

DO PARENTS PROTECT THEIR CHILDREN? THE EFFECTS OF FOOD INSECURITY ON  
CHILD MENTAL HEALTH

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# DO PARENTS PROTECT THEIR CHILDREN? THE EFFECTS OF FOOD INSECURITY ON CHILD MENTAL HEALTH

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## ABSTRACT

Qualitative studies suggest that parents often believe that they can protect their children from the effects of food insecurity except in the most severe cases, but research consistently indicates that this may not be the case. Children who are food insecure are more likely to have negative outcomes, like nutritional deficiencies, behavior problems, and lower academic achievement, and interviews with children suggest that they, like their parents, may experience a great deal of stress and worry about their family's ability to secure a sufficient amount of food. While several studies have indicated a relationship between food insecurity and poor mental health in adults, no wide scale quantitative studies have looked at this relationship among children. Using the Panel Study of Income Dynamics (PSID), this thesis attempts to fill this gap. Panel fixed effects and ordered logistic regression analysis reveal that food insecurity predicts higher levels of anxiety and depression among children between the ages of 4 and 12 and that this effect is heightened for children suffering from more severe forms of food insecurity. With nearly 20 percent of all children in the United States under the age of 18 experiencing some degree of food insecurity, these results underscore the importance of increasing access to nutritious food while also recognizing and addressing the impact that food insecurity has on the mental health of children.

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## CHAPTER ONE

### INTRODUCTION

In the United States, nearly 20 percent of all children under the age of 18 do not have sufficient and reliable access to the nutritious food that is necessary to sustain a healthy and active lifestyle and are considered food insecure. While food insecurity is problematic at any age, it is especially concerning during early childhood as this is a sensitive period of development during which children make important gains physically, mentally, and emotionally. An inadequate diet during this time can have both immediate and long-lasting impacts on the health, conduct, and achievement of children. In addition to producing nutritional deficiencies, food insecurity has been tied to increased behavior problems in children that can extend into adolescence, decreased cognitive functioning, and lower levels of self-control (Slack & Yoo, 2005; Johnson & Markowitz, 2017). Research has further linked food insecurity and the worry that comes along with not having consistent access to food to increased parental stress and maternal depression, both of which can negatively impact parenting and affect child development (Whitaker, et al., 2006).

In 2018, the federal government spent \$68 billion on nutrition assistance programs, like the Supplemental Nutrition Assistance Program (SNAP), the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC)<sup>1</sup>, and the National School Lunch Program (NSLP), in an effort to alleviate the effects of food insecurity by supplementing a family's food budget and providing greater access to nutritious food (Center on Budget and Policy Priorities,

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<sup>1</sup> WIC provides supplemental foods as well as nutrition education and health care referrals to pregnant and postpartum women who are breastfeeding and to children under the age of 5 who are low-income and are identified as having a nutritional risk ("About WIC").

2019). Research suggests that these nutrition assistance programs can decrease nutritional deficiency, lower the risk of abuse and neglect, and reduce the prevalence of food insecurity (Kowaleski-Jones & Duncan, 2000; Lee & Mackey-Bilaver, 2007; Ratcliffe & McKernan, 2010). One evaluation of SNAP found that participation decreases the likelihood of being food insecure by about 30% while others have found evidence that food insecurity increases when families lose access to these benefits (Ratcliffe & McKernan, 2010; Arteaga, et al., 2016).

Even if these programs do help to reduce the prevalence of food insecurity, there is also evidence that these programs do not do enough. SNAP benefits, which are distributed once a month, fall short in covering the cost of a meal in almost every county across the continental United States, and daily reports of food insecurity are the greatest during the second half of the month following SNAP receipt (Waxman, et al., 2018; Gassman-Pines & Schenck-Fontaine, 2019). There are, however, a myriad of factors that likely affect the prevalence of food insecurity, including poverty, stress, and parental depression, that can't be solved simply through nutrition assistance programs alone, and the reality is that many people living in the United States, especially children, do not have consistent access to quality food in spite of these programs (Melchior et al., 2009).

