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Original Research Article

Household Food Insecurity in Early Adolescence and Risk of Subsequent Behavior Problems: Does a Connection Persist Over Time?

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Abstract

Objective Household food insecurity is common among U.S. families, and adolescents are almost twice as likely as school-aged children to be food insecure. However, little is known about how household food insecurity relates to adolescent behavioral outcomes over time. The purpose of this study was to examine whether food security status in early adolescence is associated with behavioral problems over a 6-year period in an ethnically diverse sample of teenagers from low-income households. **Methods** The study examined longitudinal data from the Welfare, Children, and Families: A Three-City Study. A total of 1,049 primary caregivers completed measures of child/adolescent behavioral problems and household food insecurity during the past year. Data were collected across three waves, when focal children were between 10 and 14 years old, 11 and 16 years old, and 16 and 18 years old, respectively. Generalized estimating equations were used to assess initial household food insecurity as a time-invariant effect on adolescent behavioral problems over time. **Results** Baseline household food insecurity in pre- or early adolescence was significantly associated with greater internalizing problems and total behavioral problems over time. **Conclusions** These findings indicate that household food insecurity is associated with behavioral problems throughout adolescence. This suggests the need for health providers to screen for household food insecurity during scheduled health visits and highlight the need for integration of psychosocial services into pediatric care and expansions in current federal assistance programs.

Key words: adolescent; household food insecurity; internalizing; mental health; stress.

Food insecurity, or lack of consistent access to nutritious food because of insufficient financial resources, was a stressor faced by 12.3% of U.S. households in 2016 (Coleman-Jensen, Rabbitt, Gregory, & Singh, 2017). Household food insecurity is most commonly determined by the frequency and severity of a set of behaviors and experiences that reflect difficulty in meeting household food needs, such as worrying that food will run out before securing funds to purchase more, not being able to afford well-balanced meals, restricting or skipping meals because there is not enough money to buy food, or not eating for an entire day because there was not enough money to buy food (Coleman-Jensen et al., 2017). More than 16% of all households with children in the United States are food insecure, compared with 10% of households without children (Coleman-Jensen et al., 2017). The percentage of children living in food-insecure households (ages: 0–17 years) has remained relatively consistent over time, from 17% in 1999 to 18% in 2016, with a peak at 23% in 2009 (Child Trends, 2018).

Household food insecurity is an emotionally and physiologically stressful state that exposes children to both immediate- and long-term risks of socioemotional

and developmental problems. For example, preschool-aged children in food insecure households demonstrate higher rates of behavioral problems (Slack & Yoo, 2005) and school-aged children who are food insecure show higher rates of depression, anxiety, and externalizing disorders (Slack & Yoo, 2005; Slopen, Fitzmaurice, Williams, & Gilman, 2010) and poorer academic outcomes (Jyoti, Frongillo, & Jones, 2005) compared with their peers who are from food secure families.

Food Insecurity and Adolescence

The burden of food insecurity among teenagers is approximately twice that of younger children in low-income households in urban areas, a possible result of households prioritizing the nutritional needs of younger children as well as heightened sensitivity among adolescents to the social stigma associated with poverty and receipt of food assistance that may limit the effectiveness of such interventions among this age group (Moffitt & Ribar, 2016). Despite its prevalence, relatively few studies have examined the potential effects of household food insecurity on social and emotional development within the unique context of adolescence, and almost none has used a longitudinal design that explore these associations over time. One study of a sample of 15- and 16-year-old adolescents found an association between food "insufficiency," defined as a family respondent reporting that the "family sometimes or often did not have enough to eat," and symptoms of dysthymia and suicidal ideation (Alaimo, Olson, & Frongillo, 2002). An examination of the association between food insecurity and mental disorders within a nationally representative sample of 13–17-year-old adolescents found that higher food insecurity was significantly associated with an increased likelihood of having met diagnostic criteria for a mood, anxiety, behavior, or substance use disorder in the past year (McLaughlin et al., 2012). More recently, Poole-Di Salvo, Silver, and Stein (2016) analyzed data from over 8,600 adolescents between the ages 12 and 16 years and found that those in higher food insecurity households had a more than twofold risk of having a mental health problem based on parent ratings. However, the statistical models used in these studies were cross-sectional in nature, making it difficult to determine whether these associations persisted over time.

The association between household food insecurity and behavioral or mental health problems during adolescence may reflect the effects of chronic stress on neurobehavioral development. Adverse childhood environments have been shown to be associated with heightened emotional reactivity which, in turn, is related to the development of mood and anxiety disorders in adulthood (McLaughlin et al., 2010). Adolescents are particularly vulnerable to the neurological effects of chronic stress, as they display higher cortisol levels in response to individual stressors relative to those in both late childhood and adulthood (Gunnar, Wewerka, Frenn, Long, & Griggs, 2009). These stress-induced responses may become less reversible over time, as brain structures that are especially sensitive to stress, such as the amygdala and prefrontal cortex, continue to mature during adolescence (Giedd & Rapoport, 2010). As a result, adolescents may be at higher risk of persistent maladaptive neurobehavioral development (Romeo, 2013) and clinically elevated mental health problems in the context of chronic stressors like household food insecurity.

In addition to the direct physiological effects of food insecurity, food insecurity likely has deleterious effects on family functioning, parental mental health, and parenting, all of which are related to psychological and behavioral maladjustment among adolescents. As noted by McLaughlin et al. (2012), food insecurity within families with adolescents appears to be a marker of material deprivation (e.g., food, shelter, clothing, and access to health care). Material deprivation has been associated with parental mental health problems (Bronte-Tinkew, Zaslow, Capps, Horowitz, & McNamara, 2007) such as parental depression. Parental mental health problems, in turn, are associated with lower levels of positive parent–child interaction (Zaslow, Hair, Dion, Ahluwalia, & Sargent, 2001) and less responsive parenting (Zaslow & Eldred, 1998), each of which are risk factors for the development of emotional and behavioral problems among youth (Brumariu & Kerns, 2010; McAdams et al., 2017).

Not only is it important to determine the overall effect of food insecurity on adolescent psychosocial functioning, it is also important to determine how adolescents tend to react to this stressor. Factor analysis has consistently found support for an internalizing–externalizing model of stress response in adolescents (Hewitt et al., 1997), with internalizing symptoms reflecting the tendency to process stress internally (e.g., depression and anxiety) and externalizing symptoms reflecting the tendency to process stress through outward behavior (e.g., hyperactivity, oppositional defiant disorders, and substance use disorders). Of note, prior studies have found food insecurity to be associated with both internalizing and externalizing behavior problems in school-age children, after accounting for potential confounds such as socioeconomic status (Slopen et al., 2010). However, little is known about the relative and potential effect of food insecurity on these symptoms in adolescence.

