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## Food Insecurity and Psychological Distress: A Review of the Recent Literature

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### Abstract

**Purpose of review:** Food insecurity is the lack of sufficient food in quantity and/or quality. Psychological distress includes mental health issues such as depression and anxiety. This review provides current information on research examining the association between food insecurity and psychological distress.

**Recent findings:** Among studies published in the previous five years, food insecurity was significantly and positively associated with multiple indicators of psychological distress. This included cross-sectional and longitudinal studies, as well as primary data collection and secondary data analyses, from countries of varying income levels. Articles also provided evidence within various populations, such as adults of all ages, college students, those living with chronic disease, and parents.

**Summary:** Food insecurity and psychological distress are interconnected health issues. Future research should consider a number of important gaps in the literature, with the most important being the development of interventions to improve food insecurity and psychological health concurrently.

### Keywords

food insecurity; psychological distress; psychological health; psychological well-being; mental health

### Introduction

Food insecurity “exists when people do not have adequate physical, social, and economic access to sufficient, safe, and nutritious food, which meets their dietary needs and food

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Conflict of Interest

Candice A. Myers declares she has no conflict of interest.

Human and Animal Rights and Informed Consent

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preferences for an active and healthy life.”[1] Across the world, the Food and Agriculture Organization of the United Nations estimates that over 2 billion people are food insecure, which includes 8% of the population in North America and Europe.[2] In the United States (U.S.), the U.S. Department of Agriculture found that 11% of households reported being food insecure in 2018, while many states saw household food insecurity well above the national average.[3] Food insecurity is primarily a nutritional risk that affects diet and in turn can lead to various forms of malnutrition, including undernutrition and, paradoxically, overnutrition in the form of overweight and obesity. [2, 4] The positive association between food insecurity and obesity is most robust in women in high-income countries.[5, 6]

While food insecurity is a nutritional state that influences diet and body weight, it also holds consequences for psychological wellbeing. Specifically, food insecurity encompasses issues of psychological acceptability, such that an individual may experience feelings of deprivation or restricted food choice and anxiety about food supplies as a result of being food insecure.[7] Given this, food insecurity can negatively influence psychological health. The purpose of this review was to summarize recently published literature in the field of food insecurity research as it relates to psychological distress. Specifically, this review provides a broad overview of research published in the previous 5 years that has examined the association between food insecurity and psychological distress. For the purposes of discussion, published articles were organized under six categories, including 1) recent reviews; 2) analyses that span the globe; studies in 3) adult populations, 4) younger populations, 5) populations with chronic disease; and those which examine associations with 6) maternal depression. Table 1 displays published articles included in this review by category and relevant details for each article.

## Review Articles

Two recent articles provided scoping and systematic reviews of published research addressing food insecurity and mental health, [8, 9] both of which summarize research beyond the five years assessed in this review. Maynard et al. undertook a scoping review of studies that investigated the association between food insecurity and poor mental health with a specific focus on females in high-income countries.[8]•• Looking at 39 articles published up to May 2016, these authors identified a significant and positive link between food insecurity and depression in both cross-sectional and longitudinal analyses. Arenas and colleagues performed a systematic review and meta-analysis of published research up to December 2018 addressing food insecurity and mental health conditions among adults in the U.S.[9]•• Their results demonstrated a significant link between food insecurity and increased risks of depression, anxiety, and sleep disorders.

A more narrow review was also recently published that focused specifically on longitudinal research addressing food insecurity and emotional health (e.g., depression, anxiety, stress, etc.) in the U.S. published from January 2006 to July 2016.[10] Via a systematic narrative review, Bruening and others found a bi-directional relationship between food insecurity and poor emotional health in the U.S.

## Globally Focused Analyses

Using data from the 2014 Gallup World Poll, three analyses examined the association between food insecurity and mental health status and subjective well-being across the globe. Jones conducted a global analysis of food insecurity and mental health status using cross-sectional data from individuals located in 149 countries across the world.[11]•• Results demonstrated a dose-response relationship between food insecurity and poorer mental health indicating that as levels of food insecurity worsened (i.e., mild to moderate to severe) so did reported mental health status. In a similar analysis using individual-level data from 138 countries across the globe, Frongillo and others looked at the association between food insecurity and subjective well-being, which included reported feelings of worry, sadness, or stress.[12] They found that food insecurity was significantly associated with poorer subjective well-being in individuals aged 15 years and older. Taking a more macro-level perspective, the same researchers looked at aggregate levels of food insecurity and subjective well-being across 147 countries, and compared more- and less-developed countries.[13] They found that food insecurity was associated with poor subjective well-being, with this relationship being stronger in more-developed versus less-developed countries.

## Adult Populations

A number of studies from various countries assessed the link between food insecurity and psychological distress in adult populations. These studies largely undertook cross-sectional secondary data analyses, with a few collecting primary data via surveys. Further, most studies were carried out in high-income countries, with one study focusing on a low-income country. Chung and others utilized nationally representative data in adults aged 19 years and older from Korea to explore how food insecurity affected mental health indicators and quality of life.[14] They found that Koreans living in households reporting food insecurity without hunger or food insecurity with hunger had higher odds of reporting perceived stress compared to those living in food secure households. Further, Koreans living in food insecure households with hunger also showed greater odds of depressive symptoms compared to those living in food secure households. Looking at quality of life, Chung et al. also found that compared to Koreans living in food secure households, those living in food insecure households without and with hunger showed greater odds of anxiety/depression. A study conducted in Denmark by Lund and colleagues focused on how food insecurity was associated with health-related outcomes, including psychological distress.[15] Their analyses showed that adults 18 years old or more who reported low and very low food security demonstrated greater risks of psychological distress compared to adults who were food secure. Using a nationally representative survey of Canadians aged 18 years and older, Martin et al. demonstrated that the prevalence of mental illness, defined as self-reported diagnosis of mood or anxiety disorders, was higher for women and men living in severely food insecure households compared to those living in food secure households.[16] Similarly, in a sample of Indigenous Canadians aged 19 years and older, Hossain and Lamb found that greater levels of food insecurity were linked to lower levels of psychological well-being.[17] Within the U.S., Liu et al. used data from the Behavioral Risk Factor Surveillance System (BRFSS) in 12 states to explore the relationships between food insecurity, frequent mental