Qualitative studies suggest that parents recognize the strain of food insecurity on their own well-being but that they like to believe that they are able to protect their children from its detrimental effects except in the most severe cases (Knowles, et al., 2015). Interviews with children between the ages of 11 and 16, however, suggest the opposite – not only are children cognizant of their family's struggle, they often undertake behaviors such as eating less or claiming to not be hungry in an effort to alleviate their parents' stress (Connell, et al., 2005). This would suggest that children are not protected from the effects of food insecurity, and that

just like their parents, they are frequently worried about their family's ability to secure a sufficient amount of food.

Research has examined the link between food insecurity and adult mental health, finding evidence of a negative effect, but no wide-scale quantitative studies have looked specifically at this relationship in children to see if food insecurity directly and significantly impacts child mental health. This thesis seeks to fill this gap. Using data from the Panel Study of Income Dynamics (PSID), it looks at food insecurity status and the effect that this has on measures of mental health, specifically anxiety and depression, for children between the ages of 4 and 12.

## CHAPTER TWO

### PRIOR STUDIES

#### **Background**

##### *Measure of Food Insecurity*

In 1992, the Food Security Measurement Project was formed by the United States Department of Agriculture (USDA) in an effort to develop a standard measure of food security. Using the Community Population Survey (CPS) Food Security Supplement of 1995, the project identified a set of 18 questions that are now used as a standard way to measure the severity of food security in the US (Bickel, et al., 2000).

This measure classified households into one of four categories depending on the number of questions that respondents answered affirmatively: food secure, food insecure without hunger, food insecure with moderate hunger, and food insecure with severe hunger (Bickel, et al., 2000). There is not a consistent definition of hunger, however, and while it is related to the concept of food insecurity, hunger is more of a physiological phenomenon rather than an economic condition; in 2006 these categories were replaced in recognition of this (“Measurement”). The categories are now high food security, marginal food security, low food security, and very low food security.

The 18 questions cover indications of household food insecurity in addition to specific items related to both adult and child experiences of food insecurity. Any household that answers affirmatively to at least 3 of the 18 questions is classified as food insecure on this continuum (“Measurement”).

It is believed that using the full 18-item scale of the USDA household food security model allows for a more precise differentiation among the most severe categories of food insecurity, and this is reflected in much of the literature (Bickel, et al., 2000). For instance, when looking at the associations between food insecurity, parental depression, parenting styles, and child health outcomes, Bronte-Tinkew, et al. (2007) used the full 18-item scale. Likewise, Johnson and Markowitz (2017) followed the precedent of earlier studies and utilized the full scale to look at the timing and intensity of food insecurity on child outcomes.

While a family is typically categorized as food insecure if they have three or more affirmative answers on the 18-question scale, some research has suggested that answering yes to just one question is indicative of food insecurity. Bronte-Tinkew, et al. (2007) observed that families that answered yes to just one or two of the food insecurity questions had similar rates of parental depression and poor child health outcomes to the families that answered yes to three or more questions, and both groups had significantly higher rates of these negative outcomes than families that did not have any indication of food insecurity.

Some research has utilized only specific subsets of the 18-item scale. The ten questions that pertain only to household and adult measures of food insecurity are typically used to assess food security status in households with no children, but Whitaker, et al. (2006) used this subscale to assess the effect of maternal food insecurity on several outcomes, including child behavior problems. Since these households included children, this decision is somewhat unusual.

While using the adult and household specific questions as a subscale is common when looking at food insecurity in households without children, there is some hesitation in using only the child specific questions to look at food insecurity among children. These eight questions capture the food security status of the eldest child in the household, so the full 18-item scale is

typically considered a more accurate and preferable measure of food insecurity status among families with more than one child (Bickel, et al., 2000; Johnson & Markowitz, 2018). There is evidence to suggest, however, that while the full scale may be best for identifying food insecure households, the child scale may be better at identifying actual child experiences of hunger that result from food insecurity despite this scale having a lower level of precision. Over the 5-year period between 1995-1999, Nord and Bickel (2002) identified prevalence rates of food insecurity with the child scale that are an average of 20% higher than the estimates of the full scale. King (2018) also used the child only measure and found larger associations between food insecurity and child behavior problems than the full scale indicated.