The Present Study

Food insecurity is a source of chronic stress that may have clinically important effects on both short- and

long-term neurobehavioral development when experienced during adolescence. Within food insecure households with children, it has consistently been reported that anxiety and depression (internalizing problems) and externalizing problems are connected to the lack of access to reliable and sufficient amounts of household food (Kleinman et al., 1998; Slopen et al., 2010). Furthermore, it is has been posited that these behavioral problems may be the result of disrupted parenting characterized by less sensitive and responsive parenting (Bronte-Tinkew et al. 2007). However, despite the fact that household food insecurity among adolescents is more than twice as common as food insecurity among younger children (Moffitt & Ribar, 2016), little is understood about the potential long-term effects of household food insecurity on adolescent development and behavior. To address this gap in the current literature, we used data from the Welfare, Children, and Families: A Three-City Study (WCFS; Angel, Burton, Chase-Lansdale, Cherlin, & Moffitt, 2012), a longitudinal sample of low-income children, adolescents, and their mothers in the post-welfare reform era, to examine the association between initial household food insecurity and internalizing and externalizing symptoms among adolescents over a 6-year period. In light of the above and findings by McLaughlin et al. (2012) who reported that food insecurity within households with adolescents (assessed only at one period) was associated with increased odds of mood, anxiety, behavior, and substance disorders, even after controlling for a number of socioeconomic indicators, it was hypothesized that higher levels of baseline food insecurity (measured as a fixed effect at one time point) would be associated with higher levels of the time-varying outcomes of internalizing, externalizing, and total behavior problems (measured at three different points) over a 6-year period.

Method

Participants and Sampling

The WCFS (Angel et al., 2012) is a random sample survey that evaluated the general well-being of low-income families, as well as their responses to government assistance programs, in the post-welfare reform era (1999–2005). The full sample ($N = 2,402$) included mostly single-parent households with children of age <18 years whose income was less than twice (or 200%) the federal poverty line who resided in low-income neighborhoods of Boston, Chicago, and San Antonio. To achieve roughly equal numbers of individuals across racial/ethnic groups (i.e., black, Hispanic, and non-Hispanic White), block groups from the 1990 Census were selected and ranked according to the percentage of families living below the poverty line, as well as by racial/ethnic group. Door-to-door household screening interviews were conducted to identify households that met the inclusion criteria for participation: headed by a primary female caregiver, falling below 200% of the federal poverty line, belonging to one of the three racial/ethnic groups of interest, and having a focal child who was <5 years of age or between 10 and 14 years at the time of interview. This sampling process yielded an initial random sample of approximately 3,000 children, from ages 0 to 4 or 10 to 14 years who lived in poor families and low-income neighborhoods and belonged to one of the study's three targeted race–ethnic groups (Angel et al., 2012). Of the full sample of respondents initially selected for the study, 2,402 households (~75%) agreed to participate. Although this final sample was broadly comparable with the national population of low-income families at the time, there were some differences; for example, the sample has a larger percentage of black and Hispanic families relative to non-Hispanic White families, lower marriage rates, and slightly higher incomes compared with low-income mothers (<200% of poverty line) from the nationally representative 1999 Child Population Survey (Fomby, Estacion, & Moffitt, 2003).

For the current analysis, we further restricted the sample of participants to include only households with focal children who were between 10 and 14 years at baseline ($N = 1,160$). To support reliable comparisons across waves, we excluded from this initial subsample cases where the same caregiver did not complete the assessment at each time point or where caregivers did not reside with the focal child at each time point. Other cases with missing background data were also excluded, which included the following variables: domestic violence, marital status, household income-to-needs ratio, and neighborhood problems. Maternal employment over the past week was considered for inclusion as a covariate but was excluded because of high number of missing values ($N = 53$). In addition, there was a small cohort of older focal children ($N = 213$) for whom the measure of behavior problems changed over time because of age guidelines (i.e., those who completed the Child Behavior Checklist [CBCL/4–18; Achenbach, 1991; CBCL/6–18; Achenbach & Rescorla, 2001] during the first two waves but the Adult Behavior Checklist [Achenbach, 1997] at the third wave). To support the reliability of responses over time, the first two points of data from these individuals were included in the analysis, but data from the third wave were not. Finally, one observation with an extremely high total score (CBCL = 138) was excluded from the analysis, as total scores >133 suggest exaggeration or misunderstanding of the measure, per scoring criteria (Achenbach & Rescorla, 2001). This resulted in a final sample of

1,049 individuals, or approximately 90% of the initial subsample of children of age 10–14 years at baseline. Total 946 children were retested at Wave 2 (90.2% retention rate) and 523 children were retested at Wave 3 (49.9% retention rate), with a total of 2,519 observations across all three waves.

Measures

Outcome Variables

The primary outcomes of interest were behavior problems (i.e., internalizing symptoms, externalizing symptoms, and total problems) assessed at three points over the 6-year follow-up period (when children were between 10 and 14 years old, 11 and 16 years old, and 16 and 18 years old, respectively). Behavior problems were assessed using Achenbach Child Behavior Checklist (CBCL 4–18; Achenbach, 1991; CBCL 6–18; Achenbach & Rescorla, 2001). Primary maternal caregivers completed the measures about the focal child at all waves of data collection. The CBCL 4/18 was administered at Waves 1 and 2, and the CBCL 6/18, an updated version of the CBCL/4–18 that included new age-based norms and six replacement items (#2, 4, 5, 28, 78, and 99), was administered at Wave 3. Both versions contain 113 items that are rated as *Not True* (0), *Somewhat or Sometimes True* (1), or *Very True or Often True* (2), and there is a high degree of correlation between the two measures, suggesting that they measure the same underlying constructs (Achenbach & Rescorla, 2001). On both versions of the CBCL, items are clustered to form empirically based syndrome scales (e.g., anxious/depressed), which are combined to form three broader scales: an Internalizing scale that sums the "Anxious/Depressed," either "Withdrawn-Depressed" (CBCL/6–18) or "Social-Withdrawal" (CBCL/4–18), and Somatic Complaints subscales, an Externalizing scale that sums either the "Rule-breaking" (CBCL/6–18) or "Delinquent Behavior" (CBCL/4–18) and "Aggressive Behavior" subscales, and a Total Problems score that sums the scores of all problem items. Subscale scores were calculated by summing all appropriate items, yielding a raw score total with higher scores reflecting greater problems in each domain. Raw scores may also be converted to standardized *T*-scores developed from a large, nationally representative sample of children which can be classified according to severity level, with $T < 60 =$ normal; $60 \leq T \leq 63 =$ Borderline; and $T > 63 =$ Clinically elevated. In keeping with the authors' recommendation (Achenbach, 1991; Achenbach & Rescorla, 2001), however, raw scores for the Total Problems, Internalizing Disorders, and Externalizing Disorders subscales were used for the primary data analysis. Per scoring criteria provided by the authors of the CBCL, protocols with more than eight missing items were considered invalid and not included in the analysis. Mean imputation was used for missing items in protocols with eight or fewer missing items. In general, missing data for the CBCL at all three time points in the WCFS were rare: >90% of all protocols had no missing items and only 2% ($N = 24$) of all protocols were missing more than eight missing items, and thus removed from the analysis. Finally, distributions of CBCL, internalizing, and externalizing scores all had substantial positive skews; as a result, we applied a logarithmic transformation to these variables as a component of our analysis.

