for the seven follow-up examinations (year 2, 5, 7, 10, 15, 20, and 25) were 91, 86, 81, 79, 74, 72, and 72% of survivors, respectively. At each study center, the Institutional Review Board approved the study and each participant signed written informed consent. Eligible participants were those who answered the QEWP-R at year 10 (CARDIA form 50, downloadable from http://www.cardia.dopm.uab.edu) and had measured or reliably imputable BMI (n = 3,892 at year 10). The study flow and timing important design elements are also displayed in Figure 1.

2.2 | Measurements

Weight and height were measured at each examination with participants wearing light clothes and no shoes. Body weight was measured to the nearest 0.2 kg using a balance beam scale and height using a centimeter ruler to the nearest 0.5 cm (Friedman et al., 1988). Body mass index (BMI) was calculated as weight (kg)/height (m)^2.

Standard structured questionnaires were used to obtain age, race, sex, educational attainment, smoking, alcohol drinking, and physical activity (Jacobs, Hahn, Haskell, Pirie, & Sidney, 1989) among CARDIA participants at each examination (documented at http://cardia.dopm.uab.edu).

2.3 | Questions related to a PREF

The QEWP-R is a standard self-administered questionnaire (Nangle, Johnson, Carr-Nangle, & Engler, 1994; Spitzer et a., 1992) developed by Spitzer et al. (1992) which was administered only once at CARDIA year 10 (participant ages 27–41 years). The QEWP-R includes questions about a range of potential problematic behaviors and attitudes toward food. Paralleling the DSM-V eating disorders diagnostic criteria, we say that the participant “endorsed a construct” if he or she answered affirmatively to the construct question or question set, as follows: Anx: anxiety surrounding food and eating (affirmative answer to 3 or more of 5 anxiety questions was counted as Anx = 1); Com: compensation to avoid gaining weight (compensatory behaviors at a frequency of 1/week or more, assessed using 6 questions, was counted as Com = 1); EpiEat: episodic overeating (1 question, “yes” was counted as EpiEat = 1); LoC: sense of loss of control after overeating (1 question asked of those who endorsed EpiEat, “yes” was counted as LoC = 1); Overeat: upset over overeating (those reporting being moderately or more upset about overeating were counted as having Overeat = 1); Control: upset over loss of control when overeating (those reporting being moderately or more upset over loss of control were counted as having Control = 1); Shape: shape and weight concerns (those reporting shape and weight were a main
concern or the most important concern were counted as having Shape-1); and Diet: proportion of time spent on dieting (those reporting they spent at least half of the time dieting as an adult were counted as having Diet = 1). Verbatim questions and application of the above criteria are provided in Supporting Information Table 1. We assign one point for each construct endorsed to form the PREF scale. PREF ranges from 0 to 8 points. We call those who had 0 points “normal eaters.” An overview of the PREF constructs and categories is provided in Figure 2.

2.4 | Repeated measures of history of dieting for reliability of QEWP-R dieting construct

History of past and current dieting (i.e., “Have you been on a weight reducing diet?” and “Are you on such a diet now?”) was asked at each of years 0, 2, 7, 10, 15, 20, and 25. Based on the responses at each exam, participants were categorized into three categories "no history of dieting," "history of ever dieting, but not currently dieting," and "currently dieting."

2.5 | Statistical analysis

The prevalences of each construct and participant characteristics were assessed. Descriptive statistics were presented as mean ± SD or % frequency. In many cases, the PREF scale was summarized into six categories: 0 points, 1 point, 2 points, 3 points, 4 or 5 points, and 6–8 points. Preliminary analyses indicated that BMI was similar between 4 and 5 points; 6–8 points were collapsed to maintain adequate numbers of participants.

Reliability of PREF was assessed in the dimension of dieting. The proportion of time spent on dieting at CARDIA year 10 ("Diet" construct

Questionnaire on Eating and Weight Patterns-Revised (QEWP-R)

Constructs:
Anx: Anxiety associated with eating or around food
Com: Compensatory behavior to avoid weight gain
EpiEat: Episodic overeating without loss of control
LoC: Episodic overeating with loss of control
Overeat: Upset over overeating
Control: Upset over loss of control when overeating
Shape: Concern about weight or shape
Diet: Proportion of time dieting with intention to lose weight

Problematic Relationship to Eating and Food (PREF)
0 point (reference group)
1 point
2 points
3 points
4, 5 points
6, 7, or 8 points