There is also research that indicates that in some households that were classified as food insecure with severe hunger (what is now classified as very low food security), the child scale did not necessarily indicate that the children in the household were experiencing hunger (Nord & Bickel, 2002). This could suggest that parents are sometimes able to shield their children from the direct hunger effects of food insecurity. Indeed, Nord and Bickel (2002) found that children in resource-constrained households typically do not experience the direct effects of food insecurity and hunger until the situation has become quite severe. They found that children under 5, as well as those who live in households with higher incomes and two parents instead of one, tended to be more protected from the experience of hunger.

However, since all food insecurity questions, even the child-specific questions, are answered by an adult in the household, it is also possible that this is a situation where parents are under the impression that their children are not experiencing the direct effects of food insecurity even if they are. Regardless, this research does identify an important point – even among

households that face the same resource constraints, the experience of food insecurity and the deprivation of children can differ.

### **Literature Review**

Research on food insecurity and other aspects of poor nutrition points to adverse effects on children, with a main focus in the literature on outcomes that are related to behavior and school achievement. Studies have indicated that externalizing behavior problems, an umbrella term that includes actions like aggression, stealing, and other delinquent behaviors, are more prevalent among children who experience food insecurity and other causes of nutritional deficiencies (Weinreb, et al., 2002; Whitaker, et al., 2006). Liu, et al. (2004) found that malnutrition was associated with increased levels of aggression and hyperactivity and a higher prevalence of conduct disorder. Similarly, Jackson (2016) found that poor quality nutrition in early childhood was associated with antisocial behavior.

While food insecurity is not necessarily a permanent condition, being food insecure in one year is highly predictive of whether a family will be food insecure the following year (Gundersen & Ziliak, 2014). Any one episode of food insecurity is related to increased behavior problems and more negative outcomes (Johnson & Markowitz, 2017; Kimbro & Denney, 2015). There is also evidence to suggest that the effects of food insecurity in early childhood on behavior problems and misconduct extend beyond just early childhood and elementary school. Longitudinal studies have followed the effect of food insecurity on behavior problems into adolescence (Jackson & Vaughn, 2016; Whitsett, et al., 2019).

Behavior problems can disrupt learning, but that is not the only way that academic performance is affected by food insecurity. Poor nutrition during pregnancy and early in childhood is associated with cognitive and physical delays, and there is also a body of evidence

showing the negative impact of food insecurity on reading and math skills as early as kindergarten (Tanner & Finn-Stevenson, 2002; Johnson & Markowitz, 2017; Jyoti, et al., 2005; Alaimo, Olson, & Frongillo, 2001). Poor nutrition in early childhood can also affect non-cognitive functions at school, including self-control, peer interactions, and approaches to learning, all of which are associated with increased academic success (Howard, 2011).

In addition to the direct impacts on physical and cognitive development, there is also evidence that suggests an indirect relationship between food insecurity and child behavior problems that is driven by parental characteristics (Slack & Yoo, 2005). Food insecurity is associated with parental stress and depression and predicts harsher discipline styles and more irritable and less responsive parenting (Slack & Yoo, 2005; Ashiabi & O’Neal, 2008; Johnson & Markowitz, 2017). Such parenting is linked to increased behavior problems in childhood and reduced academic achievement (Yeung, et al., 2002).

A large body of evidence also looks at the health outcomes of food insecure parents and children. Hunger has been linked to nutritional deficiencies, more frequent colds, illnesses, infections, headaches, and stomachaches, and overall worse health among low-income children (Alaimo, Olson, Frongillo, & Briefel, 2001; Bronte-Tinkew, et al., 2007). There is also a higher prevalence of mental health problems globally among the food insecure population, with research pointing to higher rates of depression, anxiety, and PTSD among adults who experience food insecurity (Weinreb, et al., 2002; Whitaker, et al., 2006; Siefert, et al., 2004; Jones, 2017). While these findings are unsurprising, these studies tend to consist of smaller, unrepresentative samples and be cross-sectional, so the evidence doesn’t necessarily suggest a causal link.