Responses to items (Total Problems) on both the CBCL/4–18 and CBCL scale/6–18 have demonstrated both internal consistency (alpha = .96–.97) and 8-day test–retest reliability ($r = .93$–.94) across a wide range of ages (Achenbach, 1991; Achenbach & Rescorla, 2001). Scores on the CBCL from our initial subsample of adolescents from the WCFS demonstrated high internal consistency (Total Problems, Internalizing Problems, and Externalizing Problems) at Wave 1 (alphas = .95, .88, .89, respectively), Wave 2 (alphas = .96, .89, .91, respectively), and Wave 3 (alphas = .94, .87, .90, respectively).

Primary Predictor

The main predictor of interest was household food insecurity over the previous year, which was evaluated at baseline using eight items derived from 18-item USDA Household Food Security Survey (HFSS) module (Bickel, Nord, Price, Hamilton, & Cook, 2000). The full HFSS module serves as the "gold standard" (Hager et al., 2010) for measuring household insecurity over the 12 months before the interview date (Cook, 2013). The items within the module are ranked sequentially in order of severity of food insecurity on a 0–10 scale, from least (0.9: "respondent worried food would run out") to most severe (9.2: "child did not eat for a whole day"). The total number of affirmative responses on the HFSS module provides a continuous measure of each household's food insecurity, which could then be classified into one of four categories of food security: Food Secure (High Food Security and Marginal Food Security) and Food Insecurity (Low Food Security and Very Low Food Security; United States Department of Agriculture, 2018). The WCFS used an abbreviated version of the full 18-item HFSS module consisting of eight items, all of which were calibrated to exceed minimal severity thresholds for a classification of "food insecure." For the purpose of the current analyses, affirmative responses on these eight items were summed to produce a continuous measure of household food insecurity, with higher totals indicating greater food insecurity. It should be noted that even marginal household food insecurity (one or two reported items) is associated with increased health risk (Cook et al., 2013). A range of studies indicate that responses to the full 18-item

HFSS provide valid and reliable assessment of food insecurity (Hamilton et al., 1997; United States Department of Agriculture, 1997), and responses to our modified eight-item HFSS scale showed internal consistency (alpha = .83). As the distribution of food insecurity scores within our sample had a large positive skew, we applied a logarithmic transformation to the household food insecurity variable before analysis.

Covariates

We considered the following baseline variables as confounding factors potentially associated with the primary predictor (which will be labeled going forward as "household food insecurity") and outcomes (adolescent behavior problems): child sex (1 = male; 2 = female); age of caregiver, age of child, and marital status of the caregiver (0 = unmarried; 1 = married); caregiver educational status (0 = did not earn high school diploma, 1 = earned high school diploma); and ethnicity of the caregiver (two dummy variables were created to categorize maternal ethnicity into three descriptors: White, Black, and non-White Hispanic). Given prior studies that suggest a strong association between domestic violence and household food insecurity (Munger, Hofferth, & Grutzmacher, 2016), a measure of domestic violence in the previous 12 months (0 = did not experience domestic violence; 1 = experienced domestic violence) was also included in all models. We also used the ratio between household income and number of people in the household (which is used to determine federal poverty status) as an indicator of overall poverty status, as we aimed to account for likely covariance between overall economic insecurity and household food insecurity across time. Ratios of 1 reflect a family existing at the official definition of poverty, ratios <1 reflect a family existing below the poverty level, and ratios >1 reflect a family existing above the poverty level (e.g., a ratio value of 1.25 indicates that income was 125% above the appropriate poverty threshold). To further account for socioeconomic problems that were likely related to both household food insecurity and the outcomes of interest, a measure of self-reported neighborhood problems was also included in all models. Self-reported neighborhood problems were measured using an 11-item scale constructed by the study's authors to assess respondents' perceptions of problems (e.g., assaults and muggings, drug dealing, gangs, abandoned houses, and teenage pregnancy) in their local neighborhood. Participants were asked "How much of a problem are _____ in your neighborhood?", and responded using a Likert-type response format (*1 = Not a Problem; 2= Somewhat of a Problem; 3 = A Big Problem*); scores could range from 11 to 33 with higher scores reflecting a greater severity of neighborhood problems. In the full sample of WCFS respondents, the scale demonstrated high internal consistency (weighted alpha = .91). Finally, maternal depression was added as a time-dependent variable to account for the potential effect of maternal mood on self-reported household food insecurity and child behavior symptoms. Maternal depression was measured using the six-item depression subscale on the Brief Symptom Inventory-18 (Derogatis, 2001). Respondents are asked to indicate on a scale from 0 (*not at all*) through 4 (*very much*) to what extent they are troubled by the complaints. Scores can potentially range from 0 to 24; higher scores indicate higher levels of depressive symptoms. Responses on the depression subscale have shown good internal consistency (alpha = .84) within a normative community sample of U.S. adults (Derogatis, 2001). In the full sample of participants from the WCFS, responses on the depression measure also showed high internal consistency at all three waves (alpha[s] = .81–.86).

Procedure

Data for the WCFS were collected in 1999, 2001, and 2005 via in-home interviews completed in either English or Spanish using Automated Computer-Assisted Survey Interview methodology. Parent interviews took approximately 2.5 hr, with approximately 75 min devoted to questions about the parent and household, and approximately 75 min of questions pertaining to the focal child and parenting. All interviewers completed intensive training to ensure they had the necessary skills to conduct in-depth personal interviews. Adult participants and children of age >10 years provided informed consent. Parents were also asked to provide consent for their children to participate. Adult participants were paid a $30 incentive on completion of the main survey. The study received Institutional Review Board (IRB) approval from all universities and data collection firms involved in the project (Angel et al., 2012).

