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Original Article

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Food security and eating disorder behaviors in the International Food Policy Study, 2018 to 2022

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Abstract

Background: A link has been established between food insecurity and eating disorder (ED) pathology, but most research on this topic has occurred in the USA. This study examined associations and potential moderators of associations between food security (FS) levels and ED behaviors cross-nationally.

Methods: Repeated cross-sectional data representing 104 881 adults 18–100 years of age in Australia, Canada, Mexico, the UK, and the USA came from five waves (2018–22) of the International Food Policy Study. Participants completed the Household Food Security Survey Module and reported on past-3-month binge eating and self-induced vomiting to control weight. Associations between past-year household FS level and ED behaviors were examined with adjusted modified Poisson regression models. Interactions with potential moderators were also tested.

Results: Marginal, low, and very low FS were associated with elevated prevalence of both ED behaviors. Compared with households with high FS, binge eating was 1.34, 1.54, and 1.73 times as prevalent in households with marginal, low, and very low FS, respectively. Associations were stronger for self-induced vomiting; compared with households with high FS, self-induced vomiting was 2.40, 7.10, and 11.98 times as prevalent in households with marginal, low, and very low FS, respectively. Moderation results revealed meaningful differences by some factors. For example, associations were weaker in Mexico and stronger among ethnic minorities and participants with children.

Conclusion: Results support cross-sectional associations between FS and ED behaviors, with a particularly strong link for self-induced vomiting. Some heterogeneity in these associations was observed across country and sociodemographic factors.

Keywords: food insecurity; eating disorders; binge eating; self-induced vomiting; international; cross-cultural.

Key Messages

- We sought to examine whether food insecurity is associated with eating disorder behaviors across five countries.
- Results were suggestive of dose–response relationships, such that increasing severity of food insecurity corresponded to increasing prevalence and frequency of binge eating and self-induced vomiting.
- These findings highlight the cross-national importance of efforts to improve the availability of nutritious foods for food-insecure populations.

Introduction

Household food security (FS) is an important determinant of physical and emotional health [1]. FS is characterized by consistent access to ample nutritionally adequate and safe foods [2]. FS levels exist on a continuum and can be categorized as high, marginal, low, and very low FS [3]. Food insecurity (FI)—i.e. the absence of FS—which typically encompasses low and very low FS [3], is defined as having restricted or unreliable access to nutritious food in a manner that is socially accepted [2]. Marginal FS is characterized by some anxiety over the amount of food in the house [3].

FI impacts populations in low-, middle-, and high-income countries across the globe. In 2022, 29.6% of the world was food-insecure [4]. Low-income households [5], racial/ethnic minorities [6], and households with children [7] bear a disproportionate brunt of FI. Various factors may contribute to these disparities; neighborhood context (e.g. grocery infrastructure) [8], accessibility (transportation to and availability

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of quality foods) [9], and the affordability of foods [5] are key factors [10]. As the energy density of foods increases, their cost tends to decrease [11]. Thus, FI drives a reliance on low-cost, palatable, energy-dense foods to fulfill caloric requirements [12], propagating life-long diet-related consequences such as type 2 diabetes [13]—consequences linked with high weight [14], depression and other mental health problems [15], and other chronic diseases [16].

More recently, eating disorder (ED) behaviors have gained increased attention as a negative outcome of FI [17]. ED behaviors span a spectrum, including, but not limited to, disinhibited (e.g. binge eating) and compensatory (e.g. self-induced vomiting) behaviors to offset the effects of overeating or to control weight [18]. Though such behaviors are implicated in clinical EDs (e.g. bulimia nervosa, binge eating disorder) [19], they can also occur among individuals without clinical EDs. ED behaviors have psychological and physical repercussions, such as an increased risk of developing full-blown EDs [19], poor dietary intake [20], and depressive symptoms [21].

In the past, research on the driving forces behind the development of ED health-risk behaviors have predominately revolved around body dissatisfaction and weight control [22]. While these motivations are still relevant, individuals experiencing FI may face additional pressures. Those who are affected by FI may engage in ED behaviors for reasons that do not fit into the mold of typical ED pathology that is traditionally targeted in preventative, diagnostic, and treatment practices [23]. A commonly discussed theory within the discourse on the association between FI and ED behaviors is the feast-or-famine cycle. This cycle refers to the fluctuating patterns of food availability and scarcity that breed variability in food intake [24]. Binge eating could be considered a consequence of FI, as suggested by the restraint theory in which limiting food intake can lead to uncontrolled eating under certain circumstances (e.g. an abundance of palatable foods); self-induced vomiting may then result from a feeling of uncomfortable fullness that accompanies overeating [25]. In the USA, for example, the Supplemental Nutrition Assistance Program has been criticized for potentially exacerbating this problem, with the timing of monthly allocation encouraging a disproportionate use of benefits at the beginning of the month and funds running out towards the end of the month [18]. Outside of the USA, cyclical food availability may take form in other ways, such as periodic paycheck distribution. The same cycle may occur when pay is received on a monthly basis, leading to the overaccumulation of food at the time of receiving the paycheck, with both money and food dwindling as the month progresses.

