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Title

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Permalink

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Journal

International Journal of Eating Disorders, 56(6)

ISSN

0276-3478

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Publication Date

2023-06-01

DOI

10.1002/eat.23944

Peer reviewed



Published in final edited form as:

Int J Eat Disord. 2023 June ; 56(6): 1233–1239. doi:10.1002/eat.23944.

Food insecurity and binge-eating disorder in early adolescence

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Abstract

Objective: Food insecurity is defined as lack of consistent access to adequate food for healthy living. The objective of this study was to determine the associations between food insecurity and binge-eating disorder in a national cohort of 9–14-year-old children.

Method: We analyzed prospective cohort data from the Adolescent Brain Cognitive Development (ABCD) Study (N=10,035, 2016–2020). Logistic regression analyses estimated the associations between food insecurity at baseline, year one, or year two (exposure) and binge eating, subclinical binge-eating disorder (Other Specified Feeding and Eating Disorder-Binge-Eating Disorder [OSFED-BED]), and binge-eating disorder (BED) (outcome) based on the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5) at two-year follow-up.

Results: The prevalence of food insecurity in the study was 15.8%. At two-year follow-up, 1.71% of the sample received a diagnosis of BED or OSFED-BED, while 6.62% reported binge

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All authors approve of the final submitted version

Conflict of Interest Disclosures (includes financial disclosures): The authors have no conflict to declare.

eating. Food insecurity was associated with 1.67 higher odds of BED or OSFED-BED (95% CI 1.04–2.69) and 1.31 higher odds of binge-eating symptoms (95% CI 1.01–1.71).

Discussion: Food insecurity in early adolescence is associated with higher odds of developing future binge-eating and BED or OSFED-BED. Clinicians may consider assessing for binge eating in adolescents with food insecurity and provide support in accessing appropriate food resources.

Keywords

binge-eating disorder; food insecurity; binge eating; adolescent health

Introduction

Food insecurity (FI) is defined as limited accessibility to adequate food for healthy living due to a lack of money or other resources (Keenan et al., 2001). Based on national surveys, nearly 3 million (7.6%) US households with children experience FI and this number has increased in recent years (Coleman-Jensen et al., 2021). Numerous studies have linked FI with significant negative impacts on all domains of health in children, including physical, emotional, and behavioral health and development (Thomas et al., 2019). For example, FI has been shown to alter dietary behavior among children. However, specific forms of dietary behaviors such as binge eating, the consumption of large amounts of food in a short period of time coupled with a sense of loss of control, are understudied. Given the ongoing development and high prevalence of FI, coupled with the potential harms of binge eating especially among children, further studies are warranted to elucidate the intricate ways FI impacts dietary behaviors among children.

Binge eating, other disordered eating behaviors, and eating disorders represent a growing public health concern, given their associations with psychosocial impairment and medical complications (Nagata et al., 2018; O'Brien et al., 2017). Particularly in children, the risk factors for the development of binge-eating behaviors are not fully understood (Bohon, 2019). Households with FI may experience fluctuations in their food consumption that correspond to fluctuations in food availability, sometimes described as the “feast-or-famine” cycle (Dinour et al., 2007). For example, periods of food scarcity and food abundance may result in periods of food restriction and overconsumption, respectively, and thereby contribute to the development of binge eating. Furthermore, food scarcity can also cause stress, activating the hypothalamic-pituitary-adrenal axis leading to cortisol release, which may contribute to binge eating behaviors (Gluck, 2006).