Statistical Analysis

Separate generalized estimating equation (GEE) regression models were used to examine the longitudinal association between household food insecurity and adolescent behavior problems over time. The GEE approach was used to account for correlation between repeated observations over time from a single subject. GEE models also do not require that each subject have observations from each time point, which allowed us to include initial observations of subjects who later left the study by Wave 2 or Wave 3. An unstructured working correlation matrix was used for all analyses. Most covariates, as well as household food insecurity, were modeled as time-invariant (e.g., only assessed at the initial time point) effects, when the focal child was between 10 and 14 years old. Maternal depression

was modeled as a time-varying variable (i.e., assessed at each survey wave) to account for the potential effect of current maternal mood on each rating of child behavior. All outcomes, including internalizing, externalizing, and total problem behaviors were also modeled as time-varying outcomes over the 6-year period, and a minimum of one data point and a maximum of three were thus included from individual households. Because GEE accounts for repeated observations over time, the beta coefficients reflected the effect on each time-varying outcome while effectively holding time (e.g., Waves 1, 2, and 3) constant. Two-tailed tests and a significance level of .05 were used for hypothesis testing.

In a second set of analyses, we examined whether any observed relations between household food insecurity and child behavior problems were moderated by poverty status (assessed using the income-to-needs ratio), domestic violence in past year, maternal depression, child sex, and survey wave. Interaction terms were created using mean-centering. For all analyses, renormalized statistical weights were applied to account for clustering by block groups, sampling stratification, survey nonresponse, and to ensure equal representation among the three different city sites, per recommendations by the study authors (Angel et al., 2012). All analyses were performed using SPSS version 24.

Table I. *Descriptive Statistics for Variables Used in the Analysis at Baseline, Final Sample (N = 1,049)*

Variables	*M* or frequency	*SD*
Predictor		
Food insecurity	0.41	1.19
Outcomes		
CBCL,[a] raw scores (*T*-scores)		
Externalizing	9.88 (52.24)	7.98 (11.06)
Internalizing	8.52 (52.55)	7.38 (10.62)
Total	29.98 (53.19	21.27 (11.43)
Covariates		
Child sex		
Male	46%	
Female	54%	
Child age	12.02	1.39
Caregiver race		
White	5%	
Black	41%	
Hispanic	53%	
Caregiver age (years)	38.03	7.71
Below federal poverty line	70%	
Income-to-needs ratio	0.77	0.57
Married	35%	
Mother has high school diploma	50%	
Neighborhood problems	20.12	
Domestic violence	25%	
Maternal depression	2.50	3.44

[a]CBCL = Child Behavior Checklist.

Results

Of the 1,160 families in the data set at Wave 1, 1,049 (90%) met our inclusion criteria. Descriptive statistics for the final sample are presented in Table I. The mean level of household food insecurity in the year before the interview was 0.41 ($SD = 1.19$), with 17% ($N = 178$) of all children living in a household that provided at least one affirmative response to the food insecurity items. The most frequently endorsed household food insecurity item (81%; $n = 144$) involved adults cutting the size of their meals or skipping meals because of insufficient financial resources. A large portion of the sample (41%; $N = 427$) reported that they were receiving food stamps at the baseline survey. The majority of caregivers were unmarried (65%), of non-White Hispanic (53%) or African-American (41%) ethnic backgrounds. Caregiver age ranged from 18 to 74 years, with a mean age of 38.03 years ($SD = 7.71$). Approximately half of caregiver respondents had a high school diploma or higher (50%). Domestic violence was relatively common, with 25% of respondents reporting having experienced at least one incidence of domestic violence in the year before the baseline interview. The mean age of all focal children at baseline was 12.02 years ($SD = 1.39$), with the majority being female (54%). More than 70% of all families were below the official 1999 federal poverty line (i.e., falling below an income-to-needs level of 1). At baseline, average raw total CBCL scores for the final weighted sample were 29.98 ($SD = 21.27$), internalizing scores were 8.52 ($SD = 7.38$), and externalizing scores were 9.88 ($SD = 7.98$). Clinically significant total behavioral problems ($T > 63$) were observed in 21% of focal children, with slightly lower individual rates of clinically significant internalizing (16%) and externalizing (16%) problems.

There was a significant, weak positive relation between households below the poverty threshold at baseline and continuous household food insecurity scores on the abbreviated HFSS, $r(1,047) = .09$, $p = .005$. Using the continuous forms of the poverty-level variable (income-to-needs ratio) resulted in a similar relation, $r(1,047) = -.10$, $p = .001$. There was also a significant positive relation between household food insecurity scores and maternal depression, $r(1,047) = .28$, $p < .001$, as well as total child behavior problems, $r(1,047) = .17$, $p < .001$, internalizing symptoms, $r(1,047) = .18$, $p < .001$, and externalizing symptoms, $r(1,047) = .12$, $p < .001$. Regarding attrition, there was no significant relation between household food insecurity scores and odds of dropping out of the study after the first wave, $r(1,047) = -.04$, $p = .21$. Households with focal female children were more likely to drop out of the survey after the first or second

Table II. *Generalized Estimating Equations Predicting Child Internalizing, Externalizing, and Total Problem Behaviors*

	Total			Internalizing			Externalizing		
Predictor	*B*	SE *B*	95% CI	*B*	SE *B*	95% CI	*B*	SE *B*	95% CI
Household food insecurity	0.19*	0.08	0.04, 0.34	0.27**	0.08	0.11, 0.43	0.08	0.09	−0.10, 0.27
Income-to-needs ratio	0.07	0.03	0.00, 0.13	0.10*	0.04	0.02, 0.17	0.04	0.04	−0.04, 0.12
Child gender	−0.02	0.04	−0.10, 0.05	0.06	0.04	−0.02, 0.14	−0.04	0.04	−0.13, 0.04
Child age	0.00	0.14	−0.03, 0.02	0.00	0.02	−0.04, 0.03	0.00	0.02	−0.03, 0.03
Parent age	0.00	0.00	−0.01, 0.00	−0.01	0.00	−0.01, −0.00	0.00	0.00	−0.01, 0.00
Parent race									
Black	−0.20**	0.07	−0.35, −0.05	−0.29**	0.08	−0.46, −0.13	−0.17	0.09	−0.34, 0.00
Non-White Hispanic	−0.18*	0.07	−0.40, −0.06	−0.17*	0.08	−0.33, −0.01	−0.23**	0.09	−0.40, −0.06
Caregiver educational status	−0.11*	0.04	−0.18, −0.03	−0.14**	0.04	−0.22, −0.06	−0.11*	0.04	−0.20, −0.02
Marital status	−0.06	0.04	−0.15, 0.03	0.03	0.05	−0.06, 0.12	−0.18**	0.06	−0.29, −0.07
Domestic violence	0.19**	0.04	0.11, 0.26	0.14**	0.05	0.05, 0.23	0.21**	0.05	0.12, 0.30
Maternal depression	0.03**	0.00	0.03, 0.04	0.04**	0.00	0.04, 0.05	0.03**	0.00	0.02, 0.03
Neighborhood problems	0.01**	0.00	0.01, 0.02	0.02**	0.00	0.01, 0.02	0.02**	0.00	0.01, 0.02

Note. Child gender: 1 = male, 2 = female. Parent race reference category is "white." Caregiver educational status: 0 = no high school diploma, 1 = high school diploma or higher (excluding GED). Marital status: 0 = not married, 1 = married. Domestic violence: 0 = no events in past year, 1 = >0 events in past year. CI = confidence interval.