FIGURE 1  Flow chart showing CARDIA exam years and sample for the analyses [Color figure can be viewed at wileyonlinelibrary.com]

FIGURE 2  Overview of the problematic relationship to eating and food concept and its points and categories [Color figure can be viewed at wileyonlinelibrary.com]
in PREF) was compared to the history of past and current dieting reported at each CARDIA examination. We assessed concurrent reliability using diet history asked at year 10. We assessed the association of QEWP-R year 10 dieting with early adulthood dieting reported at year 0. We conducted a cross-sectional examination of PREF with BMI, both at year 10. We assume problematic eating behaviors and attitudes exist before they were queried at year 10; that is, that answers to QEWP-R reflect longer-standing characteristics. Therefore, we also examined 25 year BMI trajectories as a function of PREF using repeated measures regression across all eight CARDA examinations (Toeplitz or banded correlation structure assumed). BMI was further examined in six BMI categories (underweight, normal weight, overweight, class I obese, class II obese, and class III obese) (National Heart, Lung, and Blood Institute, 2016). Associations were examined between PREF and BMI categories at year 0 (young adulthood, the earliest CARDIA examination in the BMI trajectory), year 10 (time of QEWP-R self-administration), and year 25 using multinomial logistic regression.

Statistical tests were two sided with a type 1 error rate of 0.05. Statistical analyses were conducted using SAS 9.4 (SAS Institute Inc., Cary, NC).

3 | RESULTS

The study sample included 794 black men, 1,094 black women, 944 white men, and 1,060 white women. The mean age at PREF assessment was 35 years (27–41 years). Mean educational attainment was 14.6 years. Average BMI in the sample was 27.5 kg/m²; 25.6% were classified as obese, 25.4% were current smokers, and the sample had mean physical activity of 331 exercise units (which equates approximately to 30 min of moderate intensity activity 5 days a week (Whitaker, Odegaard, Jacobs, Sidney, & Pereira, 2017). Twenty-six percent of men were heavier alcohol consumers (consumed at least 14 alcoholic drinks per week), and 20.0% of women were heavier alcohol consumers (consumed at least seven drinks per week) (Table 1).

### Table 1
Characteristics of participants with problematic relationship with eating and food (PREF) measured in 1995–1996 (CARDIA year 10): coronary artery risk development in young adults (n = 3,892)

<table>
<thead>
<tr>
<th>Problematic relationship to food and eating categories N (%)</th>
<th>0 points</th>
<th>1 point</th>
<th>2 points</th>
<th>3 points</th>
<th>4–5 points</th>
<th>6–8 points</th>
<th>Total (n = 3,892)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Black men</td>
<td>373 (47.0)</td>
<td>225 (28.3)</td>
<td>101 (12.7)</td>
<td>58 (7.3)</td>
<td>28 (3.5)</td>
<td>9 (1.1)</td>
<td>794</td>
</tr>
<tr>
<td>Black women</td>
<td>442 (40.4)</td>
<td>235 (21.5)</td>
<td>141 (12.9)</td>
<td>91 (8.3)</td>
<td>128 (11.7)</td>
<td>57 (5.2)</td>
<td>1094</td>
</tr>
<tr>
<td>White men</td>
<td>444 (47.0)</td>
<td>259 (27.4)</td>
<td>126 (13.3)</td>
<td>49 (5.2)</td>
<td>45 (4.8)</td>
<td>21 (2.2)</td>
<td>944</td>
</tr>
<tr>
<td>White women</td>
<td>371 (35.0)</td>
<td>267 (28.3)</td>
<td>123 (12.4)</td>
<td>95 (9.0)</td>
<td>148 (14.0)</td>
<td>56 (5.3)</td>
<td>1060</td>
</tr>
<tr>
<td>Age (SD), years</td>
<td>35.2 (3.6)</td>
<td>34.9 (3.7)</td>
<td>34.8 (3.7)</td>
<td>34.8 (3.6)</td>
<td>35.1 (3.7)</td>
<td>34.8 (3.7)</td>
<td>35.0 (3.7)</td>
</tr>
<tr>
<td>Education (SD), years</td>
<td>14.6 (2.6)</td>
<td>14.6 (2.5)</td>
<td>14.7 (2.7)</td>
<td>14.5 (2.4)</td>
<td>14.5 (2.5)</td>
<td>14.9 (2.6)</td>
<td>14.6 (2.6)</td>
</tr>
<tr>
<td>BMI (SD), kg/m²</td>
<td>25.9 (5.4)</td>
<td>26.9 (5.9)</td>
<td>28.0 (6.5)</td>
<td>30.6 (7.8)</td>
<td>31.5 (7.6)</td>
<td>32.9 (8.0)</td>
<td>27.5 (6.5)</td>
</tr>
<tr>
<td>% obese (BMI &gt; 30.0 kg/m²)</td>
<td>18.2</td>
<td>22.7</td>
<td>26.7</td>
<td>41.6</td>
<td>51.3</td>
<td>57.3</td>
<td>26.6</td>
</tr>
<tr>
<td>Physical activity (SD), exercise units</td>
<td>323.7 (268.0)</td>
<td>357.4 (277.0)</td>
<td>318.5 (280.2)</td>
<td>318.5 (280.2)</td>
<td>267.0 (221.0)</td>
<td>284.3 (252.2)</td>
<td>331.4 (275.3)</td>
</tr>
<tr>
<td>Current smokers (%)</td>
<td>24.9</td>
<td>29.1</td>
<td>23.3</td>
<td>24.5</td>
<td>21.8</td>
<td>24.7</td>
<td>25.4</td>
</tr>
<tr>
<td>Heavier alcohol consumption (%)</td>
<td>24.9</td>
<td>29.1</td>
<td>23.3</td>
<td>24.5</td>
<td>21.8</td>
<td>24.7</td>
<td>25.4</td>
</tr>
<tr>
<td>&gt;14 drinks/week for men</td>
<td>25.8</td>
<td>27.5</td>
<td>27.6</td>
<td>25.8</td>
<td>14.9</td>
<td>17.7</td>
<td>26.0</td>
</tr>
<tr>
<td>&gt;7 drinks/week for women</td>
<td>23.2</td>
<td>16.4</td>
<td>14.6</td>
<td>19.8</td>
<td>24.6</td>
<td>8.4</td>
<td>20.0</td>
</tr>
</tbody>
</table>

