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An exploratory examination of internalized weight stigma in a sample living with food insecurity

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Abstract

Internalized weight stigma (IWS) is associated with various health concerns, regardless of body size. One weakness of existing IWS research is that it largely lacks diverse study populations. One recent exception, however, found increasing IWS was associated with higher levels of food insecurity (FI) in a low-income, majority Latinx sample. Using the same sample (N = 530), the present study further explored levels of IWS as compared to documented (mostly White/European) samples; we also investigated IWS in relation to three dichotomous eating disorder (ED) outcomes (e.g., any/no vomiting). Finally, based on previous qualitative findings regarding dietary restraint in the most severe level of FI, we explored the independent contribution of dietary restraint and IWS to cross-sectional risk of ED pathology. Results indicated that individuals living with FI experience IWS at concerning levels. Additionally, IWS played a small yet significant role in cross-sectional risk for ED pathology regardless of FI severity, while dietary restraint contributed to independent risk only in those with the most severe FI. Findings suggest that IWS is prevalent in this marginalized population, associated with ED pathology, and that the effect of dietary restraint on risk for ED pathology appears to uniquely impact those living with severe FI.

Keywords

Food insecurity; Weight stigma; Disordered eating; Dietary restraint; Marginalized population

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Declaration of Competing Interest

The authors report no declarations of interest.

1. Introduction

Weight bias, which consists of negative attitudes, assumptions, and judgements towards those who are perceived as having high body weight, is pervasive throughout Western Society (Pearl & Puhl, 2018; Puhl & Heuer, 2010). Weight bias frequently gives rise to weight stigma, which consists of overt expressions of prejudice and discrimination towards those living in higher weight bodies (Puhl, Himmelstein, & Quinn, 2018). Weight stigma has been documented in a wide range of domains, including educational, employment, and medical settings, as well as in mass media and interpersonal relationships (Puhl & Brownell, 2001; Puhl & Heuer, 2010). Both prospective and cross-sectional research supports a link between weight stigma and a host of negative outcomes, including unhealthy eating behaviors, decreased physical activity, depression, low self-esteem, body dissatisfaction, and worsened health care utilization (Puhl & Heuer, 2010; Puhl et al., 2018).

One possible sequela of weight stigma is that it can be internalized. Internalized weight stigma (IWS) happens when individuals apply weight bias inwards towards themselves (Puhl et al., 2018). Although IWS is often viewed as a problem that is tied to living in a higher weight body (Ratcliffe & Ellison, 2015), IWS appears to occur across the weight spectrum. Indeed, elevated IWS has been observed in people with lower, middle, and higher weight bodies (Puhl et al., 2018; Schvey & White, 2015). Moreover, studies indicate that IWS contributes significant variance to negative conditions even when controlling for body mass index (BMI). For instance, Latner, Durso, and Mond (2013) found that IWS significantly correlated with both lower physical and mental health-related quality of life even when BMI, age, and other indicators of physical health were statistically controlled. Similarly, Pearl et al. (2017) found that high IWS was associated with increased odds of meeting criteria for metabolic syndrome and high triglycerides when controlling for BMI, age, sex, race, and ethnicity (Pearl et al., 2017). Taken together, findings demonstrate that a) IWS is an important variable in and of itself, and b) there is a need to study IWS across the weight spectrum versus presuming it only is associated with higher weight bodies.

In a systematic review of IWS studies, Pearl and Puhl (2018) note that one significant limitation in the existing research literature is a lack of diversity with respect to gender and race/ethnicity (e.g., the literature contains substantially more research on White women than other populations), which limits the generalizability of existing findings. In one exception to this trend, Becker, Middlemass, Taylor, Johnson, and Gomez (2017) examined the prevalence of IWS in a predominantly Latinx sample of participants ($N = 503$) living with food insecurity. Food insecurity occurs when a household has insufficient access to nutritious food as a result of inadequate resources (e.g., money; Coleman-Jensen, Rabbitt, Gregory, & Singh, 2017). Becker et al. included IWS in their study based on the following rationale: food insecurity has been found to be associated with obesity, which may result in adults living with food insecurity receiving weight stigmatizing messages from both public health initiatives and/or medical providers. These messages may, in turn, lead to IWS (see Becker et al., 2017 for more detail). Results from Becker et al. indicated that as the level of food insecurity worsened so did ED pathology, dietary restraint (DR), anxiety, and IWS, as measured by the Weight Self Stigma Questionnaire (WSSQ: Lillis, Loumo, Levin, & Hayes, 2010).

A second reason for studying IWS in those living with food insecurity is that there seems to be little reason to assume that impoverished communities would be immune to negative societal weight bias messaging. If anything, the limited research suggests the opposite. For instance, Puhl et al. (2018) found that education and income were negatively associated with IWS. This highlights the importance of studying IWS in diverse populations, including those with lower income and educational levels.

The aim of the present exploratory study was to use the Becker et al. sample to investigate three questions with regards to IWS in a predominantly Latinx, low income, food insecure population. First, we examined the relative level of severity of IWS in those living with food insecurity by comparing the level of IWS in the Becker et al. sample to other studies that utilized the WSSQ. Because of the limited existing IWS research in a sample like this, we did not have any hypotheses. Thus, this was a purely exploratory analysis.