*$p < .05$. **$p < .01$.

wave compared with households with male children, $\chi^2(2, N = 1{,}049) = 5.79$, $p = .02$. One-way analysis of variance (ANOVA) tests also revealed a significant association between child age and attrition, $F(2, 1{,}047) = 237.55$, $p < .001$. Post hoc comparisons were performed using the Tukey HSD test and showed that the mean initial age of those who remained for all three waves ($M = 11.18$, $SD = 0.93$) was significantly younger than the mean initial age of those who left after the first wave ($M = 12.28$, $SD = 1.35$), which in turn was significantly younger than the mean initial age of those who left after the second wave ($M = 12.83$, $SD = 1.28$). Furthermore, it should be noted that baseline CBCL scores did not significantly differ based on time of attrition.

Before adjusting for potential confounds, generalized estimating models showed that household food insecurity predicted higher raw internalizing scores, externalizing scores, and total behavior scores. Thus, the initial hypotheses were supported. After adjustment for all covariates, beta coefficients remained statistically significant for internalizing symptoms and total behavior problems (see Table II). Beta coefficients were no longer statistically significant for externalizing symptoms after model adjustment. As GEE implicitly accounts for repeated observations over time, these beta coefficients describe the effect of household food insecurity on each time-varying outcome while holding within subject covariance across time (e.g., Waves 1, 2, and 3) constant.

Post hoc analysis of these models revealed that other covariates were significantly associated with the outcome variables of interest. Other risk factors associated with higher levels of behavior problems included (a) the presence of at least one domestic violence incident in the year before baseline, which was significantly associated with more total behavior problems, internalizing symptoms, and externalizing problems; (b) maternal depression (time variant), which was associated with more total behavioral problems, internalizing problems, and externalizing symptoms; (c) neighborhood problems assessed at baseline, which was associated with more total behavioral problems, internalizing symptoms, and externalizing symptoms; (d) caregiver high school education (compared with those without high school diplomas), which was associated with fewer internalizing symptoms, externalizing symptoms, and total behavior problems; (e) non-White Hispanic ethnicity (compared with respondents who identified as White), which was associated with fewer internalizing symptoms, externalizing symptoms, and total behavior problems; and African-American ethnicity (compared with respondents who identified as White), which was associated with fewer internalizing symptoms and total behavior problems; (f) having a caregiver currently married at baseline (compared with having an unmarried or previously married caregiver), which was associated with fewer externalizing symptoms; and (g) income-to-needs ratio, which was associated with more total behavioral problems. In addition, the main effect of time (survey wave) was also explored ($T1 = 0$, $T2$ and $T3 = 1$) by subsequently adding time as an additional covariate to our models. Time was statistically significant for total behavior problems, internalizing scores, and externalizing scores, with problem scores decreasing from Wave 1 through Wave 2 and Wave 3.

We also adopted a post hoc approach to examine whether any observed relations between household food insecurity and child behavior problems were

moderated by child sex, income-to-needs ratio, survey wave, domestic violence in the household, and maternal depression. Centered interaction terms were created for each variable of interest, food insecurity × child sex, food insecurity × income-to-needs ratio, food insecurity × wave (e.g., Time 1 vs. Time 2 and 3), food insecurity × domestic violence, and food insecurity × maternal depression. There was no evidence that any effects of household food insecurity at baseline behavioral problems were moderated by sex, wave, domestic violence, or maternal depression (p-interactions $> .05$). Conversely, the interaction term for household food insecurity × income-to-needs ratio was significant ($B = 0.40$, 95% confidence interval, CI [0.13, 0.66], $p = .003$), indicating that the association between household food insecurity and total behavioral problems was moderated by the household income-to-needs ratio. To probe this interaction, income-to-needs ratio was dichotomized by creating two groups: one with income-to-needs scores at least 1 *SD* below the *M* ($n = 391$) and the other with scores at least 1 *SD* above the *M* ($n = 103$). Probing of the interaction indicated that the strength of the association was somewhat stronger among those who were well above the median income to needs ratio ($B = 0.73$, 95% CI [0.33, 1.13], $p < .001$) compared with those who were well below it ($B = 0.54$, 95% CI [0.10, 0.98], $p = .017$).

Discussion

Using a subsample ($N = 1{,}049$) from the WCFS, we found that household food insecurity in early to mid-adolescence was significantly associated with more internalizing, externalizing, and total behavioral problem symptoms and that this relationship persisted over a 6-year period. The association between household food insecurity (in the past year) and behavioral problems was strongest at baseline. However, initial household food insecurity was still significantly associated with higher behavioral problems six years after baseline (when the focal children were in their mid- to late teens). To our knowledge, this research is one of the first studies to assess the longitudinal effects of household food insecurity on behavioral problem symptoms during the specific developmental stage where it is most common: adolescence. It also consistent with cross-sectional studies that have shown household food insecurity to be associated with compromised behavioral health at individual points in time in adolescence (Poole-Di Salvo et al., 2016).

Most mental disorders follow a developmental course that begins early in life (Kessler et al., 2007); as a result, preventing neurobehavioral problems in childhood and adolescence is a key priority to optimize mental health outcomes throughout the lifespan. Our analysis has demonstrated an association between household food insecurity in early adolescence and behavioral problems that appear to persist throughout adolescence and into young adulthood. This finding is particularly important in the context of the United States, where adolescents are almost twice as likely as younger children to experience household food insecurity (Moffitt & Ribar, 2016). We speculate that household food insecurity is a chronic source of stress that reduces one's overall sense of security, and thus contributes to persistent stress sensitivity and subsequent behavior problems in the context of adolescence. Household food insecurity may also contribute to adolescent behavior problems indirectly by placing additional stress on caregivers and thereby interfering with their ability to provide consistent, attuned parenting. Maternal depression is a known risk factor for internalizing and externalizing symptoms in adolescents (Jaser et al., 2008), and household food insecurity is, in turn, a risk factor for maternal depression (Huddleston-Casas, Charnigo, & Simmons, 2009).