Interviews with parents also indicate a relationship between food insecurity and parental mental health, even suggesting the possibility that food insecurity should be classified as a form of toxic stress, a condition of extreme and prolonged adversity that is closely associated with abuse, neglect, and extreme poverty, due to its potentially damaging effects on well-being and child development (Knowles, et al., 2015). While these studies are small, qualitative, and focus solely on parents identified as being food insecure, they offer an important insight into the lives of food insecure families. The interviews suggest that parents recognize the stress of being food insecure and the effect that this can have on their children but believe that they can ultimately shield them from the worst effects (Knowles, et al., 2015). The literature would suggest otherwise, however.

Few studies assess children's own perceptions of food insecurity. For the most part, measures are reported by parents, and even a qualitative study that interviewed children was unable to directly ask children about their personal experiences with food insecurity (Connell, et al., 2005). Instead, the children could only speak of other children that they knew, although their accounts indicated that they were likely referring to themselves in their responses. Such interviews suggest that children also experience great anxiety about food insecurity; despite their parents' attempts to shield them from the deleterious effects, their experiences of food insecurity may in fact be quite similar to those of adults (Connell, et al., 2005).

Some quantitative studies have attempted to look more closely at this mental health aspect of food insecurity in relation to children. One study found decreased psychosocial functioning among children experiencing food insecurity, but this study used referrals to psychologists and reports of the child's ability to get along with friends as a proxy for measures of mental health and relied solely on a 1-item measure of family hunger (Alaimo, Olson, &

Frongillo, 2001). Weinreb et al. (2002) did look specifically at anxiety and depression among school-aged children, finding increased rates of anxiety and chronic illness among food insecure children, but the sample consisted only of a small group of homeless and very low-income families in Massachusetts. The study also utilized a lesser known 7-item hunger scale developed as part of the Community Childhood Hunger Identification Project instead of the more standard 18-item measure developed by the USDA.

While there is a great deal of evidence documenting the prevalence of food insecurity and the adverse impact that it has on both parent and child outcomes, there is very little research that focuses on the relationship between food insecurity and child mental health. The few studies that have examined this link have consisted of small, non-representative populations. While the evidence suggests a causal relationship may exist, no quantitative studies have directly asked if food insecurity causes children to be anxious or depressed using the standard 18-item measure of food insecurity developed by the USDA and a nationally representative dataset.

### **Conceptual Model**

#### *The Family Stress Model*

Food insecurity is a form of economic hardship where a household lacks the resources to consistently secure an adequate amount of nutritious food. To examine the proposed link between food insecurity and child mental health, the conceptual framework for this thesis is adapted from the Family Stress Model (FSM) (Conger & Elder, 1994).

The FSM was first used as a way to understand and explain how the economic recession in the 1980s impacted rural, resource-strapped families (Conger, et al., 2010). This model proposes a series of channels that connect economic hardship, family dysfunction, and child outcomes. It is theoretically based off of prior perspectives of psychological distress but includes

two unique premises: that economic stressors disrupt daily life and that aspects of parental mental health are an important channel through which economic strain affects children (Conger & Elder, 1994). This model has been adapted in many contexts and is often referenced in the food insecurity literature as the theoretical underpinning of the causal pathway between food insecurity and child behavior outcomes.

The FSM begins with economic hardship, which can range from having a low-income or high debt to some other sort of negative financial event that puts long-term strain on the family. This hardship then creates economic pressure, usually in the form of material hardship. In this case, the economic pressure is food insecurity, the inability to pay for an adequate amount of nutritious food. This model proposes that economic pressure and the inability to meet this basic need indirectly affects child behavior outcomes, mainly through three interconnected channels: parental psychological distress, interparental relationships, and actual parenting.