Second, we sought to determine if findings from other samples generalized to individuals living with food insecurity. To do this, we examined to what degree IWS cross-sectionally correlated with continuous measures of ED pathology, DR, and anxiety. We hypothesized that IWS would correlate with all three measures. In addition, we investigated the degree to which IWS cross-sectionally contributed to risk of three dichotomous clinical ED outcomes (i.e., presence or absence of binge eating, self-induced vomiting, clinically significant ED pathology). We hypothesized that IWS would contribute to increased risk of all three ED outcomes in cross-sectional logistical regression models. Because DR is a well-established risk factor for ED pathology (e.g., Stice, Marti, & Durant, 2011), we also examined whether IWS would still increase risk of the dichotomous ED outcomes when DR was included in the model; we hypothesized that both IWS and DR would contribute to ED risk.

The final set of analyses was based on a) the main findings from Becker et al. (2017), and b) secondary qualitative analyses of DR data using the same data (Middlemass et al., 2020). More specifically, in Becker et al., participants who reported the greatest level of food insecurity (i.e., adults living with hungry children) reported higher levels of IWS, DR, and ED pathology as compared to those with lower levels of food insecurity. In Middlemass et al. this same food insecure group appeared to qualitatively differ with regards to DR; participants with hungry children reported stretching food even when food was available to preserve it for their children. In contrast, those with lower levels of food insecurity described engaging in DR predominantly at the end of the month when food was running out. To investigate both findings further, we explored the differential ED risk associated with both DR and IWS in participants with the most severe level of food insecurity compared to those experiencing lower levels. This analysis was also exploratory.

2. Method

2.1. Participants

The present sample of 503 adult clients of local food pantries included men (n = 114) and women (n = 385) (note: four participants did not disclose their gender). Participants completed questionnaires while obtaining services at food pantries and received a $5 gift card to a local grocery store chain as compensation for their study participation. Nearly

65 % of the sample self-identified as Hispanic/Latinx, 16.5 % as Black/African American, and 11.3 % self-identified as Non-Hispanic White/Caucasian. Over half (59.0 %) of the participants reported an annual household income of less than $10,000, and 41.7 % reported having less than a high school education. For full breakdown of participant demographics, see Becker et al. (2017).

2.2. Procedure

Prior to study inception, we established a collaborative research partnership with the San Antonio Food Bank. Following Institutional Review Board (IRB) approval, undergraduate-level research assistants (RAs) collected data at local food pantries. Staff at each pantry served as gatekeepers and helped RAs meet clients awaiting services. Clients were offered the opportunity to complete study surveys during their wait time so to not disrupt client's access to food. Because pantry procedures varied, recruiting procedures also slightly varied based on staff recommendations. For instance, at mobile pantries that placed food directly into cars, RAs approached people in waiting cars with no introduction by staff. In contrast, at some pantries, staff introduced RAs to clients who were waiting for food. RAs then approached clients who would clearly be waiting in a line long enough to complete the survey. RAs used a standardized recruitment script to introduce the study, and subsequently proceeded with the informed consent process with clients who expressed interest in participating. All materials were available in both Spanish and English; for participants experiencing difficulties when trying to read the questionnaire, RAs read items and response options aloud so as to not exclude clients with low literacy rates (see Becker et al., 2017 for full procedure details).

2.3. Measures

2.3.1. Food insecurity status—Food insecurity was assessed using the Radimer Cornell Food Insecurity Measure (RCFIM: Kendall, Olson, & Frongillo, 1995; Radimer, Olson, Greene, Campbell, & Habicht, 1992). The 13 items are measured on a 3-point Likert scale (0=*Not True;* 1 = *Sometimes True;* 2 = *Always True),* and were used to create three clusters of food insecurity: 1) household food insecurity, which is associated with anxiety about food running out but not hunger; 2) individual food insecurity, which includes inability to access sufficient food for all members of the household due to inadequate resources, resulting in adults, but not children, going hungry; and 3) child hunger household food insecurity, in which adults report having hungry children in the house insinuating the adults are even hungrier (Radimer et al., 1992). The last category is considered the most severe level of food insecurity because adults will typically protect children from hunger if they have the ability to do so; thus, when child hunger is present the assumption is that the adults are even more hungry. The most severe level of food insecurity in a household without children based on the RCFIM is individual food insecurity.

We labeled participants who did not meet the food insecurity criteria as "not food insecure." We used this terminology (as opposed to food secure) because all participants in the study sought food from food pantries, a socially stigmatized way of accessing food. This suggests that even the most "food secure" participants in our sample likely live on the margins between food security and food insecurity. Research supports the internal consistency,

construct, and criterion-related validity of the RCFIM (Kendall et al., 1995; see Becker et al. for further information on the RCFIM and clusters).