While conceptualizing ED pathology in the context of FI has come a long way in recent years, the majority of research has been conducted within the USA, thereby limiting understanding of these associations within the confines of USA-based food-assistance policies and practices [18]. Furthermore, the role of sociodemographic and other relevant variables on the strength of association remains understudied. Therefore, the purpose of this investigation was to (i) use repeated cross-sectional data from Australia, Canada, Mexico, the UK, and the USA to evaluate the generalizability of associations between household FS levels and ED behaviors across countries and (ii) explore the extent to which sociodemographic and other relevant variables may moderate such associations. We hypothesized that lower levels of FS would be associated with greater prevalence of ED behaviors across the countries studied and that the strength of these associations may be magnified or attenuated by some of the potential moderators.

Methods

Study design and participants

Repeated cross-sectional data from Australia, Canada, Mexico, the UK, and the USA were drawn from the International Food Policy Study [26]. The present study uses data from self-administered web-based surveys conducted in 2018, 2019, 2020, 2021, and 2022. Adults between 18 and 100 years of age were recruited through the Nielson Consumer Insights Global Panel and their partner panels each survey year. Age and sex quotas were used to recruit participants with characteristics representative of each country's population. E-mail invitations with unique survey access links were sent to a random sample of panelists within each country, age, and sex quota. After eligibility screening based on age, sex, and residence in a target country, potential respondents were provided with information about the study and an opportunity to consent. Respondents received incentives in accordance with their panel's usual incentive structure. The study was reviewed and approved by the University of Waterloo Research Ethics Committee [27–31]. The analytic sample size for the present study was 104 881. Information on survey cooperation rates, explanations for participant exclusions, and post-stratification sample weight construction is included in the Supplementary material [27–31].

Measures

Surveys were conducted in English in Australia and the UK, Spanish in Mexico, English and French in Canada, and English and Spanish in the USA. Spanish and French translations were reviewed by members of the International Food Policy Study research team who were fluent in each language [27–31].

Household FS level

The household FS level over the past year was assessed with the 18-item US Household Food Security Survey Module (HFSSM) [32]. Ten items assess FS status among adults in the household and, where applicable, the remaining eight items ask about the experiences of children in the household. Missing responses at the item level were filled in with affirmative responses if a participant provided (i) a valid affirmative response to at least one item that was more severe than the missing item and (ii) no negative response to any item that was less severe than the missing item; all other missing items were filled in as negative responses [33]. Consistently with the scoring guidelines for the HFSSM [34], a score of 0 (i.e. no affirmative responses) was classified as high FS, a score of 1–2 was classified as marginal FS, a score of 3–7 (for households with children) or 3–5 (for households without children) was classified as low FS, and a score of 8–18 (for households with children) or 6–10 (for households without children) was classified as very low FS.

ED behaviors

Binge eating and self-induced vomiting for weight control were assessed by asking participants how often over the past

3 months they had "gone on eating binges" and "made yourself sick (vomited) to control your weight" [35]. Response options were "never," "less than 1 time a month," "1 to 3 times a month," "once a week," "2 to 6 times a week," "once a day," and "more than once a day." For the main analyses, responses were collapsed to represent having ever (with any frequency) or never engaged in a given behavior over the past 3 months.

Covariates/potential moderating variables

In addition to country and survey year, which were part of the study design, variables considered as covariates and/or potential moderators included the following, which were assessed via self-report: age, gender (derived from self-reported sex assigned at birth and gender identity), ethnicity (categorized into country-specific "majority" or "minority" groups in line with census questions asked in each country), educational attainment (categorized as "low," "medium," or "high" according to country-specific criteria of the highest level of formal education attained), perceived income adequacy (assessed with the question, "Thinking about your total monthly income, how difficult or easy is it for you to make ends meet?"), perceived social status (assessed by using the MacArthur Scale of Subjective Social Status [36]), employment status, student status, status as a parent with a child aged <18 years living in the household (including stepchildren and adopted children), and perceived weight status ("Obese," "Overweight," "Underweight," or "Just about right").