Note. 0 points n = 1,630, 1 point n = 986, 2 points n = 491, 3 points n = 293, 4–5 points n = 349, 6–8 points n = 143.
had 4–5 points, and 3.7% had 6–8 points. Women and whites had dis-proportionately greater prevalence of PREF ≥3 compared to men and blacks (Table 1). Age and educational attainment varied little across PREF. Some other health-related behaviors correlated with PREF. Mean physical activity was lower among those with PREF 7 and 8 points were collapsed for the small sample size.

3.3 | Reliability and internal consistency of the proportion of time spent dieting as reported on the QEWP-R

To examine the reliability of QEWP-R in the dimension of diet, we compared early years of history of dieting and time spent on dieting as an adult on year 10. Those who reported no past-year dieting at year 0 also reported very low levels of dieting on the QEWP-R assessed 10 years later, suggesting consistency in this behavior over time. Among 2,455 participants who reported never having been on a diet in year 0, 6.4% said they dieted half or more of the time. This compares to 50.3% endorsing half or more of the time dieting among the 306 who were currently on a diet at year 0.

3.4 | PREF and BMI

Across the eight examinations, trajectories of mean BMI over the 25 years were graded by PREF points (Figure 3). The gradients of BMI were generally small between 4 and 5 points. The association of mean BMI by PREF strengthened over the 25 years of follow-up. Mean BMI was about 4.5 kg/m² higher for 6–8 versus 0 points at year 0, increasing to about 7.0 kg/m² at year 25. The trajectories of mean BMI did not change much after adjustments for demographic and behavioral variables, including smoking or alcohol consumption. The mean BMI was generally ordered with black women having the highest BMI, followed by black men, white men, and white women. However, there were no significant race-sex interactions in BMI trajectories between PREF (p > .08).

In addition to the trajectories of mean BMI, we examined BMI categories. In year 0 (young adulthood), grades 2 and 3 obesity were infrequent (about 4.9% of the year 0 sample), but the proportion was higher in those with higher PREF (from 1.3% in the PREF 0 points to 7.5% in the PREF 6–8 points, Figure 4). Similarly in year 10, prevalence of grades 2 and 3 obesity were higher over the PREF scale (from 5.5% in 0 points to 35.0% in 6–8 points). Underweight was rare in all exam years; most underweight persons had 0 PREF points.