distress, and insufficient sleep in adults.[18] Their results indicated that the prevalence of frequent mental distress was significantly greater in adults who reported food insecurity compared to those who did not report food insecurity. They also found that the frequency of insufficient sleep was more prevalent in those who reported food insecurity. Using a sample of African-American adults from the California Health Interview Survey, which is the largest state-based health survey in the U.S., Allen et al. determined that the prevalence of mild to moderate psychological distress was higher among those who reported being food insecure and serious psychological distress was highest in those who reported food insecurity with hunger.[19] Friel and colleagues used nationally representative data in adults from Australia to extend the research evidence on food insecurity and mental health by incorporating the impact of drought. [20] Their results found that exposure to drought heightened the relationship between food insecurity and psychological distress, measured as non-specific symptoms of anxiety and depression. Such results are important as they point to the need to consider the complex relationship between climate change and food insecurity, with specific consideration given to how these interconnected issues threaten well-being. Last, in a population-based study in Uganda, Perkins and colleagues surveyed adults aged 18 years and older to assess the association between food insecurity and depression symptoms. [21] Their study demonstrated that severe food insecurity was associated with greater depression symptom severity for both women and men.

Two studies examined food insecurity and psychological distress in older adults in the U.S. Jung et al. conducted a cross-sectional study of lower income older adults aged 60 years and older in Alabama to investigate the associations between self-care capacity, food insecurity, depressive symptoms, and nutritional status.[22] Their study demonstrated that food insecurity was significantly associated with greater depressive symptoms. Pak and Kim used longitudinal data from a sample of Americans over age 50 to test the association between food insecurity and health outcomes, including depressive symptoms.[23] Based upon their analysis, they concluded a significant linkage between food insecurity and the occurrence of more depressive symptoms.

## Young Adult and Adolescent Populations

Researchers have also investigated the link between food insecurity and psychological distress in younger populations, including young adults and adolescents. These studies include both secondary data analyses and primary data collection and were conducted across countries with a range of income levels (i.e., high-, middle-, and low-income). Using National Health and Nutrition Examination Survey (NHANES) data from the U.S., Maynard et al. investigated the association between food insecurity and perceived anxiety among adolescents aged 12 to 17 years.[24]• They found that in sex-stratified analyses food insecurity was associated with higher perceived anxiety in adolescent females but not males. Nagata and colleagues also used nationally representative data from the U.S. in young adults aged 24 to 32 years.[25] Their analysis demonstrated that young adults who reported food insecurity had greater odds of mental health problems, including depression and anxiety or panic disorder. They further found that food insecurity was associated with poorer sleep outcomes including trouble falling asleep and staying asleep. Moving beyond cross-sectional analyses, Fertig used longitudinal data from the U.S. to examine how experiences of food

insecurity during childhood influenced psychological distress experienced later in life.[26]• Fertig's results suggested that young adults who reported experiencing food insecurity during childhood also reported greater psychological distress in adulthood.

Rani and colleagues used a sample of teenage girls aged 13 to 19 in India to investigate the impact of food insecurity on mental health. Their analysis found that teenage girls from food insecure households were more likely to have high levels of anxiety, depression, loss of behavioral control, and psychological distress compared to those living in food secure households.[27] In a sample of youth aged 17 to 21 years from Ethiopia, Jebena and others showed that food insecurity was significantly associated with common mental disorders, including somatic items, such as sleeplessness or poor memory, and psychological issues, such as stress-related and mood disorders.[28] In a sample of young women aged 18 to 34 years from Kenya, Gust et al. demonstrated that compared to those who reported low to no psychological distress, young women who reported high or moderate psychological distress also reported concerns about recent food insecurity.[29]

### College Students

A recent systematic literature review highlighted the increasing prevalence of food insecurity among students enrolled in postsecondary education institutions,[30] which has consequences for health outcomes in college students including psychological well-being. Darling et al. carried out a study in a sample of freshmen college students from a single U.S. university to understand how food insecurity was associated with mental health outcomes. [31] They found that young adults who reported being food insecure also reported greater depressive symptoms compared to those who did not report food insecurity. Bruening and colleagues conducted a secondary analysis of data from a study in a sample of university freshmen enrolled at a single university in the U.S.[32] Their cross-sectional analysis provided evidence that food insecurity and a greater likelihood of depressed mood were associated in the sample, but did not find similar significant associations longitudinally. Using qualitative methods, Meza et al. interviewed 25 undergraduate students to explore the psychosocial consequences of food insecurity. Data from in-depth, semi-structured interviews demonstrated that students who experienced food insecurity also discussed feelings of sadness and hopelessness as a consequence.[33]

### People Living with HIV and Diabetes

Focusing on populations living with chronic disease, research has shown that food insecurity can impede disease management by acting as a barrier to antiretroviral therapy adherence [34] and diabetes self-management.[35-37] Given this, food insecurity also plays a role in the mental health of people living with HIV (PLHIV) and type 2 diabetes patients. Heylen and colleagues focused on the relationship between food insecurity and psychological well-being in a sample of PLHIV in South India.[38] They showed that PLHIV with moderate to severe food insecurity reported lower quality of life compared to those with mild to no food insecurity. They also found that male, but not female, PLHIV with food insecurity also reported greater depression. Another study conducted in Ethiopia used a sample of PLHIV to test the hypothesis that food insecurity would be associated with poorer quality of life.

[39] Tesfaye and others demonstrated that severe food insecurity was associated with poorer quality of life and common mental disorders, including symptoms of depression and anxiety. In a sample of PLHIV in San Francisco, California, Palar et al. assessed the longitudinal association between food insecurity and depressive symptoms.[40] Results from their analysis showed that severe food insecurity significantly increased the subsequent severity of depressive symptoms.

Using NHANES data, Montgomery et al. examined the relationship between food insecurity and depression in adult patients with type 2 diabetes in the U.S.[41]• Their analysis demonstrated that food insecurity was significantly and positively associated with depressive symptoms. Silverman and colleagues undertook a secondary data analysis of patients with type 2 diabetes enrolled in a randomized clinical trial to determine the relationship between food insecurity and depression.[42] They found that food insecurity was associated with depression in those living with diabetes. In a sample of Latinos with type 2 diabetes participating in a stress management intervention, Bermúdez-Millán and colleagues examined the mediating role of psychological distress on the association between food insecurity and poor sleep quality. [43] Their analysis found that food insecurity was associated with greater psychological distress in the sample. Further, depressive and anxiety symptoms each mediated the relationship between food insecurity and poor sleep quality.