Statistical analysis

Analyses were conducted in Stata 16.1 and incorporated post-stratification sample weights to minimize nonresponse and selection bias. Descriptive statistics were calculated and associations between household FS level and ED behaviors were examined by using modified Poisson regression models (i.e. with robust standard errors) to calculate prevalence ratios [37]. Models were adjusted for country, survey year, age, gender, ethnicity, educational attainment, perceived income adequacy, perceived social status, employment status, student status, and parent status to account for potential confounding; these covariates were selected a priori. Perceived weight status was not included as a covariate because, as a consequence of FI [38], weight status may act as a mediator or collider on the pathway from FI to ED behaviors, in which case adjustment for it could have introduced overadjustment bias or selection bias, respectively. Variables with the highest item-level missingness were perceived social status (1.88%; $n = 1974$), binge eating (1.32%; $n = 1386$), and perceived weight status (1.18%; $n = 1236$). To minimize nonresponse bias due to item-level missingness, we conducted multiple imputation with 20 replications by using the fully conditional specification method, pooling regression results across replications. We assessed for interaction on the additive scale (i.e. corresponding to differences in absolute risk) between household FS level and each hypothesized potential moderating variable (country, survey year, age, gender, ethnicity, parent status, and perceived weight status) by using the identity link function with a Gaussian distribution and robust standard errors [39]. Interaction results were interpreted graphically by plotting adjusted prevalence estimates and 95% confidence intervals (CIs) computed with marginal standardization, a Poisson distribution, the log link function, and robust standard errors via mimrgns.

Results

Table 1 outlines sample characteristics of the analytic sample for the present study. Nearly half of the participants reported binge eating over the past 3 months, and nearly 1 in 10 reported self-induced vomiting to control weight over the past 3 months.

Associations between household FS level and ED behaviors

Marginal, low, and very low FS were associated with greater prevalence of both types of ED behaviors examined. The household FS level exhibited associations that suggested dose–response relationships for both ED behaviors, such that increasing severity of FI corresponded to increasing prevalence of both behaviors. Compared with households with high FS, after adjusting for covariates, the prevalence of past-3-month binge eating was 1.34 (95% CI: 1.31–1.37) times the prevalence in households with marginal FS, 1.54 (95% CI: 1.50–1.57) times the prevalence in households with low FS, and 1.73 (95% CI: 1.69–1.77) times the prevalence in households with very low FS, and the prevalence of past-3-month self-induced vomiting to control weight was 2.40 (95% CI: 2.15–2.68) times the prevalence in households with marginal FS, 7.10 (95% CI: 6.49–7.77) times the prevalence in households with low FS, and 11.98 (95% CI: 10.99–13.05) times the prevalence in households with very low FS.

Sensitivity analyses were also conducted to examine associations between household FS level and frequencies of past-3-month binge eating and self-induced vomiting. These associations were similarly suggestive of dose–response relationships across all behavior frequencies examined (<1 time a month, 1–3 times a month, and at least weekly, relative to never over the past 3 months) for both binge eating and self-induced vomiting (Supplementary Table S1). Moreover, the strength of these associations generally increased with increasing behavior frequencies, additionally suggesting dose–response relationships between FI and frequency of binge eating and self-induced vomiting.

Differences in associations by potential moderating variables

Results of moderation analyses exploring potential differences in associations between household FS level and ED behaviors by various factors are illustrated in Figures 1–7 and described below.

Country

Associations between household FS level and both ED behaviors were weaker in Mexico compared with Australia, Canada, the UK, and the USA (Figure 1). Across all FS statuses, a higher prevalence of binge eating but lower prevalence of self-induced vomiting was observed in Mexico relative to other countries. In a post-hoc analysis to assess whether these patterns may have been driven by differences in survey language, a similar pattern by language within the USA was observed for binge eating, but not self-induced vomiting, with a weaker association between FS status and binge eating among participants who completed the survey in

Table 1. Observed sample characteristics

	% (*n*) or Mean ± SD
Country	
Australia	18.7 (19 574)
Canada	20.5 (21 528)
Mexico	19.9 (20 910)
UK	20.6 (21 597)
USA	20.29 (21 272)
Survey year	
2018	21.8 (22 824)
2019	18.4 (19 284)
2020	20.4 (21 411)
2021	19.7 (20 685)
2022	19.7 (20 677)
Age group (years)	
18–29	22.3 (22 637)
30–44	26.8 (28 007)
45–59	25.4 (25 980)
≥60	25.5 (28 257)
Gender	
Cis men	48.2 (51 024)
Cis women	51.0 (52 929)
Trans men	0.3 (248)
Trans women	0.3 (234)
Gender queer/gender nonconforming	0.3 (310)
Ethnicity	
Majority in respective country	76.5 (84 229)
Minority in respective country	23.5 (19 448)
Educational attainment	
Low	41.9 (30 943)
Medium	22.1 (28 175)
High	36.0 (45 299)
Perceived income adequacy	
Very difficult to make ends meet	9.0 (8316)
Difficult to make ends meet	21.9 (21 590)
Neither easy nor difficult	37.2 (37 852)
Easy to make ends meet	20.9 (23 262)
Very easy to make ends meet	11.1 (12 789)
Perceived social status (on a scale of 1–10)	5.5 ± 1.9
Employment status	
Employed	50.2 (54 599)
Seeking work	5.9 (5306)
Retired	18.4 (20 486)
Student	
No	83.0 (86 993)
Yes, full-time	9.6 (9841)
Yes, part-time	7.4 (7913)
Parent with any children aged <18 years in the household	31.1 (33 190)
Perceived weight status	
"Obese"	7.8 (8013)
"Overweight"	42.1 (43 738)
"Just about right"	42.4 (44 498)
"Underweight"	7.7 (7396)
Household FS level	
High FS	49.2 (54 295)
Marginal FS	16.2 (16 323)
Low FS	16.7 (16 505)
Very low FS	17.9 (17 294)
Past-3-month ED behaviors	
Binge eating	43.6 (44 515)
Self-induced vomiting	9.4 (9520)