2.3.2. Weight stigma—We used the Weight Self-Stigma Questionnaire (WSSQ) to measure IWS (Lillis et al., 2010). The WSSQ is a 12-item self-report measure with two subscales: 1) self-devaluation and 2) fear of enacted stigma. Participants rated their agreement on a 7-point Likert scale (1=*Strongly Disagree* to 7=*Strongly Agree*). We made two changes to this measure to make it more comprehensible for participants who had lower reading levels. First, two items from the fear of enacted stigma subscale were cut due to complexity of the questions' language (e.g., *"Others will think I lack self-control because of my weight problems").* Second, we changed "weight problems" and "overweight," which are ambiguous constructs, to "fat" [(e.g., *"I would never have any problems with weight if I were stronger"* (Flesch-Kincaid grade level 3.8) was changed to "I *would never be fat if I were stronger"* (Flesch-Kincaid grade level 1.0)]. The changes made to the measures meet face validity standards (Belone, Lucero, & Wallerstein, 2016); more importantly, the changes were made to ensure that we could reach an underserved, under studied, and marginalized population. As Snow, Tweedie, and Pederson (2018)) argue, it is important to make sure that marginalized populations are heard and valued, and to make that a reality, it is sometimes necessary to change language of survey instruments. By applying best practices espoused by Stonewall, Dorneich, Shenk, Krejci, and Passe (2019)), we ensured that our survey was inclusive, culturally sensitive, and used appropriate language, which is key to conducting research incorporating a socially conscious lens (Belone et al., 2016).

Scores from the two subscales were summed to form a total global score. The total global score was used for all analyses, except the comparison of descriptive statistics with other studies. For the latter comparison, we calculated mean scores because we cut two items from the measure (see Becker et al., 2017 for additional detail about WSSQ and scale total scores). Research supports the reliability and validity of the WSSQ (Lillis et al., 2010).

2.3.3. Dietary restraint (DR)—We used three items of the DR subscale of the Eating Disorder Examination Questionnaire (EDE-Q) to measure restraint overeating, avoidance of eating, and food avoidance (Fairburn, 2008). Items were rated on a 7-point Likert scale (0= *No Days* to 6= *Every Day*) for the past 28 days. Because individuals with food insecurity may restrict for reasons other than weight and shape concerns (i.e. to stretch food supplies, lack of resources, reserve food for children; Middlemass et al., 2020), we removed the standard caveat that DR was for weight and shape concerns only (see Becker et al., 2017 for additional detail).

2.3.4. ED pathology—Eighteen self-report items from the Eating Disorder Diagnostic Scale for DSM 5 (EDDS-5: Stice, Fisher, & Martinez, 2004) assessed ED pathology. Research supports the internal consistency, convergent and predictive validity, and criterion validity with interview-based diagnoses of the EDDS-4, as well as sensitivity to change (Stice et al., 2004). We used the EDDS-5 instead of the EDDS-4 for two reasons. First, the EDDS-5 includes questions about night eating, which we thought might be present in this population. Second, KM, who has significant expertise with low-income marginalized

populations, concluded the EDDS-5 wording was slightly easier to comprehend even though the two measures are identical in many ways.

With regards to scoring the EDDS items, per Stice et al. (2004) and Krabbenborg et al. (2012), we calculated a standardized summed composite score. We used the established clinical cutoff score of 16.5 to indicate probable clinically significant EDs. Because we used the EDDS-5 as opposed to the EDDS-4, in Becker et al. (2017) we conducted a series of analyses to check whether or not the 16.5 cutoff appeared to still be appropriate. All analyses supported the use of the 16.5 cutoff. For instance, the mean difference in EDDS scores between the two groups created by the cutoff in Krabbenborg et al. (2012) was 28.29, which differs by only 3.5 % from the difference (29.30) between the non-clinical and clinical groups in the present sample (see Becker et al., 2017 for additional EDDS analyses, information on scoring, and results).

2.3.5. Anxiety—Eight items from the Penn State Worry Questionnaire (PSWQ) assessed anxiety/worry (Meyer, Miller, Metzger, & Borkovec, 1990). In order to reduce confusion and increase comprehensibility, we excluded items if they were worded complexly or reversed scored. Items were rated on a 5-point Likert scale (1=*Not at All Typical of Me* to *5=Very Typical of Me;* see Becker et al., 2017 for additional information).

2.4. Analytic strategy

As noted above, there were three primary aims of this study. For the first aim, to assess the level of severity of IWS in Becker et al. (2017), we used descriptive statistics to compare rates of IWS to two other studies that utilized the same measure of IWS (Lillis et al., 2010; Palmeira, Cunha, & Pinto-Gouveia, 2018). As noted above, these were exploratory analyses with no hypotheses.

For the second aim, we first correlated IWS (i.e., the WSSQ subscales and global score) with continuous indicators of ED pathology, anxiety, and DR. We hypothesized that these measures would correlate with IWS as observed in other populations. To adjust for multiple comparisons, we used a Bonferroni correction with $p < .002$ as the threshold for significance for these correlation analyses. For the second aim, we also used a series of logistic regression models to assess the degree to which IWS cross-sectionally contributed to the risk of three ED outcomes. To limit the number of analyses for the logistical regressions, we only used the global WSSQ score. The three dichotomous ED-related outcomes used in the regression analyses were: 1) the clinical cutoff for an ED (EDDS); 2) any self-induced vomiting over the past month; and 3) any binge eating in the past month. Because DR is a well-established risk factor for ED pathology (e.g., Stice et al., 2011), and Middlemass et al. (2020) found that DR was significantly correlated with ED pathology in this sample of individuals living with food insecurity, we also explored the differential risk associated with both DR and IWS. We did this by including both DR and IWS as predictor variables in the same model for the entire sample; for this analysis we hypothesized that both DR and IWS would cross-sectionally contribute independent risk for each of the three dichotomous ED-related outcomes.