Post hoc interaction models revealed that the ratio of households' total income-to-needs moderated the strength of the relation between household food insecurity and total behavioral scores (but not externalizing or internalizing scores), such that the strength of this association was larger as the ratio of family income relative to their household needs increased. The simple effect of household food insecurity also remained significant in the model after accounting for the interaction. This may have occurred because the potential effect of household food insecurity may have been relatively blunted by other, competing economic stressors that families at the lower end of the income-to-needs ratio were more likely to experience. Given the post hoc nature of this analysis, however, these results should be treated with caution and further analyses are necessary to examine the replicability of this effect.

It is also noteworthy that behavioral problems, in general, were associated with a number of covariates. In particular, more behavioral problems were, as would be expected, related to having experienced a domestic violence incident within the past year, higher levels of reported neighborhood problems, higher levels of maternal depression, having a caregiver without a high school diploma, and not having a marriage partner, and self-reported "white" ethnicity. These additional variables suggest that adolescent mental disorders appear to be influenced not only by poverty but by a whole host of environmental and personal risk factors, many of which cannot be easily targeted for intervention at the individual level and would require a more systemic approach to prevention and intervention. It should also be pointed out that behavioral problems (across all three outcome measures) declined

from baseline over time. Although there is no apparent explanation for the decline, the current authors believe that the decline might reflect the child's ability to adapt to adverse circumstances more effectively as they develop better coping skills and more cognitive flexibility as they progress through adolescence (Compas, Connor-Smith, Thomsen, & Wadsworth, 2001). That is, children may learn over time how to better cope with or respond to the stresses associated with living in poverty, which may translate into fewer behavioral problems noted by their caregivers over time.

This study emphasizes the need to expand screening for household food insecurity as a part of scheduled health maintenance visits using brief, well-validated measures such as the two-item food insecurity screener known as the Hunger Vital Sign (Children's HealthWatch, Policy Action Brief, 2014), which has been validated by a number of researchers (Gundersen, Engelhard, Crumbaugh, & Seligman, 2017; Hager, 2010). This screener is appropriate for use with both parents and adolescents (Baer, Scherer, Fleegler, & Hassan, 2015). This is particularly important given that a majority of low-income households tend to underuse assistance programs for which they are qualified (Kleinman et al., 2007). However, only about 13–15% of pediatricians currently screen for household food insecurity, even within high-need settings where measured rates of household food insecurity exceed more than half of all patients (Barnidge, LaBarge, Krupsky, & Arthur, 2017; Essel, Burke, Weissman, & Dietz, 2017). Furthermore, the association between household food insecurity and increased risk of behavior problems indicates that mental health-care providers, including social workers, psychologists, school counselors, and therapists, who work with adolescents exhibiting symptoms of psychiatric disorders, such as mood or anxiety disorders, conduct disorders, or substance use disorders, should also screen for household food insecurity and to provide appropriate referrals to social service supports to address household food insecurity concerns. Given that it is typical for adolescents and families to experience shame around household food insecurity (Connell, Lofton, Yadrick & Rehner, 2005), it may be important for providers to normalize the experience of household food insecurity in their screeners or before directly inquiring about it. The prevalence of behavioral problems among adolescents in our sample also reaffirms the ongoing need for health-care providers to routinely screen adolescent patients (and their caregivers) for mental health concerns, including depression, anxiety, and disruptive behaviors (e.g., aggression and conduct problems) and to provide appropriate mental health referrals when necessary. Likewise, social service providers who assist families who are facing household food insecurity should be aware of the increased risk of behavioral problems and psychiatric disorders among the youth they encounter.

The current findings also underscore the need for pediatricians, mental health providers, and other health-care professionals to become informed about federal nutrition programs, and to assist in developing internal resources that help connect patients to them. Current recommendations from the American Academy of Pediatrics include a range of activities designed to support families facing challenges to food security, from distributing informational flyers to patients, promoting nutrition programs within clinic waiting rooms, hosting individuals from agencies who can assist patients with screening or in-house referrals (e.g., social workers, community health workers, and volunteer help desks), and developing partnerships with external organizations who can reach out to consenting patients at a later date (Gitterman, 2015). Over the long term, however, broader systems of care that fluidly integrate social work and mental health specialists into pediatric primary care settings are necessary. On a policy level, these results highlight the need to expand existing federal nutrition programs that serve low-income families, including most notably the Supplemental Nutritional Assistance Program (e.g., SNAP).

A strength of the current study is that it used a large sample with data on family demographics, income, childhood circumstances, and mental health outcomes. Given that the number of children of age <18 years facing household food insecurity has increased slightly in the two decades since these data were collected (Child Trends, 2018), our results are likely to be generalizable to contemporary urban populations that are experiencing household food insecurity. An additional strength of the current study is that the large sample size also allowed us to adjust our models for a range of potential confounds beyond income that are typically associated with both household food insecurity and child behavior (neighborhood conditions, domestic violence, etc.).

However, this study also has limitations. First, we used a modified, eight-item measure of household food insecurity that may have not captured the full extent of the overall prevalence of household food insecurity in comparison with the 18-item HFSS. In addition, the data may have been limited in accuracy because of the reliance on self-reports of a single respondent (i.e., maternal caregivers). Thus, it is possible that method bias contributed to some of the observed relations between the variables of interest, particularly if respondents who were more likely to perceive themselves as food insecure were also more likely to experience a negative perceptual bias, and

thus perceive their children as having more behavioral problems. Despite this, prior studies of the primary outcome measure, the CBCL, have consistently shown high inter-rater agreement between parent and teacher versions that support its validity as a caregiver-report measure of youth behavior (Achenbach & Rescorla, 2001). It is also important to note that the measure of perceived neighborhood problems was also included as a covariate in tested models; this self-reported variable, also susceptible to negative perceptual bias, was significantly associated with household food insecurity but not with a higher risk of behavioral problems in any ensuing model. Such findings provide some assurance that common method bias, though not possible to eliminate, may not be of significant concern.

Additionally, behavioral outcomes were assessed using a slightly different measure at Wave 3, which accounted for 20% of total observations across time. Specifically, the CBCL/6–18 is an updated version of the CBCL/4–18 with six items having been replaced. Although there were no significant differences in CBCL scores between Wave 2 and Wave 3, this may have nevertheless introduced additional variance to our outcome variable.

It should also be noted that household food insecurity was weakly related to poverty status. Given the restricted range on poverty levels within the current sample, it was not surprising to find such a weak relation. This finding suggests that household food insecurity, to an extent, may be confounded by poverty levels. However, the relation between household food insecurity and behavioral problems was still significant even with the limited range of poverty levels for the current sample (i.e., less than twice the federal poverty line) and when poverty level was statistically controlled. Thus, it is very possible that the magnitude of the relation between household food insecurity and behavioral problems would be even stronger within a sample comprising of a wider range of poverty levels.