## Maternal Depression

Among mothers, experiencing food insecurity may elicit a protective response to shield their children. Known as ‘maternal deprivation,’ mothers sacrifice or reduce their own food intake to ensure their children have enough to eat.[44] With this in mind, researchers have explored the impact of food insecurity on maternal psychological health. This includes studies in low-income countries, as well as the U.S. In a study of pregnant women in Ethiopia, Jebena and colleagues examined the association between household food insecurity with mental distress during pregnancy.[45] They found that pregnant women living in food insecure households were more likely to have mental distress than those who reported food security. Weigel et al. carried out a study in a sample of women with children in Ecuador and showed that household food insecurity was associated with low mental health scores and mental health complaints, such as stress and depression.[46] Munger and colleagues examined the longitudinal relationship between food insecurity and maternal depression using a secondary data analysis in a sample of urban mothers from the U.S.[47] Their analysis showed a significant link between food insecurity and the probability of maternal depression across two years. Reversing the directionality of the association between food insecurity and psychological distress, Noonan and others utilized data from a nationally representative sample of children born in the U.S. to explore the effects of maternal depression on subsequent food insecurity.[48] They found an adverse relationship between maternal depression and food insecurity, wherein severe maternal depression increased the likelihood of subsequent food insecurity.

Maternal depression also had mediating effects on other family issues, such as parenting and the home emotional environment. Using longitudinal data in a sample of rural, low-income mothers in the U.S., Doudna et al. found a reciprocal relationship between food insecurity

and depressive symptoms across time.[49] They further found that depressive symptoms decreased parenting confidence and perceived parenting support over time. Investigating the home emotional environment, Gill et al. looked at the mediating role of maternal depression on the association between food insecurity and the home emotional environment in a cross-sectional analysis of mothers and children under the age of five in the U.S.[50] Their study showed that mothers in households with low and very low food security were more likely to report greater frequencies of disciplining children. However, they did not find that maternal depression significantly mediated this relationship.

A few studies further explored the link between food insecurity and maternal depression by including intimate partner violence as another harmful factor. Hernandez and colleagues examined if food insecurity was driven by maternal experiences of intimate partner violence and if maternal depression mediated this relationship. [51] Using longitudinal data from a sample of disadvantaged urban mothers in the U.S., they found that mothers who experienced intimate partner violence saw an increased risk of experiencing food insecurity two years later, and maternal depression mediated this relationship indicating the compounding effect of experiencing intimate partner violence on depression leading to food insecurity. In a study of women living in Greater Rio de Janeiro, Brazil, Leite de Moraes et al. examined associations between food insecurity, common mental disorders, and psychological and physical intimate partner violence.[52] Their study suggested that food insecurity was significantly associated with both psychological and physical violence. Further, via path analysis they identified that food insecurity and psychological intimate partner violence were linked via both physical intimate partner violence and common mental disorders.

### **Paternal Psychological Health**

While the focus of most research examining food insecurity and psychological distress in the context of families has been on the experience of mothers, a few studies have assessed how food insecurity and paternal psychological health are related. In a nationally representative sample of mothers and fathers in the U.S., Tseng and colleagues examined the cross-sectional association between household food insecurity and serious psychological distress in parents.[53] They found that among both mothers and fathers, food insecurity was significantly associated with serious psychological distress. Importantly, their study highlighted that fathers in food insecure households were at a higher risk of serious psychological distress compared to food insecure mothers. In another study that also used nationally representative data from the U.S., Ciciurkaite and Brown examined the adverse mental health effects of food insecurity in both men and women to better understand gender differences in family roles.[54] For both women and men, they found that low and very low food security, compared to full food security, was associated with greater depressive symptoms. Among women, they found that having children provided protective effects against psychological distress (e.g., depressive symptoms), controlling for food security status. However, the psychological benefits of having children were significantly lower among women with low or very low food security. Among men, they did not find a significant effect of having children on depressive symptoms, regardless of food security status.

## Role of Supplemental Nutrition Assistance Program In the United States

Within the U.S., the Supplemental Nutrition Assistance Program (SNAP) is among the largest Federal food and nutrition assistance programs to address food insecurity by providing monthly electronic benefits to qualifying low-income households to purchase food.[3] Importantly, some studies have considered the role of SNAP in the relationship between food insecurity and maternal depression. Oddo et al. examined if SNAP participation was associated with improvements in psychological distress among household heads using longitudinal survey data.[55] They showed that after 6 months of SNAP participation, fewer household heads reported psychological distress. Leung and colleagues used NHANES data to examine the association between food insecurity and depression and determine if this association differed by SNAP participation among adults with household incomes  $\leq$  130% of the federal poverty threshold.[56] Their analysis demonstrated that food insecurity was positively associated with depression, but SNAP modified this association by decreasing the magnitude of this relationship. Among studies discussed previously, a number also assessed the impact of SNAP on the relationship between food insecurity and maternal depression. Munger and colleagues examined the role of SNAP participation in the relationship between food insecurity and maternal depression.[47] They found that the loss of SNAP benefits increased the probability of depression, while gaining SNAP benefits reduced the probability of depression. Further, Noonan and others found that maternal depression related to an increased likelihood of participating in SNAP.[48] Taken together, these studies highlight the buffering role of SNAP in the relationship between food insecurity and psychological distress in mothers who participate in the program.

While the focus was not on mothers, two studies also examined the potential buffering role of SNAP. In Fertig's aforementioned study, young adults who reported experiencing food insecurity as children also reported greater psychological distress. Fertig also found that SNAP usage during childhood reduced the deleterious consequences of food insecurity on psychological health in adulthood.[26] However, the study by Pak and Kim found that SNAP participation did not modify the relationship between food insecurity and depression in older adults.[23]

## Conclusions

Overall, the studies reviewed herein established a significant and positive association between food insecurity and psychological distress. This adverse relationship exists in adults, adolescents and young adults, college students, individuals with chronic disease, and parents. Studies utilized both cross-sectional and longitudinal data, as well as primary data collection and secondary data analyses. Further, studies were from a multiple countries across the globe with varying income levels. A few studies also found that SNAP played a buffering role in the relationship between food insecurity and psychological distress.