Many studies have indicated that economic strain creates a great deal of stress and affects parents emotionally and behaviorally. In the food insecurity and hardship literature alone, research has indicated an impact on maternal depression and parental stress and anxiety (Bronte-Tinkew, et al., 2007; Weinreb, et al., 2002; Whitaker, et al., 2006). This model also proposes that this stress can strain interparent relationships and cause marriage problems (Conger, et al., 2010). The stress from the economic pressure as well as from parent relationship problems can impact parenting quality, sensitivity, and engagement, possibly leading to harsher parenting (Slack & Yoo, 2005; Ashiabi & O'Neal, 2008; Johnson & Markowitz, 2017). The FSM then proposes that the parenting practices will directly affect child outcomes, both emotionally and behaviorally.

It is important to note that while this framework proposes a causal pathway that links economic hardship to adverse parent and child outcomes, it also recognizes that economic

hardships affect each family differently. There is evidence to suggest that families have different predispositions to stress and have varying levels of resilience. For instance, it is believed that nurturant parenting can protect children from adverse outcomes and promote resilience (Conger & Conger, 2002). It is also believed that prior experiences, particularly from childhood, can predict parents' ability to cope with adverse situations (Conger, et al., 2010). In the model, this is called risk and protective factors, and it captures an important point: there are many factors that can either promote or reduce the probability that economic hardship will severely impact a family and its ability to function and that there can be ways to minimize the challenges that are created by economic hardship.

While it may be true that sensitive and attentive parenting can minimize the adverse effects of economic hardship on child outcomes, the literature suggests that children are still exceedingly impacted by its effects. Qualitative studies in particular suggest that children are very cognizant of economic strains and express concern over their parents' wellbeing (Knowles, et al., 2015; Connell, et al., 2005). Children in these studies also report undertaking actions to ease the burden (Connell, et al., 2005). The FSM proposes only an indirect pathway between economic pressures and child outcomes that is mediated by parental experiences and behavior and focuses only on the psychological distress of parents. This thesis, however, proposes a more direct pathway that links economic pressures to child experiences, specifically focusing on child psychological distress in direct response to the economic pressure. Figure 1 shows this new channel. Child psychological distress is further impacted by parental stress, which is indicated by both parent psychological distress and disrupted parenting in the model. This adaptation also proposes that child psychological distress then affects other child outcomes as well. Like all other factors in the FSM proposed by Conger & Elder (1994), the impact of both economic

pressure and parental stress on child psychological distress is mediated by a series of risk and protective factors that either mitigate or exacerbate the impacts.