All statistics except frequencies (*n*'s, which represent observed counts) are weighted by using sample weights.

Spanish compared with those who completed it in English (Supplementary Figure S1).

Survey year

Examination of potential moderation by survey year did not reveal meaningful differences, though associations between household FS level and past-3-month self-induced vomiting were somewhat stronger in later survey years (Figure 2).

Age

Associations between household FS level and both ED behaviors were generally strongest in young adulthood and weaker in older adulthood (Figure 3).

Gender

Among trans women, those with low FS were particularly likely to report both ED behaviors (Figure 4). However, such differences should be interpreted cautiously given the wide CIs.

Ethnicity

Associations between household FS level and both ED behaviors were stronger among participants representing a minority ethnicity in their country relative to those representing the majority ethnicity in their country (Figure 5).

Parent status

Associations between household FS level and both ED eating behaviors were generally stronger among parents than nonparents (Figure 6).

Perceived weight status

The association between FS level and binge eating was weakest in those perceiving themselves to be "obese"—the group exhibiting the highest prevalence of binge eating across FS statuses. The association with self-induced vomiting was weakest for those perceiving themselves to be "just about right"—the group exhibiting the lowest prevalence of self-induced vomiting across FS statuses (Figure 7).

Discussion

In this large study utilizing data from five waves of the International Food Policy Study across Australia, Canada, Mexico, the UK, and the USA, a greater severity of household FI was associated with an increased prevalence of binge eating and self-induced vomiting. Moderation analyses revealed differences in associations by country, age, gender, ethnicity, parental status, and perceived weight status. Notably, the strongest associations between household FS and ED behaviors were observed among younger adults, minority ethnic groups, and parents. Weaker associations were observed in participants from Mexico, who exhibited a higher prevalence of binge eating but lower prevalence of self-induced vomiting compared with other countries. Additionally, the link between household FS and binge eating was weakest among those who perceived themselves to be "obese," whereas the association with self-induced vomiting was weakest among individuals who felt that their weight was "just about right."

Consistently with previous research on FI and disordered eating, these findings support the prevailing claim that lower FS is associated with elevated prevalence of ED behaviors. Prior USA-based investigations suggest that a "feast-or-famine" cycle induced by public food-assistance programs that distribute benefits once a month may contribute to ED behaviors in the context of FI [18]. However, in the present study, increasing severity of FI was associated most strongly with engagement in ED behaviors at least weekly, suggesting that these behaviors may occur throughout the full month even if