This review provides critical insight into suggestions for future research in order to fill important gaps in the current literature. Moving forward, studies should consider how place-based (e.g., community, neighborhood, etc.) factors influence the link between food insecurity and poor psychological health.[57] Bergmans et al. recently investigated whether the local food environment moderated the association between food insecurity and mental



health and found that greater geographic access to fruits and vegetables weakened the association between food insecurity and poorer mental health.[58] This holds implications for better understanding the food insecurity-psychological distress linkage by incorporating contextual measures that may play a role. Further, only two studies published in recent years focused on racial/ethnic minority groups, including African Americans [19] and Latinos [43]. Food insecurity has been shown to be more prevalent in racial/ethnic minorities.[59] With this in mind, additional studies should consider health disparities associated with race/ethnicity to better elucidate the association between food insecurity and psychological distress in health disparate populations. It may also be important to consider the temporal nature of food insecurity as a 'cyclic phenomenon,' whereby households and individuals experience episodes of food adequacy and food shortage.[60, 44] Often associated with receipt of monthly Federal food assistance, food insecure households may experience food availability in the first weeks of a month, followed by food scarcity in the latter weeks of the month.[61] These alternating episodes of food availability and food scarcity may hold potential implications for concurrent experiences of psychological distress. Moreover, there are additional indicators of psychological well-being to consider in relation to food insecurity, including disordered eating [31, 62-65] and suicide [14, 25, 66-68]. While not discussed in this review article, both of these issues are associated with food insecurity and may coincide with depression, anxiety, and poor sleep quality. The confluence of multiple psychological issues may further complicate the impact of food insecurity on psychological health and vice versa.

Last, this review did not find any published studies that undertook interventions to improve either food insecurity or psychological health. Certainly, this review provides a strong body of empirical evidence that establishes the adverse bidirectional relationship between food insecurity and compromised psychological health. This evidence is the starting point for the development and implementation of interventions and programs that aim to address both food insecurity and psychological distress in order to improve nutritional and psychological well-being simultaneously.

## References

Papers of particular interest, published recently, have been highlighted as:

• Of importance

•• Of major importance

1. FAO. Trade Reforms and Food Security: Conceptualizing the Linkages. Rome: 2003.
2. FAO, IFAD, UNICEF, WFP, WHO. The State of Food Security and Nutrition in the World 2019: Safeguarding against economic slowdowns and downturns. Rome2019.
3. Coleman-Jensen A, Rabbitt MP, Gregory CA, Singh A. Household Food Security in the United States in 2018: United States Department of Agriculture2019.
4. Dietz WH. Does hunger cause obesity? *Pediatrics*. 1995;95(5):766–7. [PubMed: 7724321]
5. Nettle D, Andrews C, Bateson M. Food insecurity as a driver of obesity in humans: The insurance hypothesis. *Behavioral and Brain Sciences*. 2016;40:1–53. doi:10.1017/S0140525X16000947.
6. Morales ME, Berkowitz SA. The Relationship Between Food Insecurity, Dietary Patterns, and Obesity. *Current nutrition reports*. 2016:1–7. doi:10.1007/s13668-016-0153-y.

7. Anderson SA. Core indicators of nutritional state for difficult-to-sample populations. *The Journal of nutrition*. 1990;120 Suppl 11:1559–600. [PubMed: 2243305]
- 8. Maynard M, Andrade L, Packull-McCormick S, Perlman CM, Leos-Toro C, Kirkpatrick SI. Food Insecurity and Mental Health among Females in High-Income Countries. *Int J Environ Res Public Health*. 2018;15(7). doi:10.3390/ijerph15071424. This scoping review of studies from high-income countries identified a significant link between food insecurity and poor mental health among women, as well as a bidirectional relationship between food insecurity and poor mental health from included longitudinal analyses.
- 9. Arenas DJ, Thomas A, Wang J, DeLisser HM. A Systematic Review and Meta-analysis of Depression, Anxiety, and Sleep Disorders in US Adults with Food Insecurity. *Journal of general internal medicine*. 2019. doi:10.1007/s11606-019-05202-4. This systematic review and meta-analysis demonstrated a strong association between food insecurity and multiple indicators of poor psychological health in adults in the U.S. This included the general population and population subgroups, such as college students, seniors, and PLHIV.
10. Bruening M, Dinour LM, Chavez JBR. Food insecurity and emotional health in the USA: a systematic narrative review of longitudinal research. *Public health nutrition*. 2017;20(17):3200–8. doi:10.1017/S1368980017002221. [PubMed: 28903785]
- 11. Jones AD. Food Insecurity and Mental Health Status: A Global Analysis of 149 Countries. *American journal of preventive medicine*. 2017;53(2):264–73. doi:10.1016/j.amepre.2017.04.008. [PubMed: 28457747] This study found a significant relationship between food insecurity and poor mental health across the globe. The particular strengths of this study include data from multiple countries of varying income levels and large sample size.
12. Frongillo EA, Nguyen HT, Smith MD, Coleman-Jensen A. Food Insecurity Is Associated with Subjective Well-Being among Individuals from 138 Countries in the 2014 Gallup World Poll. *The Journal of nutrition*. 2017;147(4):680–7. doi:10.3945/jn.116.243642. [PubMed: 28250191]
13. Frongillo EA, Nguyen HT, Smith MD, Coleman-Jensen A. Food Insecurity Is More Strongly Associated with Poor Subjective Well-Being in More-Developed Countries than in Less-Developed Countries. *The Journal of nutrition*. 2018;149(2):330–5. doi:10.1093/jn/nxy261.
14. Chung HK, Kim OY, Kwak SY, Cho Y, Lee KW, Shin MJ. Household Food Insecurity Is Associated with Adverse Mental Health Indicators and Lower Quality of Life among Koreans: Results from the Korea National Health and Nutrition Examination Survey 2012–2013. *Nutrients*. 2016;8(12). doi:10.3390/nu8120819.
15. Lund TB, Holm L, Tetens I, Smed S, Nielsen AL. Food insecurity in Denmark—socio-demographic determinants and associations with eating- and health-related variables. *European Journal of Public Health*. 2017;28(2):283–8. doi:10.1093/eurpub/ckx121.
16. Martin MS, Maddocks E, Chen Y, Gilman SE, Colman I. Food insecurity and mental illness: disproportionate impacts in the context of perceived stress and social isolation. *Public health*. 2016;132:86–91. doi:10.1016/j.puhe.2015.11.014. [PubMed: 26795678]
17. Hossain B, Lamb L. Economic Security and Psychological Distress among Indigenous Canadians. *The Journal of Developing Areas*. 2019;53(1):109–25.
18. Liu Y, Njai RS, Greenlund KJ, Chapman DP, Croft JB. Relationships between housing and food insecurity, frequent mental distress, and insufficient sleep among adults in 12 US States, 2009. *Preventing chronic disease*. 2014;11:E37. doi: 10.5888/pcd11.130334. [PubMed: 24625361]
19. Allen NL, Becerra BJ, Becerra MB. Associations between food insecurity and the severity of psychological distress among African-Americans. *Ethn Health*. 2018;23(5):511–20. doi:10.1080/13557858.2017.1280139. [PubMed: 28140616]
20. Friel S, Berry H, Dinh H, O'Brien L, Walls HL. The impact of drought on the association between food security and mental health in a nationally representative Australian sample. *BMC public health*. 2014;14:1102. doi:10.1186/1471-2458-14-1102. [PubMed: 25341450]
21. Perkins JM, Nyakato VN, Kakuhikire B, Tsai AC, Subramanian SV, Bangsberg DR et al. Food insecurity, social networks and symptoms of depression among men and women in rural Uganda: a cross-sectional, population-based study. *Public health nutrition*. 2018;21(5):838–48. doi:10.1017/S1368980017002154. [PubMed: 28988551]
22. Jung SE, Kim S, Bishop A, Hermann J. Poor Nutritional Status among Low-Income Older Adults: Examining the Interconnection between Self-Care Capacity, Food Insecurity, and Depression.