The third aim was to follow-up on qualitative results regarding DR in this sample of food insecure individuals in two ways. As noted above, Middlemass et al. (2020) found that those in the most severe food insecurity group, child hunger in the home, appeared to engage in DR even when food was available, which was qualitatively different from the DR reported by participants in the other three levels of food insecurity (i.e., typically restricting when food was starting to run out). Thus, we investigated if DR and IWS risk operated differently in individuals living with the highest level of food insecurity. To do this, we split the sample into two groups based on severity of food insecurity, child hunger in the home (n = 227) and the three lower levels of food insecurity (n = 276). In sum, this analysis further investigated if the independent contributions of DR and IWS to ED pathology differed in the most severe level of food insecurity.

In line with past research (e.g., Gagne et al., 2012; Breland et al., 2018), for all logistic regression analyses, we adjusted for demographic characteristics previously linked with ED pathology: gender, age, ethnicity, and education level. We also tested for collinearity among predictor variables using variance inflation factors (VIFs); VIFs greater than 10 suggest collinearity. All analyses were completed using SPSS version 21 (IBM Corp. Released 2012. IBM SPSS Statistics for Windows, Version 21.0. Armonk, NY: IBM Corp.).

3. Results

3.1. Level of IWS severity in a food insecure sample (Aim 1)

Our first set of analyses compared descriptive WSSQ scores in the present sample with two other studies that had used the same measure. Both comparison studies consisted of two groups/samples. Lillis et al. (2010) examined IWS in 84 participants who completed at least 6 months of weight loss treatment as well as 85 non-treatment seeking participants with a BMI of ≥25 who were recruited for a larger study investigating drug-taking and eating behaviors. Palmeira et al. (2018) examined IWS in participants who sought nutritional/weight loss treatment. These participants were described by Palmeira et al. as meeting criteria for having overweight or obesity. Participants in this study were divided into two subgroups based on whether or not they scored above or below a 17 on the Binge Eating Scale (BES). As noted above, because two questions were removed from the WSSQ because they were deemed problematic for a population with low education, we converted all WSSQ scores into means to facilitate comparison (see Table 1).

Results indicated that participants with lower levels of food insecurity (i.e., not food insecure, and household and individual food insecurity groups) reported relatively similar levels of IWS (Self-Devaluation M range = 2.08–2.49; Enacted Stigma M range = 1.94–2.31; Global Score M range = 2.02–2.41) to the non-treatment seeking group in Lillis et al. (2010) and the BES<17 group in Palmeira et al. (2018) on both subscales (Lillis et al. Self-Devaluation M = 2.49; Enacted Stigma M = 1.92; Palmeira et al. Self-Devaluation M = 2.72; Enacted Stigma M = 2.10) and the global score (Lillis et al. M = 2.21; Palmeira et al. M = 2.41). The most severe food insecurity group (child hunger household), however, reported Self-Devaluation IWS (M =2.98) at a level between the groups examined in both Lillis et al. (M range = 2.49–3.22) and Palmeira et al. (M range = 2.72–3.49). Moreover, the most severe food insecurity group reported levels of fear of enacted IWS (M = 2.86) that

were comparable to the treatment seeking group in Lillis et al. (M = 2.78) and the BES > 17 in Palmeira et al. (M = 2.92). When the present sample was divided according to whether or not they met criteria for a probable ED (see Becker et al., 2017 for how this measure was calculated), the non-ED group reported levels of IWS (Self-Devaluation M = 2.40; Enacted Stigma M =2.24; Global Score M = 2.32) consistent with the non-treatment seeking group in Lillis et al. and the BES <17 group in Palmeira et al. (see above for means). The probable ED group, however, reported levels of IWS (Self-Devaluation M = 4.93; Enacted Stigma M = 4.85; Global Score M = 4.91) that vastly exceeded the treatment seeking group in Lillis et al. and the BES >17 group in Palmeira et al. (see above for means).

3.2. IWS correlations with key outcomes (Aim 2)

The second set of analyses investigated the degree to which IWS was associated with ED pathology, DR, and anxiety. We first correlated the WSSQ subscale and global scores with the symptom composite from the EDDS, DR scores, and the PSWQ (see Table 2). We also correlated IWS with several individual items from the EDDS to determine what degree IWS was associated with specific ED symptoms and indices of distress, such as frequency of binge eating and self-induced vomiting, as well as weight and shape concerns. Both of the WSSQ subscales and global score significantly correlated with every comparison variable except DR; thus, all hypotheses were supported, except for that related to DR.

3.3. Logistic regression models: Global weight stigma in the full sample (Aim 2)

Results of the series of logistic regression models (Aim 2 plus Aim 3) that investigated the degree to which IWS alone, and then in conjunction with DR in the same model, independently contributed to risk of three dichotomous indicators of ED pathology are presented in Tables 3 to 6. Notably, all VIFs were less than 2, indicating that collinearity was not a concern in this study. Racial/ethnicity categories were non-significant for all models and are not included in the tables to save space and simplify the presentation of findings.