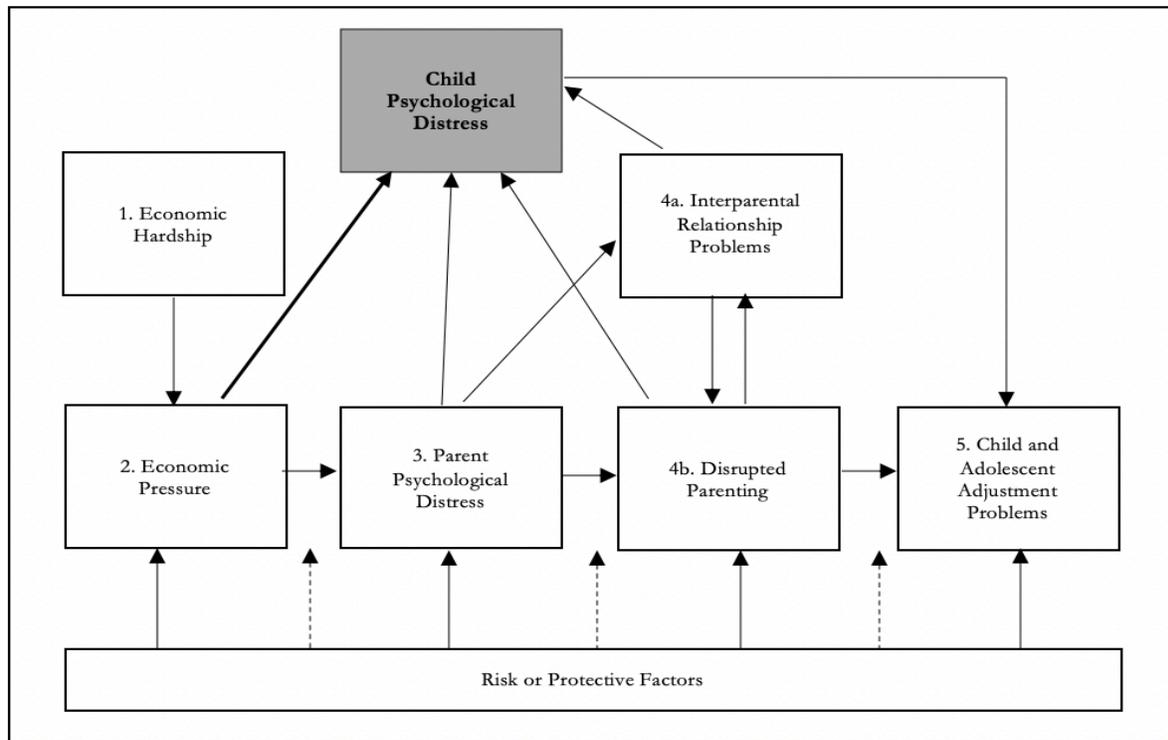


Figure 1: Adaptations to the Family Stress Model

### Hypotheses

Based on the literature and the presented conceptual model, this thesis proposes the following hypotheses:

1. Food insecurity predicts higher levels of child anxiety and depression.
2. A greater degree of food insecurity predicts a higher level of child psychological distress in the form of anxiety and depression.
3. Parental mental health heightens and attenuates the relationship between food insecurity and child anxiety and depression. Worse parental mental health predicts higher levels of child anxiety and depression while better parental mental health predicts lower levels.

## CHAPTER THREE

### DATA AND METHODS

#### **Data**

Data are drawn from the Panel Study of Income Dynamics (PSID), the longest running national household panel survey. PSID is a national probability sample that began in 1968 as a way to study poverty and income in the US. The original sample contained 4,800 families, and it has continued to grow as the original participants have split off into new households and expanded their families through marriage, childbirth, and adoption. In 1997 and 2017, a refresher sample of US immigrants was added to the sample in an attempt to maintain the national representativeness of PSID. The sample was also reduced in 1997 due to its increasing size. As of 2017, PSID includes over 77,000 individuals from 11,000 families and contains information on as many as six generations of the same families through its genealogical design. Between 1968 and 1977, families were interviewed annually. After 1977 families are interviewed biennially. Response rates for each iteration of the survey is about 95%.

The main interview component of PSID surveys the household head, but there are several supplemental surveys as well. One of these is the Child Development Supplement, which began in 1997 and collected additional data on up to two PSID children per household who were age 12 or under in 1997. Additional waves of data were collected in five-year increments in 2002 and 2007 for children in this cohort who were under the age of 18 at the time of follow up. In 2014, a new Child Development Supplement was launched. This new supplement includes data on all PSID children who were under the age of 18 in 2014. Unlike the 1997 cohort, future waves will include all new children who are born in the intervening five years between data collection.

## Analytic Sample

Data are drawn from the main interview survey as well as both iterations of the Child Development Supplement. One person per family is interviewed in the main interview data, and information can be linked between the main interview data and the Child Development Supplement using the unique family and person identification numbers.

This thesis looks at three distinct groups of children and is thus composed of three analytic samples. The first sample is limited only to families with at least one child captured in the 1997 iteration of the Child Development Supplement ( $N = 2,279$ ). The second sample is limited only to families with at least one child captured in the 1997 iteration of the Child Development Supplement who also have follow up information captured in the 2002 wave of the 1997 Child Development Supplement ( $N = 1,838$ ). The 2007 wave of the 1997 Child Development Supplement is not used as no food security data is collected between 2003 and 2014. The third sample is limited only to families with at least one child captured in the 2014 iteration of the Child Development Supplement ( $N = 2,426$ ). All samples are restricted to children who are at least 4 years of age as the outcome variable of interest is only measured for those who are age 4 and older. The 2014 sample is further restricted to children who are 12 years of age or under in order to align with the age categories captured in the 1997 sample. While PSID is composed of family level units, this thesis uses each individual child contained in the analytic sample as the unit of analysis.