Journal of the Academy of Nutrition and Dietetics. 2019;119(10):1687–94. doi:10.1016/j.jand.2018.04.009. [PubMed: 29921540]

23. Pak T-Y, Kim G. Food stamps, food insecurity, and health outcomes among elderly Americans. *Preventive medicine*. 2019;105871. doi:10.1016/j.ypmed.2019.105871.
- 24. Maynard MS, Perlman CM, Kirkpatrick SI. Food insecurity and perceived anxiety among adolescents: An analysis of data from the 2009–2010 National Health and Nutrition Examination Survey (NHANES). *Journal of Hunger & Environmental Nutrition*. 2019;14(3):339–51. doi:10.1080/19320248.2017.1393363. This study used nationally representative data from adolescents in the U.S. to show that food insecurity was significantly linked to high perceived anxiety, with sex-stratified analyses further demonstrating that this association was only significant in females.
25. Nagata JM, Palar K, Gooding HC, Garber AK, Whittle HJ, Bibbins-Domingo K et al. Food Insecurity Is Associated With Poorer Mental Health and Sleep Outcomes in Young Adults. *Journal of Adolescent Health*. doi:10.1016/j.jadohealth.2019.08.010.
- 26. Fertig A The Long-Term Health Consequences of Childhood Food Insecurity. University of Kentucky Center for Poverty Research Discussion Paper Series 2019. This longitudinal analysis utilized data from the U.S. to assess the impact of food insecurity during childhood on psychological distress experienced in adulthood. Childhood food insecurity was found to lead to poor psychological health in adulthood. Further, SNAP was found to moderate this association.
27. Rani D, Singh JK, Acharya D, Paudel R, Lee K, Singh SP. Household Food Insecurity and Mental Health Among Teenage Girls Living in Urban Slums in Varanasi, India: A Cross-Sectional Study. *Int J Environ Res Public Health*. 2018;15(8). doi:10.3390/ijerph15081585.
28. Jebena MG, Lindstrom D, Belachew T, Hadley C, Lachat C, Verstraeten R et al. Food Insecurity and Common Mental Disorders among Ethiopian Youth: Structural Equation Modeling. *PloS one*. 2016;11(11):e0165931. doi:10.1371/journal.pone.0165931. [PubMed: 27846283]
29. Gust DA, Gvetadze R, Furtado M, Makanga M, Akelo V, Ondenge K et al. Factors associated with psychological distress among young women in Kisumu, Kenya. *Int J Womens Health*. 2017;9:255–64. doi:10.2147/IJWH.S125133. [PubMed: 28496366]
30. Bruening M, Argo K, Payne-Sturges D, Laska MN. The Struggle Is Real: A Systematic Review of Food Insecurity on Postsecondary Education Campuses. *Journal of the Academy of Nutrition and Dietetics*. 117(11):1767–91. doi:10.1016/j.jand.2017.05.022.
31. Darling KE, Fahrenkamp AJ, Wilson SM, D'Auria AL, Sato AF. Physical and mental health outcomes associated with prior food insecurity among young adults. *J Health Psychol*. 2017;22(5):572–81. doi:10.1177/1359105315609087. [PubMed: 26464054]
32. Bruening M, van Woerden I, Todd M, Laska MN. Hungry to learn: the prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. *The international journal of behavioral nutrition and physical activity*. 2018;15(1):9. doi:10.1186/s12966-018-0647-7. [PubMed: 29347963]
33. Meza A, Altman E, Martinez S, Leung CW. "It's a Feeling That One Is Not Worth Food": A Qualitative Study Exploring the Psychosocial Experience and Academic Consequences of Food Insecurity Among College Students. *Journal of the Academy of Nutrition and Dietetics*. 2019;119(10):1713–21.e1. doi:10.1016/j.jand.2018.09.006. [PubMed: 30553586]
34. Singer AW, Weiser SD, McCoy SI. Does Food Insecurity Undermine Adherence to Antiretroviral Therapy? A Systematic Review. *AIDS and behavior*. 2014. doi:10.1007/s10461-014-0873-1.
35. Seligman HK, Davis TC, Schillinger D, Wolf MS. Food insecurity is associated with hypoglycemia and poor diabetes self-management in a low-income sample with diabetes. *Journal of health care for the poor and underserved*. 2010;21(4):1227–33. doi:10.1353/hpu.2010.0921. [PubMed: 21099074]
36. Gucciardi E, Vahabi M, Norris N, Del Monte JP, Farnum C. The Intersection between Food Insecurity and Diabetes: A Review. *Current nutrition reports*. 2014;3(4):324–32. doi:10.1007/s13668-014-0104-4. [PubMed: 25383254]
37. Ippolito MM, Lyles CR, Prendergast K, Marshall MB, Waxman E, Seligman HK. Food insecurity and diabetes self-management among food pantry clients. *Public health nutrition*. 2016;FirstView:1–7. doi:doi:10.1017/S1368980016001786.