Mostly cross-sectional studies have previously described associations between food insecurity and binge eating, though of these, few have specifically examined the relationship in children and adolescents (Bruening et al., 2011; Hazzard et al., 2020; Larson et al., 2020). One longitudinal study of adolescents and young adults in Minnesota demonstrated associations between severe food insecurity and binge eating (Hazzard et al., 2022). However, these studies have focused largely on binge eating, rather than the clinical diagnoses of binge-eating disorder (BED) and subclinical BED (Other Specified Feeding and Eating Disorder-Binge-Eating Disorder [OSFED-BED]). Prior studies that have examined FI and BED as well as bulimia nervosa (BN), an eating disorder that involves

binge eating symptoms plus purging, are limited to cross-sectional samples of adults (Lydecker & Grilo, 2019; Rasmusson et al., 2019). Thus, although the link between FI and binge eating is reasonably well-established in adults, there is a paucity of data using large, national longitudinal samples examining the relationship between food insecurity and BED and OSFED-BED in childhood and adolescence using the Diagnostic and Statistical Manual, 5th Edition (DSM-5) criteria (Sarmiento & Lau, 2020).

The objective of this study was therefore to examine the associations between FI and binge eating and BED or OSFED-BED in a population-based, demographically diverse cohort of children ages 9–11 in the U.S. We hypothesized that food insecurity would be associated with greater odds of binge eating and BED or OSFED-BED at two-year follow-up.

Methods

Study Sample

We analyzed prospective data from the Adolescent Brain Cognitive Development (ABCD) Study, a longitudinal study of brain development and health across adolescence in 11,875 children recruited from 21 sites around the U.S. To recruit a sample representative of U.S. diversity, the ABCD study implemented epidemiologically-informed strategies largely through school systems and considering sociodemographic factors. Additional details are described elsewhere (Garavan et al., 2018). Data analyzed are from the ABCD 4.0 release for the baseline (2016–2018, 9–10-years-old), year one (2017–2019) and year 2 (2018–2020) assessments. Participants with missing data for FI or binge eating, OSFED-BED, and BED were excluded (N=1906, 15.9%). For participants with missing confounder data, we used Gaussian normal regression imputation to impute missing data. Centralized institutional review board (IRB) approval was obtained from the University of California, San Diego. Study sites obtained approval from their respective IRBs. Caregivers provided written informed consent and each child provided written assent. Data used in this study were obtained from the ABCD Study (<https://abcdstudy.org>), held in the NIMH Data Archive (NDA).

Exposures: Food insecurity

Parents/caregivers of participants in the ABCD study were asked the following question to assess the presence of food insecurity at each year (Barch et al., 2018; Hoffman et al., 2019): “In the past 12 months, has there been a time when you and your immediate family needed food but couldn’t afford to buy it or couldn’t afford to go out and get it?” This single item has a 59–93% sensitivity and 85–87% specificity in pediatric populations for detecting food insecurity as measured by the gold-standard 18-item US Household Food Security Scale and is considered the most inclusive question of the scale (Bickel et al., 2000; Hager et al., 2010; Lane et al., 2014). Those who responded “yes” at baseline, year one, or year two were coded as having food insecurity during the study.

Outcome

The ABCD Study utilized the Kiddie Schedule for Affective Disorders and Schizophrenia (KSADS-5), a computerized tool for categorizing child and adolescent mental health

concerns based on the DSM-5, for assessment of binge eating. Parents/caregivers completed all modules of the KSADS-5 to frequency, duration, characteristics of their child's binge eating as well as associated distress. Using the KSADS-5 computerized scoring system, responses to the interview questions were extrapolated into their respective diagnosis from reported symptoms corresponding to the DSM-5. Participants who reported features of binge eating and distress associated with binge eating, but did not meet the full criteria for BED were coded as having OSFED-BED. The specific diagnostic criteria used in this study are described in Supplemental Table 1. Although BN also consists of binge eating symptoms, the prevalence of BN in the sample was low and therefore we focused our study on BED and OSFED-BED.

Confounders

We selected potential sociodemographic confounders for the association between FI and binge eating based on previous literature and theory (Hazzard et al., 2020). Age (years), sex (female, male), race/ethnicity (White, Latino/Hispanic, Black, Asian, Native American, other), household income (U.S. dollars, six categories), and highest parent education (high school or less vs. college or more) were based on parents' self-report as they could all influence both the exposure and the outcome variables. ABCD Study site was included as a confounder to adjust for potential regional variation. Baseline binge eating, BED, and OSFED-BED based on KSADS-5 assessment were also included as confounders in order to demonstrate potential temporality with the association between FI and new-onset binge eating pathology.