For the logistic regression models for ED clinical cutoff, self-induced vomiting, and binge-eating risk as a function of IWS (Table 3) in the full sample (N = 503), results indicated that IWS contributed a small, but statistically significant, increased independent risk for meeting the clinical cutoff for ED symptoms (OR =1.08, 95 % CI [1.06, 1.10], p < .001), self-induced vomiting in the past month (OR =1.04, 95 % [1.02, 1.06], p < .001), and binge eating in the past month (OR = 1.05, 95 % CI [1.04,1.07], p < .001). None of the demographic variables assessed (e.g., gender, race/ethnicity, age, education level) contributed to risk for meeting the ED clinical cutoff in this sample. Individuals with lower education had increased risk for self-induced vomiting (OR = .40, 95 % CI [.19, .82], p = .012). Men also had increased risk for self-induced vomiting (OR = .30, 95 % CI [.16, .58], p < .001) and binge eating (OR = .39, 95 % CI [.21, .72], p = .003). In the total sample, 22.0 % of the men and 12.9 % of the women reported self-induced vomiting, while 22.0 % of the men and 18.4 % of the women reported at least one episode of binge eating in the past month.

3.4. Logistic regression models: weight stigma plus DR in the full sample (Aim 2)

In the full sample, IWS *(OR* =1.09, 95 % CI [1.06, 1.11], $p < .001$) and DR *(OR* = 1.56, 95 % CI [1.20, 2.02], $p = .001$) each contributed small, but statistically significant, independent increased risk for meeting the ED clinical cutoff (Table 4). None of the demographic variables assessed contributed to risk for meeting the ED clinical cutoff. For self-induced vomiting in the past month, both IWS *(OR* =1.04, 95 % CI [1.02, 1.06], $p < .001$) and DR *(OR* =1.24, 95 % CI [1.01, 1.52], $p = .037$) similarly contributed independent increased risk. The gender effect remained from the IWS alone model remained, such that men had higher risk for self-induced vomiting *(OR* = .32, 95 % CI [.16, .64], $p = .001$), as did those with lower levels of education *(OR* = .37, 95 % CI [.17, .80], $p = .012$). Finally, both IWS *(OR* =1.06, 95 % CI [1.04, 1.07], $p < .001$) and DR *(OR* = 1.37, 95 % CI [1.15, 1.64], $p = .001$) contributed independent increased risk for binge eating in the past month in the full sample. Consistent with the other findings, each independent risk was small, yet statistically significant. Additionally, men remained at significantly higher risk for binge eating *(OR* = .40, 95 % CI [.21, .76], $p = .006$) when both IWS and DR were included in the model; no other demographic variables increased risk for binge eating.

3.5. Logistic regression models: lower- and higher-levels of food insecurity (Aim 3)

In individuals with lower levels of food insecurity (i.e., those whose scores fell into the categories of “not food insecure,” “household food insecure,” or “individual food insecure”), IWS again contributed a small, but statistically significant, independent increased risk for meeting the ED clinical cutoff (*OR* = 1.09, 95 % CI [1.05, 1.12], $p < .001$), self-induced vomiting in the past month *(OR* = 1.03, 95 % CI [1.00, 1.06], $p = .030$), and binge eating in the past month *(OR* = 1.07, 95 % CI [1.04, 1.10], $p < .001$) (Table 5). In contrast, DR did not **contribute to** risk for any of these outcomes. Additionally, the gender effects remained in this subsample, with men having increased risk for self-induced vomiting (*OR* = .28, 95 % CI [.09, .83], $p = .022$) and binge eating in the past month *(OR* = .12, 95 % CI [.04, .37], $p < .001$).

Among individuals with the highest level of food insecurity (i.e., those who reported that children go hungry in the home), DR contributed an independent increased risk for meeting the clinical cutoff for ED symptoms *(OR* = 2.18, 95 % CI [1.44, 3.29], $p < .001$); IWS again contributed a small, but statistically significant, independent increased risk for meeting the ED clinical cutoff (*OR* = 1.10, 95 % CI [1.06, 1.14], $p < .001$). Regarding self-induced vomiting in the past month, both IWS *(OR* = 1.04, 95 % CI [1.02,1.07], $p < .001$) and DR *(OR* = 1.35, 95 % CI [1.02,1.80], $p = .039$) each contributed independent risk. Being a man *(OR* = .34, 95 % CI [.13, .92], $p = .034$) and having lower levels of education *(OR* = .39,95 % CI [.16, .97], $p = .043$) remained significant contributors to risk for self-induced vomiting in the past month. Lastly, both IWS *(OR* = 1.05,95 % CI [1.03,1.07], $p < .001$) and DR (*OR* = 1.39, 95 % CI [1.09, 1.79], $p = .009$) contributed independent risk for binge eating in the past month in the child hunger group. Again, effects were small, but statistically significant. None of the demographic variables increased binge eating risk.

4. Discussion

Given the scarcity of research investigating IWS in low income, non-White populations, the present study sought to address three primary questions regarding IWS in a predominantly Latinx, impoverished, food insecure sample. This study is a follow-up analysis of the data presented in Becker et al. (2017), which primarily focused on the degree to which differing levels of food insecurity were associated with psychological distress, as indicated by ED pathology, anxiety, and IWS. Although Becker et al. (2017) previously provided mean WSSQ global scores for each of the food insecurity subgroups in that study, the only analysis conducted with IWS only investigated whether it differed between the different food insecurity groups. In contrast, this study was broadly aimed at explicating the degree to which researchers, clinicians, and public health experts should be concerned about the level of IWS in those living with food insecurity. We propose that understanding IWS in people who are food insecure is critically important because such people tend to already be oppressed and marginalized in other ways by society, including lack of access to ED treatment and medical care in general. Specifically, the present study explored: 1) the relative level of IWS in the Becker et al. sample as compared to two other studies that used the WSSQ; 2) the degree to which IWS was associated with ED pathology, anxiety, and DR; and 3) whether the relative ED pathology risk conferred by IWS and DR differed in those with the highest level of food insecurity as compared to lower levels of food insecurity.