38. Heylen E, Panicker ST, Chandy S, Steward WT, Ekstrand ML. Food Insecurity and Its Relation to Psychological Well-Being Among South Indian People Living with HIV. *AIDS and behavior*. 2015;19(8):1548–58. doi:10.1007/s10461-014-0966-x. [PubMed: 25488171]
39. Tesfaye M, Kaestel P, Olsen MF, Girma T, Yilma D, Abdissa A et al. Food insecurity, mental health and quality of life among people living with HIV commencing antiretroviral treatment in Ethiopia: a cross-sectional study. *Health and Quality of Life Outcomes*. 2016;14(1):37. doi:10.1186/s12955-016-0440-8. [PubMed: 26940394]
40. Palar K, Kushel M, Frongillo EA, Riley ED, Grede N, Bangsberg D et al. Food Insecurity is Longitudinally Associated with Depressive Symptoms Among Homeless and Marginally-Housed Individuals Living with HIV. *AIDS and behavior*. 2015; 19(8): 1527–34. doi:10.1007/s10461-014-0922-9. [PubMed: 25351185]
- 41. Montgomery J, Lu J, Ratliff S, Mezuk B Food Insecurity and Depression Among Adults With Diabetes: Results From the National Health and Nutrition Examination Survey (NHANES). *The Diabetes educator*. 2017;43(3):260–71. doi: 10.1177/0145721717699890. [PubMed: 28436293] This article established a significant link between food insecurity and depression among adults with type 2 diabetes in the U.S. The use of a nationally representative, population-based dataset makes these findings particularly relevant.
42. Silverman J, Krieger J, Kiefer M, Hebert P, Robinson J, Nelson K. The Relationship Between Food Insecurity and Depression, Diabetes Distress and Medication Adherence Among Low-Income Patients with Poorly-Controlled Diabetes. *Journal of general internal medicine*. 2015;30(10):1476–80. doi:10.1007/s11606-015-3351-1. [PubMed: 25917659]
43. Bermudez-Millan A, Perez-Escamilla R, Segura-Perez S, Damio G, Chhabra J, Osborn CY et al. Psychological Distress Mediates the Association between Food Insecurity and Suboptimal Sleep Quality in Latinos with Type 2 Diabetes Mellitus. *The Journal of nutrition*. 2016;146(10):2051–7. doi:10.3945/jn.116.231365. [PubMed: 27489004]
44. Dinour LM, Bergen D, Yeh MC. The food insecurity-obesity paradox: a review of the literature and the role food stamps may play. *Journal of the American Dietetic Association*. 2007;107(11):1952–61. doi:10.1016/j.jada.2007.08.006. [PubMed: 17964316]
45. Jebena MG, Taha M, Nakajima M, Lemieux A, Lemessa F, Hoffman R et al. Household food insecurity and mental distress among pregnant women in Southwestern Ethiopia: a cross sectional study design. *BMC Pregnancy Childbirth*. 2015;15:250. doi:10.1186/s12884-015-0699-5. [PubMed: 26449375]
46. Weigel MM, Armijos RX, Racines M, Cevallos W, Castro NP. Association of Household Food Insecurity with the Mental and Physical Health of Low-Income Urban Ecuadorian Women with Children. *Journal of Environmental and Public Health*. 2016;2016:14. doi:10.1155/2016/5256084.
47. Munger AL, Hofferth SL, Grutzmacher SK. The Role of the Supplemental Nutrition Assistance Program in the Relationship Between Food Insecurity and Probability of Maternal Depression. *Journal of Hunger & Environmental Nutrition*. 2016;11(2):147–61. doi:10.1080/19320248.2015.1045672. [PubMed: 27482302]
48. Noonan K, Corman H, Reichman NE. Effects of maternal depression on family food insecurity. *Economics & Human Biology*. 2016;22:201–15. doi:10.1016/j.ehb.2016.04.004. [PubMed: 27281498]
49. Doudna KD, Reina AS, Greder KA. Longitudinal associations among food insecurity, depressive symptoms, and parenting. *Journal of Rural Mental Health*. 2015;39(3-4):178–87. doi:10.1037/rmh0000036.
50. Gill M, Koleilat M, Whaley SE. The Impact of Food Insecurity on the Home Emotional Environment Among Low-Income Mothers of Young Children. *Maternal and child health journal*. 2018;22(8):1146–53. doi:10.1007/s10995-018-2499-9. [PubMed: 29445981]
51. Hernandez DC, Marshall A, Mineo C. Maternal depression mediates the association between intimate partner violence and food insecurity. *J Womens Health (Larchmt)*. 2014;23(1):29–37. doi:10.1089/jwh.2012.4224. [PubMed: 24131321]
52. Moraes CL, Marques ES, Reichenheim ME, Ferreira MF, Salles-Costa R. Intimate partner violence, common mental disorders and household food insecurity: an analysis using path analysis. *Public health nutrition*. 2016;19(16):2965–74. doi:10.1017/s1368980016001178. [PubMed: 27211890]