4 | DISCUSSION

We found that in a community sample of middle-aged adults, problematic behaviors and attitudes toward food were highly prevalent. >59% of CARDIA participants endorsed one or more of the problematic behaviors and attitudes toward food, with 55% endorsing 1–5 PREF points. Additionally, we found increasing BMI trajectories over time across all PREF points, from 3 to 10 years before these eating behaviors were assessed to 15 years of follow-up, which may reflect the fact that these eating behaviors and attitudes may have been longstanding. The shape of these trajectories across all PREF categories mirrors the recent CARDIA finding that the overall mean weight increase through-out the first 15 years was followed by a relatively flat mean weight trajectory (Dutton et al., 2016). Most importantly, greater mean BMI and greater adiposity was strongly graded across PREF points, including PREF 1–5 points. For example, those who had PREF 1 point had a mean BMI about 1.1 kg/m² greater than normal eaters (PREF 0 points) in year 10, while those with PREF 4–5 points had BMI 5.6 kg/m² greater than normal eaters.

Furthermore, seven of the eight problematic eating/attitude constructs were associated with higher BMI. Therefore it is consistent with our hypothesis that individual eating behavior constructs can be used to form an efficient epidemiological definition of minimal to severe PREF that has potential consequences for weight-related health.
Given their high prevalences, these behaviors may be seen as normative in middle-aged adults. Similar to the highly prevalent PREF behaviors in our study, a longitudinal study conducted in Finland that assessed seven components relevant to binge eating disorders from the Eating Disorder Inventory-2 (corresponding approximately to the EpiEat, LoC, and Anx constructs in this report) found that 67% of young women endorsed at least one binge-eating disorder construct, and 19 and 3.9% endorsed 3–5 components, and 6–7 components, respectively (Mustelin et al., 2017).

Project EAT reported that subjects with greater BMI were at greater risk for binge eating 5 years later (Goldschmidt, Wall, Zhang, Loth, & Neumark-Sztainer, 2016). Furthermore, dieting led to greater weight gain after 3–5 years of follow-up (Field et al., 2003; Neumark-Sztainer et al., 2007), and the usage of unhealthy weight control behaviors led to greater BMI after 5 years of follow-up in Project EAT (Neumark-Sztainer et al., 2006). Coupled with these findings, our results suggest that endorsement of 1–5 PREF points captures problematic issues that are important for individuals and for public health. Importantly, most of these behaviors would not rise to the level of psychiatric attention and thus may not typically receive medical or public health attention.

A few studies have looked at whether problematic eating behaviors and attitudes align with adiposity trajectories (Field et al., 2003; Mustelin et al., 2017; Neumark-Sztainer et al., 2006, 2007, 2012; Sonneville et al., 2013; Stice, Presnell, Shaw, & Rohde, 2005; Wade et al., 2017). Among adolescents and young adults participating in Project EAT, dieting and unhealthy weight control behaviors were associated with greater BMI increase over 5 years (Neumark-Sztainer et al., 2007, 2012) and 10 years (Neumark-Sztainer et al., 2012). In the young adults in the FinnTwin16 cohort study, the individual and aggregated binge-eating disorder components endorsed were cross-sectionally and prospectively associated with greater BMI assessed 10 years later (Mustelin et al., 2017). Our findings of greater and graded BMI trajectories across the PREF points among middle aged adults extends the current literature and implies that middle aged adults are also at a greater risk for greater BMI and adiposity if they have problematic attitudes and behaviors toward food.

Strengths of our study include employing a large population-based sample of generally healthy men and women, including black and white Americans, enhancing generalizability of the results. Our study participants were middle aged (27–41 years old) when the QEWP-R was administered, whereas most other studies focused on adolescence or college-age (Austin et al., 2008; Field et al., 2003; Goldschmidt, Wall, Loth, Buchianeri, & Neumark-Sztainer, 2014; Goldschmidt et al., 2016; Jones et al., 2001; Neumark-Sztainer, Wall, Larson, Eisenberg, & Loth, 2011; Neumark-Sztainer et al., 2007, 2012; Solmi, Hatch, Hotopf, Treasure, & Micali, 2014; Sonneville et al., 2013; Wade et al., 2017; Zeiler et al., 2016).