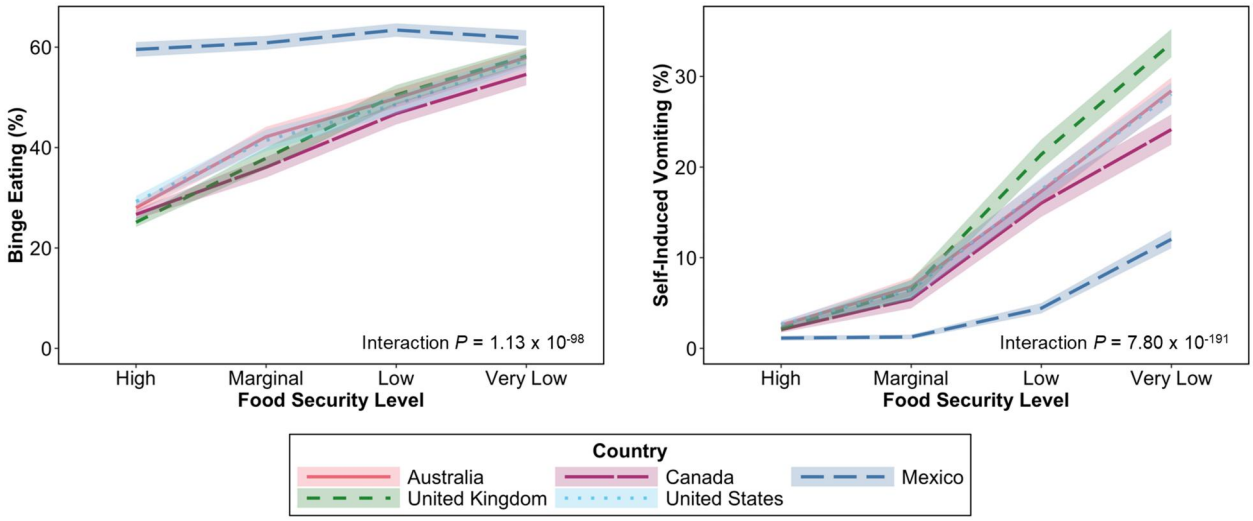

Figure 1. Predicted prevalence of past-3-month binge eating and self-induced vomiting by household FS level and country, adjusted for survey year and participant sociodemographic characteristics (shaded areas represent 95% CIs).

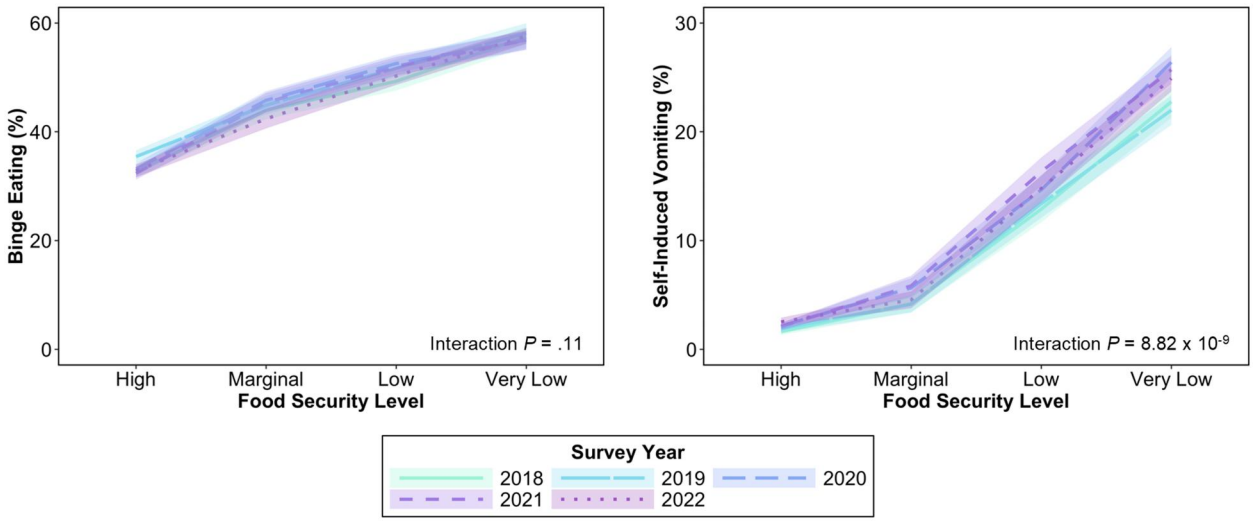

Figure 2. Predicted prevalence of past-3-month binge eating and self-induced vomiting by household FS level and survey year, adjusted for country and participant sociodemographic characteristics (shaded areas represent 95% CIs).