Finally, there were significant demographic differences between respondents based on attrition. Specifically, households with female focal children were more likely to drop out after the first wave, which may have led to an overrepresentation of male children in later stages of the survey. It is possible that the higher rate of food-insecure households at later stages of the survey may have been because of the use of economic incentives for completing the survey, which would have likely been more attractive to families struggling with household food insecurity. There were no significant differences across baseline CBCL outcomes based on likelihood of attrition, suggesting that the overall decline in CBCL scores from Wave 1 to first follow-up was a result of age rather than dropout from the study.

The present study highlights the importance of household food security for optimal neurobehavioral development and positive clinical outcomes among adolescents and reemphasizes the need to reduce high rates of household food insecurity among low-income families. This is especially relevant for clinicians serving families who in low-income areas where household food insecurity is common. Fortunately, options exist for pediatricians and other providers to help reduce household food insecurity, including the routine use of well-validated screening measures and development of referral processes in clinical settings. Broader efforts can focus on integrating social work and mental health specialists into pediatric settings, as well on expanding existing federal nutrition programs and in such a way as to directly target the unique needs of adolescents. Finally, this study indicates the need for research focused on exploring pathways between household food insecurity and adolescent behavioral problems, as well as novel clinical and policy interventions aimed at enhancing food security for low-income families.

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References

Achenbach, T. M. (1991). *Manual for the Child Behavior Checklist/4-8 and 1991 profile*. Burlington, VT: Department of Psychiatry, University of Vermont.

Achenbach, T. M. (1997). *Manual for the Young Adult Self-report and Young Adult Behavior Checklist*. Burlington, VT: Department of Psychiatry, University of Vermont.

Achenbach, T. M., & Rescorla, L. A. (2001). *Manual for the ASEBA School-Age Forms & Profiles*. Burlington, VT: University of Vermont.

Alaimo, K., Olson, C. M., & Frongillo, E. A. (2002). Family food insufficiency, but not low family income, is positively associated with dysthymia and suicide symptoms in adolescents. *The Journal of Nutrition*, *132*, 719–725. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/11925467

Angel, R., Burton, L., Chase-Lansdale, P. L., Cherlin, A., & Moffitt, R. (2012). *Welfare, Children, and Families: A three-city study*. Ann Arbor, MI: Inter-university Consortium for Political and Social Research [distributor]. Retrieved from https://doi.org/10.3886/ICPSR04701.v7

Baer, T. E., Scherer, E. A., Fleegler, E. W., & Hassan, A. (2015). Food insecurity and the burden of health-related

social problems in an urban youth population. *Journal of Adolescent Health*, *5*. 601–607. https://doi.org/10.1016/j.jadohealth.2015.08.013

Barnidge, E., LaBarge, G., Krupsky, K., & Arthur, J. (2017). Screening for food insecurity in pediatric clinical settings: Opportunities and barriers. *Journal of Community Health*, *42*, 51–57. https://doi.org/10.1007/s10900-016-0229-z

Bickel, G., Nord, M., Price, C., Hamilton, W., & Cook, J. (2000). *Guide To Measuring Household Food Security*. Alexandria, VA: Food and Nutrition Service, United States Department of Agriculture. Retrieved from https://hunger-freecommunities.org/wp-content/uploads/2011/04/USDA-guide-to-measuring-food-security.pdf

Bronte-Tinkew, J., Zaslow, M., Capps, R., Horowitz, A., & McNamara, M. (2007). Food insecurity works through depression, parenting, and infant feeding to influence overweight and health in toddlers. *Journal of Nutrition*, *137*, 2160–2165. https://doi.org/10.1093/jn/137.9.2160

Brumariu, L. E., & Kerns, K. A. (2010). Parent–child attachment and internalizing symptoms in childhood and adolescence: A review of empirical findings and future directions. *Development and Psychopathology*, *22*, 177–203. https://doi.org/10.1017/S0954579409990344

Child Trends. (2018). *Food Insecurity*. Bethesda, MD: Child Trends. Retrieved from https://www.childtrends.org/indicators/food-insecurity

Children's HealthWatch, Policy Action Brief (2014). The hunger vital sign: A new standard of care for preventive health. Retrieved from http://academicdepartments.musc.edu/ohp/SFSP/FINAL-Hunger-Vital-Sign-2-pager1.pdf

Coleman-Jensen, A., Rabbitt, M. P., Gregory, C. A., & Singh, A. (2017). Household food security in the United States in 2016 (ERR-237). U.S. Department of Agriculture, Economic Research Service. Retrieved from https://www.ers.usda.gov/webdocs/publications/84973/err-237.pdf? v=42979

Compas, B. E., Connor-Smith, J. K., Saltzman, H., Harding Thomsen, A., & Wadsworth, M. E. (2001). Coping with stress during childhood and adolescence: Problems, progress, and potential in theory and research. *Psychological Bulletin*, *127*, 87–127.

Connell, C. L., Lofton, K. L., Yadrick, K., & Rehner, T. A. (2005). Children's experiences of food insecurity can assist in understanding its effect on their well-being. *Journal of Nutrition*, *135*, 1683–1690. Retrieved from https://www.ncbi.nlm.nih.gov/pubmed/15987850

Cook, J. T. (2013). *Impacts of child food insecurity and hunger on health and development in children: Implications of measurement approach*. Washington, DC: Committee on National Statistics and Food and Nutrition Board.

Cook, J. T., Black, M., Chilton, M., Cutts, D., Ettinger de Cuba, S., Heeren, T. C. … Frank, D. A. (2013). Are food insecurity's health impacts underestimated in the U.S. population? *Advances in Nutrition*, *4*, 51–61. https://doi.org/10.3945/an.112.003228

Derogatis, L. R. (2001). *Brief Symptom Inventory (BSI)-18. Administration, scoring and procedures manual*. Minneapolis, MN: NCS Pearson.

Essel, K., Burke, M. P., Weissman, M., & Dietz, W. (2017). Exploring food insecurity screening and referral practices of pediatric providers in metropolitan Washington, DC. *The FASEB Journal*, *31*. Retrieved from http://www.fasebj.org/content/31/1_Supplement/297.7

Fomby, P., Estacion, A., & Moffitt, R. (2003). Characteristics of the three-city survey sample: Waves 1 and 2. Retrieved from http://web.jhu.edu/threecitystudy/images/CharacteristicsReport.pdf

Giedd, J. N., & Rapoport, J. L. (2010). Structural MRI of pediatric brain development: What have we learned and where are we going? *Neuron*, *67*, 728–734.