With regards to the first aim, results indicated that IWS in those living with food insecurity is evident at a concerning level. Study participants in the lower three levels of food insecurity reported levels of IWS that largely compared to non-treatment seeking participants in Lillis et al. (2010) and to participants who both met criteria for having overweight/obesity and scored below a 17 on the BES in Palmeira et al. (2018). This indicates that participants with lower levels of food insecurity reported IWS at a level that is normative in people who are living in higher weight bodies, which are routinely stigmatized in Western culture. It is important to note that Becker et al. (2017) did not collect weight and height data so we do not know to what degree participants in Becker et al. met criteria for being overweight or obese. Food insecurity, however, has been associated with higher weight status in some studies, although data are mixed (Moradi et al., 2019). As data were collected in Bexar County, Texas, it also is important to note that in 2014, 71 % of adults in the county were reported to be overweight or obese (Garza, 2018). Therefore, it is likely that many participants in Becker et al. would be classified as overweight or obese. However, even if participants were not living in higher weight bodies, IWS has been found to occur across the weight spectrum and to be associated with negative outcomes, even when controlling for BMI. In sum, participants with lower levels of food insecurity in the present study reported levels of IWS that are comparable to individuals who met criteria for being overweight or obese in two previous studies and were either not seeking treatment or scored below a 17 on the BES; this indicates that participants in this study report at least a moderate degree of IWS.

The group with the most severe level of food insecurity (i.e., child hunger household) more closely matched the treatment seeking sample in Lillis et al. (2010) and those with a BES score of greater than 17 in Palmeira et al. (2018), particularly with respect to fear

of enacted weight stigma by others. This indicates that the child hunger household group, which is already facing extreme food insecurity and other forms of societal oppression, is also reporting elevated levels of IWS that are comparable to those previously found in participants living in higher weight bodies who are treatment seeking and/or reported elevated level of binge eating (Lillis et al., 2010; Palmeira et al., 2018). In summary, descriptive analyses in the present study suggest that food insecurity is associated with levels of IWS that compare to other weight stigmatized populations.

The second aim of this study was to determine if findings from other studies showing that IWS correlates with negative mental health indicators generalized to those living with food insecurity. We hypothesized that IWS would correlate with continuous measures of ED pathology, anxiety, and DR. We also hypothesized that IWS would cross sectionally contribute to risk for three dichotomous clinical indices of ED pathology and that this relationship would hold even when DR was included in the logistic regression model. With one exception, all hypotheses were supported. IWS correlated with continuous measures of ED pathology and anxiety, although not DR. IWS also cross-sectionally contributed to risk for meeting the clinical ED cutoff, as well as any vomiting and binge eating in the past month. This finding held even when DR was included in the logistic regression model. Taken together, results suggest that IWS is associated with ED pathology and anxiety, and that IWS and DR each contribute independent, non-overlapping risk for ED pathology in this sample of food insecure adults.

Although the finding that DR and IWS did not correlate is inconsistent with what we hypothesized, review of the literature suggests that the relationship between these two constructs varies across studies. For instance, where as some studies find that IWS (as assessed by the Weight Bias Internalization Scale) is correlated with DR (e.g., Schvey & White, 2015), others do not (e.g., Roberto et al., 2012). Moreover, a study examining the psychometric properties of a Turkish version of the WSSQ also failed to find an association between IWS and DR (Sevincer, Kaya, Bozkurt, Akin, & Kose, 2017).

Of note, men in this sample reported more frequent binge eating and self-induced vomiting compared to women. Participants with lower levels of education also had increased risk for self-induced vomiting. All of these findings contradict the White woman stereotype that commonly presents in ED clinical settings. These gender and education effects did not increase risk for meeting the clinical cutoff of ED, however. Therefore, clinicians may need to consider subclinical ED presentation in patients that are outside of the stereotypical presentations of EDs. Researchers also need to conduct more studies that incorporate a diversity of participants to better understand less researched risk factors such as being poor and food insecure.

As noted above, Middlemass et al. (2020) found that the child hunger household food insecurity group appeared to qualitatively differ from the other food insecurity groups with respect to the reasons for engaging in DR. In the Middlemass et al. study, the child hunger household group appeared more prone to engaging in DR to stretch food resources even when food was available so that children would have food to eat. Based on this result, we explored the degree to which DR and IWS might operate differently in lower levels of

food insecurity as compared to the child hunger group regarding ED pathology risk. In the lower level group, DR no longer contributed significant independent risk for any of the three ED constructs although IWS continued to contribute risk. In the child hunger household group, both DR and IWS remained significant. In sum, whereas IWS contributed risk in both lower and higher levels of food insecurity, the independent risk of DR found in previous studies (i.e., Becker, Middlemass, Gomez, & Martinez-Abrego, 2019; Belone et al., 2016; Middlemass et al., 2020) appears to be driven by those in the child hunger group and not in the lower levels of food insecurity. One possible reason for this highlighted in Middlemass et al. is that individuals in the child hunger household group appear more likely to engage in DR when food is available in the home (to stretch it for children). This may require different cognitive effort than needed to restrict when a person is literally running out of food.