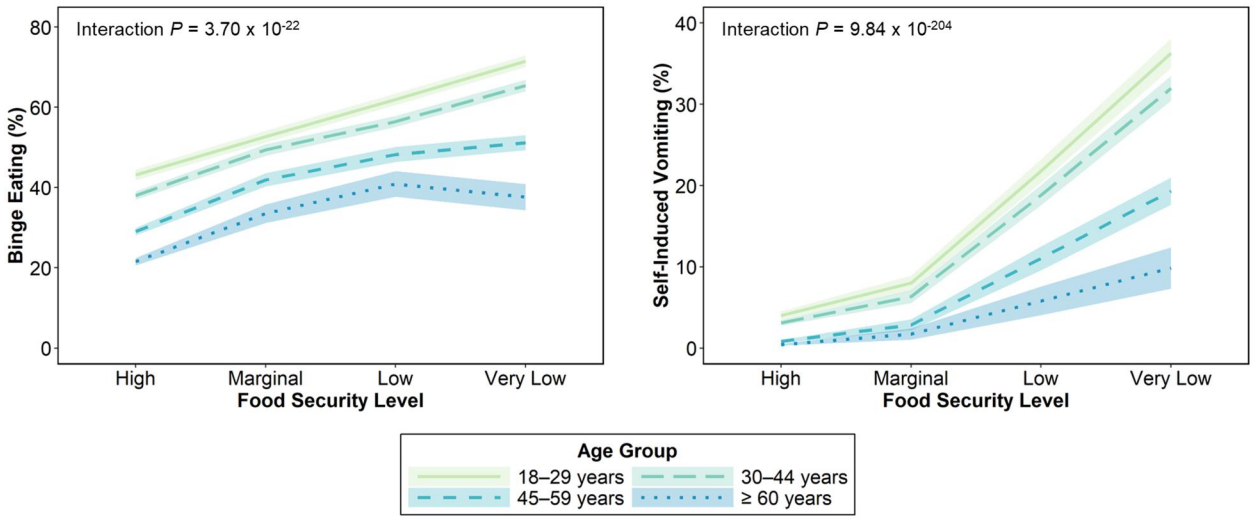

Figure 3. Predicted prevalence of past-3-month binge eating and self-induced vomiting by household FS level and age group, adjusted for country, survey year, and participant sociodemographic characteristics (shaded areas represent 95% CIs).

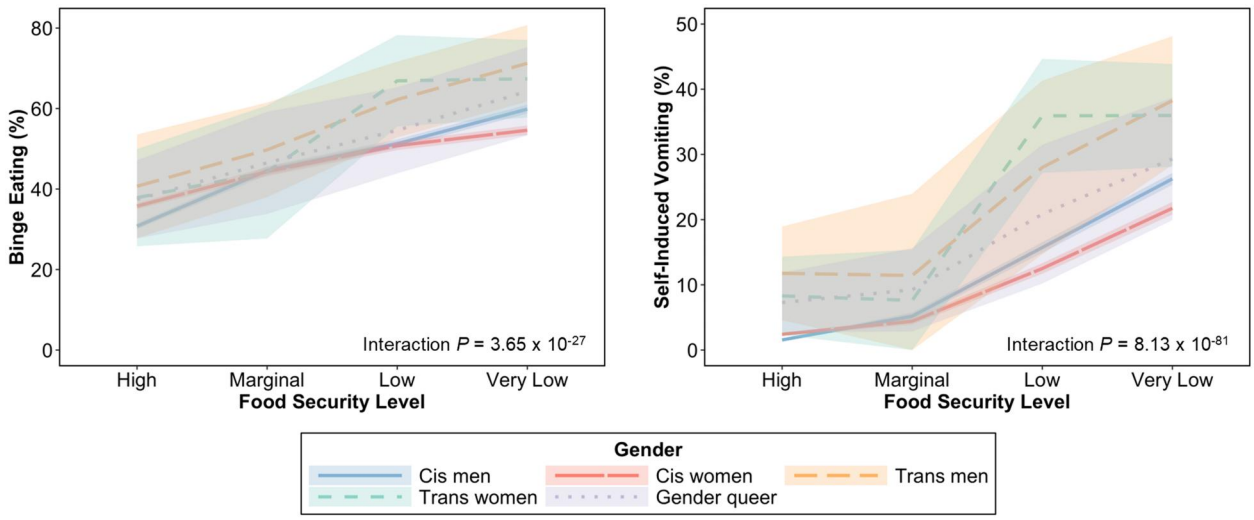

Figure 4. Predicted prevalence of past-3-month binge eating and self-induced vomiting by household FS level and gender, adjusted for country, survey year, and participant sociodemographic characteristics (shaded areas represent 95% CIs).