Statistical Analysis

Multiple logistic regression analyses were conducted in 2022 using Stata 15.1 (StataCorp, College Station, TX) to estimate associations between food insecurity at baseline, year one, or year two (exposure) and the presence of binge-eating, BED, or OSFED-BED at year two (outcome), adjusting for confounders including baseline binge eating, BED, and OSFED-BED. Propensity weights were applied to yield representative estimates based on the American Community Survey from the US Census (Heeringa & Berglund, 2020).

Results

Table 1 describes sociodemographic characteristics of the 10,035 participants included. The sample was approximately matched by sex (48.8% female) and racially and ethnically diverse (45.8% non-White). The prevalence of food insecurity at baseline, year one, or year two was 15.8%. At two-year follow-up, 1.7% of the sample received a diagnosis of either BED or OSFED-BED, while 6.6% reported any form of binge eating.

In logistic regression analyses shown in Table 1, food insecurity at baseline, one-year follow-up, or two-year follow-up was associated with 1.67 higher odds of BED or OSFED-BED (95% CI 1.04–2.69) and 1.33 higher odds of binge eating (95% CI 1.01–1.71). Supplemental Table 2 includes logistic regression analyses between the included cofounders and binge eating and BED or OSFED-BED.

Discussion

In this population-based, demographically diverse cohort of 9–10-year-old children in the United States, we found that FI was associated with greater odds of binge eating and new onset BED or OSFED-BED. Though prior longitudinal studies have also demonstrated prospective associations between FI and binge eating (Hazzard et al., 2020, 2022), this study adds to the existing literature by: 1) using a large, national cohort with two-year-follow-up, 2) incorporating DSM-5 diagnoses of BED and OSFED-BED, and 3) focusing on children and adolescents, an important and understudied developmental period.

Food insecurity remains among the top public health areas of concern as outlined by the Healthy People 2030 objectives (U.S. Department of Health and Human Services, n.d.). Though initially improved between 2018 and 2020, recent studies found increases in FI due to the Coronavirus-19 (COVID-19) pandemic (Nagata et al., 2021). Similarly, studies have also shown a dramatic rise in the prevalence of eating disorders and their symptoms during the pandemic (Rodgers et al., 2020; Taquet et al., 2022). Therefore, further interventions are urgently warranted to both reduce FI and mitigate its potential downstream consequences related to eating disorder pathology.

Several mechanisms may explain the relationship between food insecurity and binge eating as well as the further development of BED and OSFED-BED in childhood and adolescence. In addition to episodes of binge eating, BED is characterized by greater frequency of episodes as well as feelings of marked distress and shame with episodes (Bohon, 2019). OSFED-BED, also known as subclinical BED, involves meeting the criteria for BED with lower frequency and for a shorter time period. As previously described, food insecurity may lead to fluctuations in food availability that correspond to periods of food overconsumption and food restriction (Dinour et al., 2007). This phenomenon has been described among those who participate in the Supplemental Nutrition and Assistance Program, in which families receive monthly benefits to purchase food (Wilde & Ranney, 2000). These benefits may be redeemed disproportionately at the beginning of the month and exhausted before the end of the month. The period of food scarcity at the end of the month may result in food restriction that later promotes binge eating (Elran-Barak et al., 2015; Polivy, 1996). Further, in a recent meta-analysis of adolescents in sixty-eight countries, FI was also associated with higher odds of fast food consumption, which may reflect affordability and higher caloric density of such meals that can also predispose individuals to binge-eating behaviors (Larson et al., 2020; Ledoux et al., 2015; Smith et al., 2022).