As noted above, whereas DR independently increased ED pathology risk only in the child hunger household group, IWS conferred a small, but significant increased risk in both groups. This suggests that IWS had a consistent effect on risk for ED pathology across individuals living with all levels of food insecurity, thus representing a more global, or non-specific, risk factor for ED pathology in this Latinx majority population. Furthermore, the contribution of IWS to ED pathology risk was consistent regardless of any additional independent risk conferred by DR.

Conclusions from this study are limited due to some methodological considerations. First, we do not have weight data in order to examine the potential influence of BMI in these models. As noted in the Becker et al. (2017) paper, this is a highly marginalized sample population, and the majority reported very low income (>50 % reported an annual income of less than $10,000). Scales to measure one's weight are a luxury item; therefore, having access to a personal scale in this population is unlikely. Additionally, many individuals living in this level of poverty do not have regular contact with physicians in order to have updated information about their height and weight. Further, data was collected at public food pantries, so even attempting to weigh participants would have been insensitive, at best. As such, we did not collect weight and height data and did not ask participants to self-report their height and weight; doing so could have had a negative impact on participants combined with high likelihood of eliciting inaccurate information. The collection of measured (versus self-reported) height and weight data should be considered, when feasible in a non-stigmatizing manner, in some future research with marginalized and food insecure populations. This will allow researchers to confirm whether IWS acts as an independent risk factor for negative outcomes, as has been found with other populations.

Second, data were cross-sectional and therefore we are unable to make determinations about prospective relations among risk factors and ED pathology in our sample. Future longitudinal research investigating the predictive effects of IWS on ED pathology risk in diverse populations is needed. Third, we made language modifications to validated measures to enhance comprehension for individuals with lower levels of education; for this same reason we also removed two items from the WSSQ. In spite of these modifications, internal validity analyses indicated that the psychometric structure of the measures used remained acceptable in this sample (Becker et al., 2017). However, future research is needed to replicate and extend the research presented in this paper and to determine

if differences between populations are statistically significant. Fourth, we utilized only self-reported measures and most have been largely used and validated with predominantly White, female, and more affluent samples whereas our sample was predominantly Latinx, both male and female, and impoverished. It is important that future research incorporates additional measures (e.g., qualitative) that better capture the lived experience of individuals and families who are food insecure; current DR measures do not sufficiently grasp the full range of experiences that fall outside of middle-class White norms.

Finally, DR has historically been conceptualized in the ED field as consisting not only of attempts to limit food intake but also as a weight and shape-based construct (i.e., people attempt to limit their intake for weight and shape reasons). We have proposed elsewhere (e.g., Becker et al., 2019; Middlemass et al., 2020) that this is a flawed approach to this construct, given that a) Keys, Brožek, Henschel, Mickelsen, and Taylor (1950) demonstrated decades ago that restraint for reasons other than weight and shape concerns may trigger ED pathology and b) we have found in two samples that DR for reasons other than weight and shape concerns is correlated with ED pathology (Becker et al., 2019; Middlemass et al., 2020). Nonetheless, our removal of the weight and shape concern caveat to the DR questions is novel and further research is warranted to determine if DR for reasons other than weight and shaper concerns is different than DR for weight and shape concerns.

In sum, findings from this study indicate that IWS exists at concerning levels among individuals living with food insecurity and is correlated with ED pathology and anxiety. Those living with the highest degree of food insecurity report similar IWS to treatment-seeking samples, which suggests high levels of distress. Across all levels of food insecurity, IWS appears to confer a small, yet consistent and significant, increased risk for ED pathology. DR, on the other hand, only contributed additional independent risk for ED pathology among those living with children going hungry in the home (the most severe level of food insecurity). Finally, ED pathology risk identified in this sample population challenges previously held stereotypes of who experiences disordered eating. Although Middlemass et al. (2020 used qualitative data, future mixed-methods research is needed to support the findings presented here so as to better explicate the experiences and effects of weight stigma and to truly understand DR in different populations experiencing food insecurity. It is critical that researchers continue to investigate how ED risk operates similarly and differently in marginalized populations and include participants that are not typically included in traditional ED research.

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Table 1

Comparison of mean level of IWS measured by WSSQ among different samples.

	Lillis et al. (2010)) Overweight or Obese		Palmeira et al. (2018)) Tx Seek OW or Obese		Becker et al.(2017)) Food Insecure					
	Non-Tx Seek	**Tx-Seek**	**BES<17**	**BES >17**	**NFI**	**Household**	**Individual**	**CHH**	**No Clinical Sig ED**	**Probable Clinical ED**
Available *n*	85	84	196	135	39	41	177	214	358	48
Self-Devaluation	2.49	3.22	2.72	3.49	2.08	2.45	2.49	2.98	2.40	4.93
Enacted Stigma	1.92	2.78	2.10	2.92	1.94	2.09	2.31	2.86	2.24	4.85
Global	2.21	3.00	2.41	3.21	2.02	2.32	2.41	2.92	2.32	4.91

Note: Scores represent means of mean scores. Definition of acronyms: Treatment (Tx); Overweight (OW), Binge Eating Scale (BES); Significant (Sig); Eating Disorder (ED); Not Food Insecure (NFI); Child Household Hunger (CHH); Internalized Weight Stigma (IWS); Weight Self Stigma Questionnaire (WSSQ).