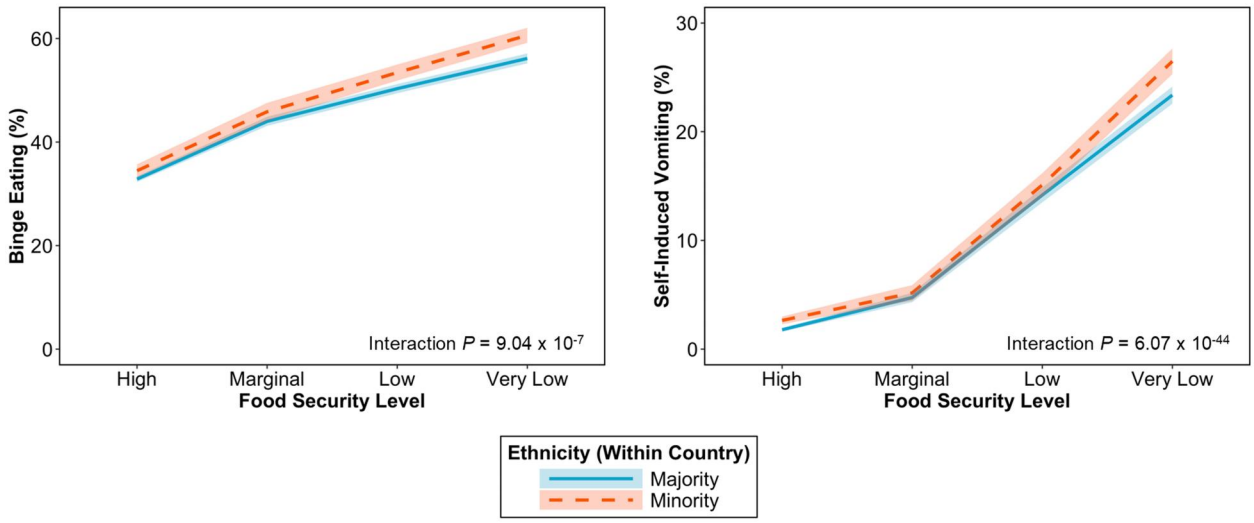

Figure 5. Predicted prevalence of past-3-month binge eating and self-induced vomiting by household FS level and ethnicity, adjusted for country, survey year, and participant sociodemographic characteristics (shaded areas represent 95% CIs).

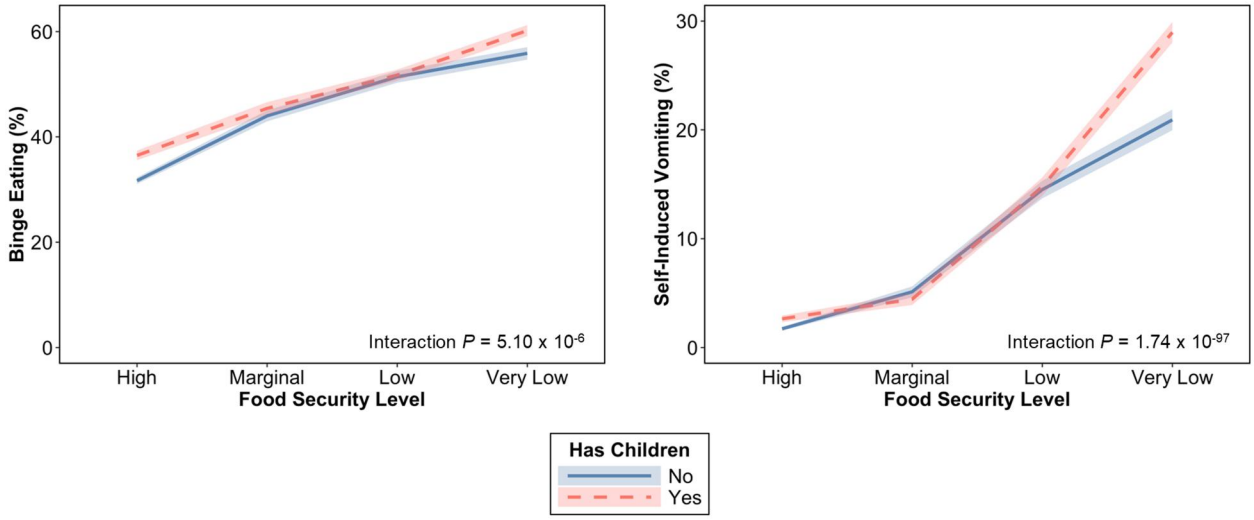

Figure 6. Predicted prevalence of past-3-month binge eating and self-induced vomiting by household FS level and parent status, adjusted for country, survey year, and participant sociodemographic characteristics (shaded areas represent 95% CIs).