Food insecurity has been linked to several negative emotional, cognitive, and behavioral outcomes that may predispose individuals to the distress and shame required to diagnose BED and OSFED-BED (Myers, 2020). Previous studies have described FI as a known risk factor for poor mental health, including depression and anxiety (Bruening et al., 2017; Myers, 2020; Nagata et al., 2021). Qualitative studies have also characterized the experience of FI with feelings of shame and self-blame, reflecting a perceived failure of self-sufficiency (Hamelin et al., 2002; Whittle et al., 2016). Psychological models aiming to elucidate the processes and pathways driving binge eating describe the important roles of low self-esteem, negative affect, and difficulty with emotional regulation (Burton & Abbott, 2019). As such,

in addition to food restriction as a mechanism, FI can lead to consequential emotional disturbances that predispose susceptible individuals to not only binge eat, but also feel the distress and shame required to meet BED criteria.

The study has several limitations worth noting. Though we adjusted for potential confounders, residual confounding remains possible. Risk factors for both FI and BED may depend on several factors not controlled for in this study, including depression and other mood disorders, parental mental health, and school success. Given the observational study design, we cannot establish causality. Although participants were recruited considering sociodemographic factors, there was likely enrollment bias of more educated parents given that over 80% of parents had completed a college degree (National Center for Education Statistics, 2022). FI measures were based on parent report and also based on a single question regarding food accessibility; thus, they may be subject to reporting bias and fail to capture the specific nuances of how food insecurity manifests in different households. We also cannot assess levels of FI like measured using the United States Department of Agriculture (USDA) Food Security Survey Module, which is a more robust measurement of FI in the US. This study uses parent-reported assessments of binge eating. Although parents are important reporters for eating disorders in young children given they have less insight regarding their eating behaviors (Barch et al., 2018; Braet et al., 2007), parent and child reports of binge eating tend to have low concordance (Bartholdy et al., 2017; Steinberg et al., 2004; Tanofsky-Kraff et al., 2005). Lastly, while specific validity data for evaluation of eating disorders with the KSADS-5 is not available, the questions and algorithms closely reflect DSM-5 criteria and have been widely used in numerous studies (Mohammadi et al., 2020; Wilkinson et al., 2018).

Multiple professional medical organizations, including the American Academy of Pediatrics, American Academy of Family Physicians, and American College of Physicians already recommend screening for FI at least annually (Patil et al., 2018). Programs such as SNAP and Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) that provide aid for patients who experience FI can better tailor the use of benefits to avoid cycles of food availability fluctuations and food overconsumption and restriction. Further policy consideration can be made to adapt food assistance programs that minimize this cycling, such as revamping benefits installments to occur weekly or biweekly for easier management. Policies such as the Child Tax Credit and health insurance coverage for eating disorders treatment could also mitigate BED risk. Furthermore, similar to FI (Odoms-Young & Bruce, 2018), there is increased recognition of BED as a complex social justice issue (Bray et al., 2022). Minority populations, for instance, have historically received lack of access to eating disorder care and inclusion in eating disorders research, increasing the risk of delayed and poorer outcomes. Policy changes that target these systemic issues, such as increased education about BED among diverse populations and increased food assistance among marginalized communities, may profoundly impact the risk of both FI and BED. The US Preventive Services Task Force (USPSTF) recently reviewed eating disorder screening in asymptomatic adolescents and adults and found there was insufficient evidence to recommend routine screening in this population (Feltner et al., 2022). However, clinicians may still consider screening for eating disorder pathology and symptoms in patients with significant risk factors, such as food insecurity, especially given the negative

consequences of eating disorders (Nagata & Golden, 2022). For example, patients who endorse food insecurity may be provided with screening for binge eating and BED, such as the validated Binge-Eating Disorder Screener-7 (BEDS-7) (Herman et al., 2016). Further studies examining the relationship between food insecurity and the development of other eating disorders is necessary as the cohort transitions to later adolescence. Future studies could explore the role of body mass index in the association between food insecurity and BED.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

Funding/Support:

J.M.N. was funded by the National Institutes of Health (K08HL159350), the American Heart Association Career Development Award (CDA34760281), and the Doris Duke Charitable Foundation (2022056).