Not having a full study of the internal reliability of PREF is a limitation of our study. However we assessed the reliability of QEWP-R in the dimension of “Diet.” The substantial agreement of the response to “time spent on dieting” with “no history or hardly dieting,” “history of ever dieting, but not currently dieting,” and “currently dieting” indicates the QEWP-R measure of dieting has good reliability. Other studies have found moderate concordance between QEWP (original version) and interview-based measures including the structured clinical interview (SCI) for DSM-IV and the eating disorder examination (EDE) (kappa 0.57) (Zeiler et al., 2016). Furthermore, QEWP-R has been recommended for screening binge-eating disorder, because it has greater sensitivity (but lower specificity) compared to SCI and EDE (Nangle et al., 1994). The temporality between weight and PREF cannot be determined solely from the single administration of the QEWP-R data available in the current study. However, several other studies have found that binge eating, which closely corresponds to the PREF construct of EpiEat, LoC in our study (Goldschmidt et al., 2014, 2016), binge-eating disorder (BED), which closely corresponds to the PREF construct of EpiEat, LoC, and Overeat in our study (Goldschmidt et al., 2016), and the usage of diet pill and laxative, which corresponds to the PREF construct of Com (Neumark-Sztainer et al., 2011) were stable between adolescence and young adulthood. Nonetheless, future research with QEWP-R administered at multiple time points would be desirable to confirm the stability of the problematic behaviors and attitudes over time in CARDIA. Because QEWP-R in CARDIA is not a clinical diagnosis and CARDIA has no record of diagnosed eating disorders, we did not intend to identify people with clinical eating disorders. However, those with PREF 6–8 points in CARDIA have presumptive eating disorders, given that they meet several elements’ of DSM-V

![FIGURE 4 Prevalences of adiposity categories according to the cumulative counts of points of problematic relationship to eating and food points (PREF) at years 0, 10, and 25. Note: age, race, sex, educational attainment, and study center adjusted. Most adipose categories (Obese III) are plotted on the bottom of each column [Color figure can be viewed at wileyonlinelibrary.com]](image-url)
eating disorder diagnostic criteria. Because our study looks at the full spectrum of eating behaviors, including both extreme ends of eating behaviors and less extreme eating behaviors, our findings may differ from studies that strictly look at participants at the most extreme ends. As in all observational epidemiological studies, our study is limited by potential residual confounding from unmeasured or unknown confounders.

5 | CONCLUSION

Problematic relationship to eating and food is a highly prevalent public health issue in mid-adulthood that is associated with elevated weight. Although those with problematic eating behaviors related to eating and food that fall short of clinically diagnosable eating disorders (PREF between one and five points) may not suffer the same degree of severe morbidity and mortality common in eating disorders (Boutelle, Neumark-Sztainer, Story, & Resnick, 2002; Bulik et al., 2008; Crow et al., 2009; Haines & Neumark-Sztainer, 2006; Harris & Barracough, 1994; Hudson et al., 2007; Neumark-Sztainer et al., 2007, 2012; Papadopoulos, Ekombom, Brandt, & Ekselius, 2009; Preti et al., 2009; Steinhausen & Weber, 2009; Sullivan, 1995), the PREF in middle aged adults is nonetheless of concern, given the potential impact on quality of life. Findings from the current study showing that long-term associations with BMI provide data to support the need for public health interventions aimed at reducing problematic eating attitudes and behaviors. Unfortunately, messages and interventions to reduce obesity may inadvertently lead to increases in these problematic eating attitudes and behaviors, which may, in turn lead to further increases in BMI. Our study supports the idea that the spectrum of disordered eating should be conceptualized as a matter of degree or severity (from “healthy eating practices” to “PREF” to “subthreshold eating syndrome” and to “the more severe clinical eating disorders”). The full spectrum of eating behaviors should be addressed within public health interventions.

ACKNOWLEDGMENTS

The Coronary Artery Risk Development in Young Adults Study (CARDIA) is conducted and supported by the National Heart, Lung, and Blood Institute (NHLBI) in collaboration with the University of Alabama at Birmingham (HHSN268201300025C & HHSN268201300026C), Northwestern University (HHSN268201300027C), University of Minnesota (HHSN268201300028C), Kaiser Foundation Research Institute (HHSN2682000029C), and Johns Hopkins University School of Medicine (HHSN26820000900041C). CARDIA is also partially supported by the Intramural Research Program of the National Institute on Aging (NIA) and an intra-agency agreement between NIA and NHLBI (AG00005). This manuscript has been reviewed by CARDIA for scientific content.

ORCID

Cynthia Yoon MS [http://orcid.org/0000-0003-0123-2260

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**How to cite this article:** Yoon C, Jacobs DR, Duprez DA, et al. Questionnaire-based problematic relationship to eating and food is associated with 25 year body mass index trajectories during midlife: The Coronary Artery Risk Development In Young Adults (CARDIA) Study. Int J Eat Disord. 2018;51:10–17. https://doi.org/10.1002/eat.22813