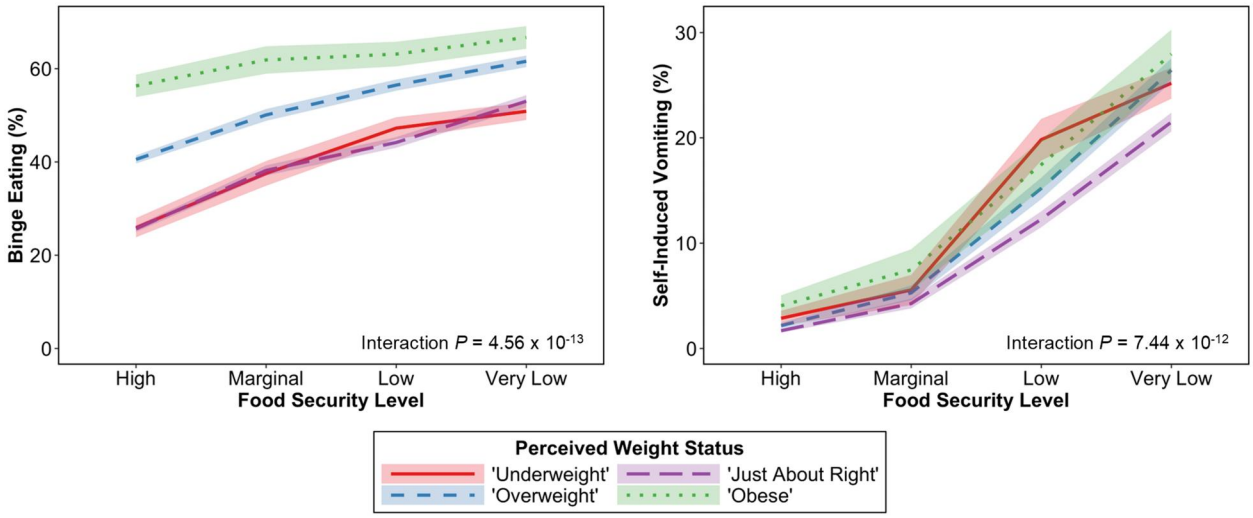

Figure 7. Predicted prevalence of past-3-month binge eating and self-induced vomiting by household FS level and perceived weight status, adjusted for country, survey year, and participant sociodemographic characteristics (shaded areas represent 95% CIs).

they may have initially developed as a response to cyclical fluctuations in food availability. Of note, the stronger association observed between FI and self-induced vomiting suggests that compensatory behaviors to control weight may occur independently of binge eating in the food-insecure context, or at least independently of eating episodes perceived to be binge eating. The strength of the association between FI and self-induced vomiting to control weight can perhaps be contextualized by considering the pervasiveness of the thin ideal in Western cultures, the challenge of affording healthful foods coupled with weight-stigmatizing public health messaging [40], and the established link between internalized weight stigma and ED pathology, including in food-insecure populations [41]. Such a context may illustrate why, across countries, Mexico—likely the least influenced by Western culture among the countries studied—exhibited the lowest prevalence of self-induced vomiting and the weakest associations between FI and ED behaviors. However, it remains important to consider the possibility of translation or cultural differences in how the question was asked. Paralleling the trend in Mexico, among those who filled out the USA-based survey in Spanish, the prevalence of binge eating was relatively similar across FS levels. This could suggest language-based differences or, alternatively, it might further bolster the earlier argument, as a greater proportion of those filling out the Spanish survey may be of Hispanic or Latinx descent and therefore remain outside the context of high-income, English-speaking countries.

Individuals who perceived their weight as "just about right" exhibited the lowest prevalence of self-induced vomiting and the weakest association with FS status. Individuals who perceive themselves as "just about right" likely feel less societal pressure to alter their bodies compared with other groups, which may explain the lower prevalence of self-induced vomiting across FS statuses. In contrast, a similar pattern was not seen for binge eating. The weakest association between FS status and binge eating was found among individuals who perceived themselves as "obese," yet this group exhibited the highest prevalence of binge eating. It is possible that other risk factors, such as body dissatisfaction and internalized weight stigma, may be more prominent predictors of risk in this high-risk group, making the impact of FI relatively less important. These findings highlight the importance of distinguishing between different predictors of risk and patterns of association when studying eating disorders and FI.

There are both strengths and limitations of the present study. Strengths include the large, international sample of diverse participants across multiple survey years, which enhanced the generalizability of findings and facilitated the examination of moderation by key factors—analyses that prior studies have not had the statistical power to conduct. However, limitations should also be noted. For example, samples were not recruited by using probability-based sampling, though sample weights based on country-specific census data were used to maximize external validity. The cross-sectional and self-report nature of the data is an additional limitation of the study.

Given the high prevalence of FI [4] and the large economic and social burden of EDs [42–44], understanding that the strong, positive, dose–response relationship between FI and ED behaviors occurs cross-nationally is compelling for both public health investigation and intervention. It also highlights the pervasive and robust association between FI and ED behaviors [18, 45], regardless of culture, geo-location, and governmental/social support structures. Efforts to improve the accessibility and availability of nutritious foods for individuals facing FI are a global issue with potentially far-reaching implications beyond physical health.

Ethics approval

The study was reviewed by and received ethics clearance through a University of Waterloo Research Ethics Committee (ORE #21460 for the 2018 survey and ORE #30829 for the 2019–2022 surveys).

Author contributions

D.H. designed the International Food Policy Study; V.M.H., N.L.B., and A.E. formulated the research questions; V.M.H. conducted the analyses; A.E., V.M.H., N.L.B., and K.R.S. drafted the manuscript, led by A.E.; all authors provided critical feedback and read and approved the final manuscript.

Supplementary data

Supplementary data is available at *IJE* online.

Conflict of interest: None declared.

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Data availability

Data can be accessed on request pending application and approval. Study information can be found on the International Food Policy Study website: http://foodpolicystudy.com/about/.

Use of artificial intelligence (AI) tools

No AI tools were used in this manuscript.

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