53. Tseng KK, Park SH, Shearston JA, Lee L, Weitzman M. Parental Psychological Distress and Family Food Insecurity: Sad Dads in Hungry Homes. *Journal of developmental and behavioral pediatrics* : JDBP. 2017;38(8):611–8. doi:10.1097/dbp.0000000000000481. [PubMed: 28742541]
54. Ciciurkaite G, Brown RL. Food insecurity, psychological distress and alcohol use: understanding the salience of family roles for gender disparities. *Health Sociology Review*. 2018;27(3):294–311. doi:10.1080/14461242.2018.1461574.
55. Oddo VM, Mabli J. Association of Participation in the Supplemental Nutrition Assistance Program and Psychological Distress. *American journal of public health*. 2015;105(6):e30–e5. doi:10.2105/AJPH.2014.302480.
56. Leung CW, Epel ES, Willett WC, Rimm EB, Laraia BA. Household food insecurity is positively associated with depression among low-income supplemental nutrition assistance program participants and income-eligible nonparticipants. *The Journal of nutrition*. 2015;145(3):622–7. doi:10.3945/jn.114.199414. [PubMed: 25733480]
57. Carter MA, Dubois L, Tremblay MS. Place and food insecurity: a critical review and synthesis of the literature. *Public health nutrition*. 2014;17(1):94–112. doi:10.1017/s1368980013000633. [PubMed: 23561752]
58. Bergmans RS, Sadler RC, Wolfson JA, Jones AD, Kruger D. Moderation of the Association Between Individual Food Security and Poor Mental Health by the Local Food Environment Among Adult Residents of Flint, Michigan. *Health Equity*. 2019;3(1):264–74. doi:10.1089/heq.2018.0103. [PubMed: 31289787]
59. Myers AM, Painter MA. Food insecurity in the United States of America: an examination of race/ethnicity and nativity. *Food Security*. 2017;9:1419–32. doi:10.1007/s12571-017-0733-8.
60. Seligman HK, Schillinger D. Hunger and socioeconomic disparities in chronic disease. *The New England journal of medicine*. 2010;363(1):6–9. doi:10.1056/NEJMp1000072. [PubMed: 20592297]
61. Wilde PE, Ranney CK. The Monthly Food Stamp Cycle: Shopping Frequency and Food Intake Decisions in an Endogenous Switching Regression Framework. *American journal of agricultural economics*. 2000;82(1):200–13. doi:10.1111/0002-9092.00016.
62. Becker CB, Middlemass K, Taylor B, Johnson C, Gomez F. Food insecurity and eating disorder pathology. *The International journal of eating disorders*. 2017;50(9):1031–40. doi:10.1002/eat.22735. [PubMed: 28626944]
63. Becker CB, Middlemass KM, Gomez F, Martinez-Abrego A. Eating Disorder Pathology Among Individuals Living With Food Insecurity: A Replication Study. *Clinical Psychological Science*. 2019;7(5):1144–58. doi:10.1177/2167702619851811.
64. Rasmusson G, Lydecker JA, Coffino JA, White MA, Grilo CM. Household food insecurity is associated with binge-eating disorder and obesity. *The International journal of eating disorders*. 2018. doi:10.1002/eat.22990.
65. Laraia B, Vinikoor-Imler LC, Siega-Riz AM. Food insecurity during pregnancy leads to stress, disordered eating, and greater postpartum weight among overweight women. *Obesity (Silver Spring, Md)* 2015;23(6):1303–11. doi:10.1002/oby.21075.
66. Shayo FK, Lawala PS. Does food insecurity link to suicidal behaviors among in-school adolescents? Findings from the low-income country of sub-Saharan Africa. *BMC Psychiatry*. 2019;19(1):227. doi:10.1186/s12888-019-2212-6. [PubMed: 31340781]
67. Sweetland AC, Norcini Pala A, Mootz J, Kao JC, Carlson C, Oquendo MA et al. Food insecurity, mental distress and suicidal ideation in rural Africa: Evidence from Nigeria, Uganda and Ghana. *Int J Soc Psychiatry*. 2019;65(1):20–7. doi:10.1177/0020764018814274. [PubMed: 30479180]
68. Koyanagi A, Stubbs B, Oh H, Veronese N, Smith L, Haro JM et al. Food insecurity (hunger) and suicide attempts among 179,771 adolescents attending school from 9 high-income, 31 middle-income, and 4 low-income countries: A cross-sectional study. *Journal of affective disorders*. 2019;248:91–8. doi:10.1016/j.jad.2019.01.033. [PubMed: 30716616]

**Table 1.**

Included studies published in the previous 5 years examining the association between food insecurity and psychological distress

Study	Country	Data Source	Longitudinal	Food Insecurity Measurement	Psychological Distress Measurement	
<b>Review Articles</b>						
[8]	Maynard et al.	High-income countries	Multiple data sources	Yes <sup>a</sup>	Multiple tools	Multiple tools
[9]	Arenas et al.	United States	Multiple data sources	Yes <sup>a</sup>	Multiple tools	Multiple tools
[10]	Bruening et al.	United States	Multiple data sources	Yes <sup>a</sup>	Multiple tools	Multiple tools
<b>Globally Focused Analyses</b>						
	Jones [11]	149 countries	2014 Gallup World Poll	No	Food Insecurity Experience Scale Survey Module for Individuals	Negative Experience Index; Positive Experience Index
[12]	Frongillo et al.	138 and 137 countries	2014 Gallup World Poll	No	8-Item Food Insecurity Experience Scale	Daily experience index; Life evaluation index
[13]	Frongillo et al.	147 countries	2014 Gallup World Poll	No	8-Item Food Insecurity Experience Scale	Daily experience index
<b>Adult Populations</b>						
[14]	Chung et al.	Korea	Korea National Health and Nutritional Examination Survey	No	Questionnaire based on the 18-Item USDA Food Security Survey Module	Binary indicators of perceived stress and experience of depressive symptoms; EuroQoL five-dimension questionnaire
[15]	Lund et al.	Denmark	Questionnaire-based survey in random sample of households <sup>b</sup>	No	Adapted from the 6-Item USDA Food Security Survey Module	Dichotomous measure of high psychological distress based on 6-Item Kessler Psychological Distress Scale
[16]	Martin et al.	Canada	Canadian Community Health Survey	No	10-Item USDA Food Security Survey Module	Self-reported mood or anxiety disorder diagnosis
	Hossain and Lamb [17]	Canada	Aboriginal Peoples Survey	No	Single question	10-Item Kessler Psychological Distress Scale
	Liu et al. [18]	United States	Behavioral Risk Factors Surveillance System	No	Single question	Single question about stress, depression, and problems with emotions; single question about perceived insufficient sleep
[19]	Allen et al.	United States	California Health Interview Survey	No	Multiple questions	6-Item Kessler Psychological Distress Scale
	Friel et al. [20]	Australia	Household, Income and Labour Dynamics in Australia Survey; Australian Bureau of Meteorology	No	Three questions regarding shortage of money, consumption of core foods, and consumption of discretionary foods	10-Item Kessler Psychological Distress Scale
[21]	Perkins et al.	Uganda	Population-based survey of all adults aged 18 years and older <sup>b</sup>	No	Household Food Insecurity Access Scale	Modified version of 15-item Hopkins Symptom Checklist for Depression
	Jung et al. [22]	United States	Cross-sectional study of lower-income adults, 60	No	6-Item USDA Food Security Survey Module	10-Item Geriatric Depression Scale