Table 2

Correlations between Weight Self-Stigma Questionnaire (WSSQ) and eating disorder pathology, anxiety, and dietary restraint.

	WSSQ Enacted	WSSQ Self	WSSQ Global
EDDS SxComp	.587**	.616**	.628**
Weight/Shape Concerns	.530**	.564**	.574**
Binge Eating Frequency	.334**	.310**	.331**
Vomiting Frequency	.219**	.249**	.249**
Lax/Diuretic Frequency	.185**	.160*	.179**
Night Eating Frequency	.352**	.376**	.381**
Eating/BI Harm Life	.512**	.480**	.515**
PSWQ	.357**	.350**	.361**
Dietary Restraint	.097	.063	.072

* $p < .002$

** $p < .0001$.

Note: Night Eating is with distress. Definition of acronyms: Eating Disorder Diagnostic Scale Symptom Comparison (EDDS SxComp), Laxative (Lax), Body Image (BI), Penn State Worry Questionnaire (PSWQ).

Table 3

Logistic regression models predicting three ED behaviors as a function of IWS (N = 503).

Predictor	Odds Ratio [95 % CI]
ED Clinical Cutoff	
Gender	.711 [.285–1.772]
Age	.912 [.609–1.366]
Education	1.106 [.544–2.249]
IWS	**1.079 [1.057–1.101]**
Self-induced Vomiting	
Gender	**.300 [.155–.578]**
Age	.887 [.643–1.225]
Education	**.398 [.194–.820]**
IWS	**1.039 [1.023–1.056]**
Binge Eating	
Gender	**.389 [.209–.722]**
Age	1.034 [.775–1.379]
Education	.676 [.381–1.198]
IWS	**1.053 [1.038–1.068]**

Note: Bold indicates statistical significance at $p < .05$; IWS = internalized weight stigma.

Table 4

Logistic regression models predicting ED behaviors as a function of IWS and DR in the full sample (N = 503).

Predictor	Odds Ratio [95 % CI]
ED Clinical Cutoff	
Gender	.686 [.257–1.827]
Age	.887 [.575–1.368]
Education	1.072 [.511–2.251]
IWS	**1.087 [1.062–1.112]**
DR	**1.559 [1.204–2.019]**
Self-induced Vomiting	
Gender	**.315 [.156–.638]**
Age	.890 [.630–1.256]
Education	**.372 [.172–.801]**
IWS	**1.039 [1.022–1.057]**
DR	**1.242 [1.014–1.521]**
Binge Eating	
Gender	**.398 [.208–.764]**
Age	1.062 [.786–1.434]
Education	.643 [.360–1.147]
IWS	**1.056 [1.040,1.072]**
DR	**1.369 [1.145–1.636]**

Note: Bold indicates statistical significance at $p < .05$; IWS = internalized weight stigma; DR = dietary restraint.

Table 5

Logistic regression models predicting ED behaviors as a function of IWS and DR in low levels of FI (N = 276).

Predictor	Odds Ratio [95 % CI]
ED Clinical Cutoff	
Gender	2.509 [.278–22.612]
Age	1.408 [.695–2.853]
Education	.448 [.073–2.760]
IWS	**1.085 [1.047–1.124]**
DR	1.008 [.616–1.647]
Self-induced Vomiting	
Gender	**.278 [.093–.829]**
Age	.979 [.588–1.631]
Education	.401 [.081–1.974]
IWS	**1.031 [1.003–1.059]**
DR	.835 [.529–1.318
Binge Eating	
Gender	**.124 [.042–.368]**
Age	1.077 [.676–1.716]
Education	.316 [.084–1.191]
IWS	**1.073 [1.044–1.103]**
DR	1.175 [.865–1.595]

Note: Bold indicates statistical significance at $p < .05$; IWS = internalized weight stigma; DR = dietary restraint.

Table 6

Logistic regression models predicting ED behaviors as a function of IWS and DR in the CHH sample (N = 227).

Predictor	Odds Ratio [95 % CI]
ED Clinical Cutoff	
Gender	.356 [.090–1.405]
Age	.591 [.321–1.088]
Education	1.238 [.479–3.197]
IWS	**1.102 [1.064–1.142]**
DR	**2.177 [1.443–3.285]**
Self-induced Vomiting	
Gender	**.339 [.125–.922]**
Age	.875 [.539–1.420]
Education	**.391 [.157–.972]**
IWS	**1.044 [1.020–1.068]**
DR	**1.353 [1.016–1.803]**
Binge Eating	
Gender	1.035 [.395–2.709]
Age	1.093 [.711–1.680]
Education	.789 [.404–1.538]
IWS	**1.051 [1.030–1.073]**
DR	**1.393 [1.085–1.788]**

Note: Bold indicates statistical significance at $p < .05$; IWS = internalized weight stigma; DR = dietary restraint.