Gitterman, B. A. (2015). Promoting food security for all children. *Pediatrics*, *136*, 2015–3301. https://doi.org/10.1542/peds.2015-3301

Gundersen, C., Engelhard, E. E., Crumbaugh, A. S., & Seligman, H. K. (2017). Brief assessment of food insecurity accurately identifies high-risk US adults. *Public Health Nutrition*, *20*, 1367–1371.

Gunnar, M. R., Wewerka, S., Frenn, K., Long, J. D., & Griggs, C. (2009). Developmental changes in hypothalamus-pituitary-adrenal activity over the transition to adolescence: Normative changes and associations with puberty. *Development and Psychopathology*, *21*, 69–85.

Hamilton, W. L., Cook, J. T., Thompson, W. W., Buron, L. F., Frongillo, E. A., Jr., Olson, C. M., & Wehler, C. A. (1997). *Household food security in the United States in 1995: Technical Report Of The Food Security Measurement Project*. Alexandria, VA: U.S. Department of Agriculture, Food and Consumer Service.

Hager, E. R., Quigg, A. M., Black, M. M., Coleman, S. M., Heeren, T., Rose-Jacobs, R. … Frank, D. A., (2010). Development and validity of a 2-item screen to identify families at risk for food insecurity. *Pediatrics*, *126*, e26–e32.

Hewitt, J. K., Silberg, J. L., Rutter, M., Simonoff, E., Meyer, J. M., Maes, H. … Eaves, L. J. (1997). Genetics and developmental psychopathology: 1. Phenotypic assessment in the Virginia Twin Study of Adolescent Behavioral Development. *Journal of Child Psychology and Psychiatry*, *38*, 943–963.

Huddleston-Casas, C., Charnigo, R., & Simmons, L. A. (2009). Food insecurity and maternal depression in rural, low-income families: A longitudinal investigation. *Public Health Nutrition*, *12*, 1133–1140.

Jaser, S. S., Fear, J. M., Reeslund, K. L., Champion, J. E., Reising, M. M., & Compas, B. E. (2008). Maternal sadness and adolescents' responses to stress in offspring of mothers with and without a history of depression. *Journal of Clinical and Child Adolescent Psychology*, *37*, 736–746.

Jyoti, D. F., Frongillo, E. A., & Jones, S. J. (2005). Food insecurity affects school children's academic performance, weight gain, and social skills. *The Journal of Nutrition*, *135*, 2831–2839. https://doi.org/10.1177/01650250500147329

Kessler, R. C., Amminger, G. P., Aguilar-Gaxiola, S., Alonso, J., Lee, S., & Ustun, T. B. (2007). Age of onset of mental disorders: A review of recent literature. *Current Opinion in Psychiatry*, *20*, 359–364.

Kleinman, R. E., Murphy, J. M., Little, M., Pagano, M., Wehler, C. A., Regal, K., & Jellinek, M. S. (1998). Hunger

in children in the United States: Potential behavioral and emotional correlates. *Pediatrics*, *101*, e3. https://doi.org/10.1542/peds.101.1.e3

Kleinman, R. E., Murphy, J. M., Wieneke, K. M., Desmond, M. S., Schiff, A., & Gapinski, J. A. (2007). Use of a single-question screening tool to detect hunger in families attending a neighborhood health center. *Academic Pediatrics*, *7*, 278–284. https://doi.org/10.1016/j.ambp.2007.03.005

McAdams, T. A., Rijsdijk, F. V., Narusyte, J., Ganiban, J. M., Reiss, D., Spotts, E. … Eley, T. C. (2017). Associations between parent-child relationship and adolescent self-worth: A genetically informed study of twin parents and their adolescent children. *Journal of Child Psychology and Psychiatry*, *58*, 46–54. https://doi.org/10.1111/jcpp.12600

McLaughlin, K. A., Green, J. G., Alegria, M., Costello, E. J., Gruber, M. J., Sampson, N. A., & Kessler, R. C. (2012). Food insecurity and mental disorders in a national sample of US adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry*, *51*, 1293–1303. https://doi.org/10.1016/j.jaac.2012.09.009

McLaughlin, K. A., Kubzansky, L. D., Dunn, E. C., Waldinger, R. J., Vaillant, G. E., & Koenen, K. C. (2010). Childhood social environment, emotional reactivity to stress, and mood and anxiety disorders across the life course. *Depression and Anxiety*, *27*, 1087–1094. https://doi.org/10.1002/da.20762

Moffitt, R. A., & Ribar, D. C. (2016). *Child age and gender differences in food security in a low-income inner-city population*. Cambridge, MA: National Bureau of Economic Research. Retrieved from https://doi.org/10.3386/w22988

Munger, A. L., Hofferth, S. L., & Grutzmacher, S. K. (2016). The role of the supplemental nutrition assistance program in the relationship between food insecurity and probability of maternal depression. *Journal of Hunger and Environment Nutrition*, *11*, 147–161.

Poole-Di Salvo, E., Silver, E. J., & Stein, R. E. (2016). Household food insecurity and mental health problems among adolescents: What do parents report? *Academic Pediatrics*, *16*, 90–96.

Romeo, R. D. (2013). The teenage brain: The stress response and the adolescent brain. *Current Directions in Psychological Science*, *22*, 140–145.

Slack, K. S., & Yoo, J. (2005). Food hardship and child behavior problems among low-income children. *Social Service Review*, *79*, 511–536.

Slopen, N., Fitzmaurice, G., Williams, D. R., & Gilman, S. E. (2010). Poverty, food insecurity, and the behavior for childhood internalizing and externalizing disorders. *Journal of the American Academy of Child and Adolescent Psychiatry*, *49*, 444–452.

United States Department of Agriculture. (1997). Household food security in the united states in 1995: Technical report of the food security measurement project. Retrieved from https://www.fns.usda.gov/household-food-security-united-states-1995-summary-report-food-security-measurement-project/

United States Department of Agriculture. (2018). Definitions of food security. Retrieved from https://www.ers.usda.gov/topics/food-nutrition-assistance/food-security-in-the-us/definitions-of-food-security/

Zaslow, M. J., & Eldred, C. A. (Eds.). (1998). *Parenting behavior in a sample of young mothers in poverty: Results of the New Chance Observational Study*. New York, NY: Manpower Demonstration Research Corporation.

Zaslow, M. J., Hair, E. C., Dion, M. R., Ahluwalia, S. K., & &Sargent, J. (2001). Maternal depressive symptoms and low literacy as potential barriers to employment in a sample of families receiving welfare: Are there two-generational implications? *Women and Health*, *32*, 211–251. http://doi.org/10.1300/J013v32n03_03