Role of Funder/Sponsor:

The funders had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

The ABCD Study was supported by the National Institutes of Health and additional federal partners under award numbers U01DA041022, U01DA041025, U01DA041028, U01DA041048, U01DA041089, U01DA041093, U01DA041106, U01DA041117, U01DA041120, U01DA041134, U01DA041148, U01DA041156, U01DA041174, U24DA041123, and U24DA041147. A full list of supporters is available at <https://abcdstudy.org/federal-partners/>. A listing of participating sites and a complete listing of the study investigators can be found at <https://abcdstudy.org/principal-investigators.html>. ABCD consortium investigators designed and implemented the study and/or provided data but did not necessarily participate in the analysis or writing of this report.

Data Availability Statement:

Data used in the preparation of this article were obtained from the ABCD Study (<https://abcdstudy.org>), held in the NIMH Data Archive (NDA). Investigators can apply for data access through the NDA (<https://nda.nih.gov/>).

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Public Significance Statement:

Prior research has shown that food insecurity is associated with disordered eating behaviors, including binge eating in adulthood. This study explored whether food insecurity in early adolescence increases risk for developing binge-eating disorder (BED). Targeted screening for BED in adolescents experiencing FI, and vice versa, may be warranted.

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Table 1.

Sociodemographic, food insecurity, and binge eating characteristics of 10,035 Adolescent Brain Cognitive Development (ABCD) Study participants

Sociodemographic characteristics (baseline)	Mean (SD) / %
Age (years)	9.9 (0.7)
Sex, n (%)	
Female	48.8%
Male	51.2%
Race/ethnicity (%)	
White	54.2%
Latino / Hispanic	19.7%
Black	16.1%
Asian	5.40%
Native American	3.20%
Other	1.40%
Household income (%)	
Less than \$25,000	16.2%
\$25,000 through \$49,999	20.4%
\$50,000 through \$74,999	18.3%
\$75,000 through \$99,999	16.5%
\$100,000 through \$199,999	21.8%
\$200,000 and greater	6.90%
Parent with college education or more (%)	81.7%
Food insecurity (baseline, year one, or year two)	15.8%
Binge eating characteristics (baseline)	
Binge eating	5.22%
BED or OSFED-BED *	1.16%
OSFED-BED *	0.59%
BED *	0.57%
Binge eating characteristics (two-year follow-up)	
Binge eating symptoms	6.63%
BED or OSFED-BED *	1.71%
OSFED-BED *	0.54%
BED *	1.17%

Propensity weights were applied to yield nationally representative estimates based on the American Community Survey from the US Census. SD = standard deviation.

* BED = Binge-Eating Disorder; OSFED-BED = Otherwise Specified Feeding and Eating Disorder (Binge-Eating Disorder)

Table 2.

Associations between food insecurity at baseline, year one, or year two and binge eating and BED or OSFED-BED at two-year follow-up in the Adolescent Brain Cognitive Development Study

	Food insecurity, unadjusted		Food insecurity adjusted	
	OR (95% CI)	p	OR (95% CI)	p
Binge Eating ^a	1.71 (1.37–2.14)	<0.001	1.33 (1.01–1.71)	0.034
BED [*] or OSFED-BED ^{*b}	2.52 (1.70–3.75)	<0.001	1.67 (1.04–2.69)	0.039

Bold indicates $p < 0.05$;

^{*} BED = Binge-Eating Disorder; OSFED-BED = Otherwise Specified Feeding and Eating Disorder (Binge-Eating Disorder)

^a Covariates: race/ethnicity, sex, household income, parent education, site, and baseline binge eating

^b Covariates: race/ethnicity, sex, household income, parent education, site, baseline OSFED-BED, and baseline BED