Study	Country	Data Source	Longitudinal	Food Insecurity Measurement	Psychological Distress Measurement
		years of age and older, in Alabama <sup>b</sup>			
[23] Pak and Kim	United States	Health and Retirement Study	Yes	Two questions	Center for Epidemiological Studies Depression Scale
<b>Young Adult and Adolescent Populations</b>					
[24] Maynard et al.	United States	National Health and Nutrition Examination Survey	No	18-Item USDA Food Security Survey Module	Single question to measure perceived anxiety
[25] Nagata et al.	United States	National Longitudinal Study of Adolescent to Adult Health	No	Single item	Modified 9-Item version of the Center for Epidemiologic Studies Depression scale; depression diagnosis: single question; anxiety or panic disorder diagnosis: single question; trouble falling or staying asleep: single question
[26] Fertig et al.	United States	Panel Study of Income Dynamics	Yes	18-Item USDA Food Security Survey Module	6-Item Kessler Psychological Distress Scale and self-reported mental health diagnosis
Rani et al. [27]	India	Community-based sample of urban slums <sup>b</sup>	No	Household Food insecurity Access Scale	Mental Health Inventory
Gust et al. [29]	Kenya	Longitudinal study of intravaginal ring acceptability and use <sup>b</sup>	No	Single question	6-Item Kessler Psychological Distress Scale
[28] Jebena et al.	Ethiopia	Jimma Longitudinal Family Survey of Youth	No	5-item scale	20-Item Self-Reporting Questionnaire
<i>College Students</i>					
[31] Darling et al.	United States	Freshmen college students from a northeastern Ohio university <sup>b</sup>	No	Two question screener	Depression, Anxiety, and Stress Scale
[32] Bruening et al.	United States	Social Impact of Physical Activity and Nutrition in College	Yes <sup>a</sup>	6-Item USDA Food Security Survey Module	Four questions measuring perceived stress; six questions measuring depressed mood; single question measuring anxiety diagnosis
[33] Meza et al.	United States	Enrolled students who visited the University of California, Berkeley, Food Pantry <sup>b</sup>	No	Recipient of food or resources from the pantry in the previous year; in-depth, semi-structured interview	In-depth, semi-structured interview
<b>People Living with HIV and Diabetes</b>					
[38] Heylen et al.	India	2-year longitudinal study on ART adherence and drug resistance in PLHIV	No	Household Food insecurity Access Scale	Beck Depression Inventory, Version I
[39] Tesfaye et al.	India	Cross-sectional study nested within a randomized controlled trial in PLHIV initiating ART <sup>b</sup>	No	Household Food insecurity Access Scale	6-Item Kessler Psychological Distress Scale
[40] Palar et al.	United States	Research on Access to Care in the Homeless	Yes	Household Food insecurity Access Scale	Beck Depression Inventory – Version II

Study	Country	Data Source	Longitudinal	Food Insecurity Measurement	Psychological Distress Measurement
Montgomery et al. [41]	United States	National Health and Nutrition Examination Survey	No	18-Item USDA Household Food Security Survey Module	Patient Health Questionnaire-9
Silverman et al. [42]	United States	Peer Support for Achieving Independence in Diabetes study	No	6-Item USDA Food Security Survey Module	Patient Health Questionnaire-8
Bermúdez-Millán et al. [43]	United States	Community Health Workers Assisting Latinos Manage Stress and Diabetes	No	6-Item USDA Food Security Survey Module	Patient Health Questionnaire-8 (Spanish Version); Pittsburgh Sleep Quality Index
<b>Maternal Depression</b>					
[45]	Jebena et al. Ethiopia	Cross-sectional sample of pregnant women <sup>b</sup>	No	Household Food insecurity Access Scale	20-Item Self-Reporting Questionnaire
[46]	Weigel et al. Ecuador	Study of the food, nutrition, and health issues of adult women and their minor children in low-income neighborhoods in Quito <sup>b</sup>	No	Language adapted version of 18-Item USDA Food Security Survey Module	Mental Health Inventory
[47]	Munger et al. United States	Fragile Families and Child Wellbeing Study	Yes	18-item USDA Food Security Survey Module	Major Depression Episode subscale of Composite International Diagnostic Interview Short Form
[48]	Noonan et al. United States	Early Childhood Longitudinal Study-Birth Cohort	Yes	18-item USDA Food Security Survey Module	Center for Epidemiological Studies Depression Scale; Composite International Diagnostic Interview Short Form
[49]	Doudna et al. United States	Rural Families Speak	Yes	18-item USDA Food Security Survey Module	Center for Epidemiological Studies Depression Scale
[50]	Gill et al. United States	Cross-sectional study of participants of the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) as part of the L.A. County WIC Survey	No	6-item USDA Food Security Survey Module	Two questions measuring frequency of maternal depressive symptoms over last two weeks
[51]	Hernandez et al. United States	Fragile Families and Child Wellbeing Study	Yes	18-item USDA Food Security Survey Module	Composite International Diagnostic Interview Short Form
[52]	Leite de Moraes et al. Brazil	Population-based cross-sectional study of female adolescents and adult women <sup>b</sup>	No	Brazilian Food Insecurity Scale (cross-culturally adapted from the 18-Item USDA Food Security Survey Module)	General Health Questionnaire
<b>Paternal Psychological Health</b>					
[53]	Tseng et al. United States	National Health Interview Survey	No	10-Item USDA Food Security Survey Module	6-Item Kessler Psychological Distress Scale
[54]	Ciciurkaite and Brown United States	National Health and Nutrition Examination Survey	No	18-Item USDA Food Security Survey Module	Patient Health Questionnaire-9
<b>Role of Supplemental Nutrition Assistance Program in the United States</b>					
[55]	Oddo et al. United States	SNAP Food Security survey	Yes	Not measured	6-Item Kessler Psychological Distress Scale



	<b>Study</b>	<b>Country</b>	<b>Data Source</b>	<b>Longitudinal</b>	<b>Food Insecurity Measurement</b>	<b>Psychological Distress Measurement</b>
[56]	Leung et al.	United States	National Health and Nutrition Examination Survey	No	18-Item USDA Food Security Survey Module	Patient Health Questionnaire-9
[47]	Munger et al.	United States	Fragile Families and Child Wellbeing Study	Yes	18-Item USDA Food Security Survey Module	Major Depression Episode subscale of Composite International Diagnostic Interview Short Form
[48]	Noonan et al.	United States	Early Childhood Longitudinal Study-Birth Cohort	Yes	18-Item USDA Food Security Survey Module	Center for Epidemiological Studies Depression Scale; Composite International Diagnostic Interview Short Form
[26]	Fertig et al.	United States	Panel Study of Income Dynamics	Yes	18-Item USDA Food Security Survey Module	6-Item Kessler Psychological Distress Scale and self-reported mental health diagnosis
[23]	Pak and Kim	United States	Health and Retirement Study	Yes	Two questions	Center for Epidemiological Studies Depression Scale

<sup>a</sup>Cross-sectional also.

<sup>b</sup>Primary data collection/analysis. *USDA* United States Department of Agriculture; *ART* Antiretroviral Therapy; *PLHIV* People Living with HIV; *SNAP* Supplemental Nutrition Assistance Program.