## Variables

### *Outcome Variable*

**Child mental health.** The outcome variable of interest is a measure of child mental health, which is constructed from the anxiousness/depression subscale of the Behavior Problems

Index (BPI). The BPI was originally adapted from the Achenbach Behavior Problems Checklist for the National Longitudinal Survey of Youth (NLSY) as a way to measure child behavior problems, and the same series of 30 questions appears in PSID.

In each wave of the 1997 Child Development Supplement and in the first wave of the 2014 Child Development Supplement, parents were asked whether specific behaviors described by the questions were “not true,” “sometimes true,” or “often true” about their children. Table 1 displays the questions that compose this subscale.

**Table 1. Behavior Problem Index Anxiousness/Depression Subscale Questions**

“He/she is too fearful or anxious”
“He/she is unhappy, sad or depressed”
“He/she has sudden changes in mood or feeling”
“He/she feels or complains that no one loves him/her”
“He/she feels worthless or inferior”

Individual items on the subscale are recoded as a dichotomous variable following the same protocol used in the NLSY79 Child surveys where statements that are “often true” or “sometimes true” are coded as 1 and those that are “not true” are coded as 0 (“Behavior Problems Index”). The total score for the BPI anxiousness/depression subscale is a sum of each of these five items. If responses were missing for one or two of these items, the average of the available scores was used. If three or more responses were missing, the individual was dropped from the analysis. On this scale, a higher score suggests a greater degree of anxiety and depression.

*Main Predictor Variable*

**Household Food Insecurity.** Food security is measured in PSID using the standard U.S. Household Food Security Survey Module developed by the USDA. The main interview household respondent answered a series of 18 questions concerning the availability of food in the

household. The food security raw score is a count of the number of items the respondent affirmed. Using this raw score, a categorical variable was created in alignment with the guidelines created by the USDA. These guidelines are displayed in Table 2.

**Table 2. U.S. Household Food Security Survey Module**

Food Security Category	Number of items affirmatively endorsed
High food security	0
Marginal food security	1-2
Low food security	3-7
Very low food security	8-18

Three different iterations of this predictor variable must be created for each of the three years of interest (1997, 2002, and 2014). For 1997 and 2014, the categorical variables can be computed directly from the food security raw score for each respective year. Questions concerning food security were not asked in 2002, however, so data for this specific year is not available and must be imputed. Research indicates that being food insecure in one year is highly predictive of being food insecure the following year, and food security questions were asked in both 2001 and 2003, so the scores for each of these two years are averaged to obtain a predicted value for 2002 (Gundersen & Ziliak, 2014).

*Mediators<sup>2</sup>*

**Parent Psychological Distress.** Parent psychological distress is captured using the K-6 Non-Specific Psychological Distress Scale. The K-6 scale was created for the redesigned U.S. National Health Interview Survey (NHIS) as a way to distinguish cases of nonspecific distress from non-cases (Kessler, et al., 2002). The 6-item scale focusing on anxiety and depression appears in PSID and asks parents how often they have felt a certain way during the past 4 weeks. The total scale ranges from 0 to 24, and following guidelines recommended by Kessler, et al.

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<sup>2</sup> Testing confirmed that the correlation between each of these three mediators is very low.

(2002), the scale is recoded as a dichotomous variable where a score of 13 or higher is coded as 1, a potential nonspecific psychological distress.

**Interparental Relationship Problems.** Interparental relationship problems are measured using the short version of the Parental Disagreement Scale. This scale contains five items concerning how children are raised, how much money is spent on children, the children's friends, time spent with friends, and use of alcohol/drugs. Responses are recoded on a 0 to 4 scale and range from "often" (4) to "never" (0) a source of disagreement. Following PSID protocol, the score for the Parental Disagreement Scale is the average of these five items. A higher score suggests a greater degree of interparental relationship problems.

**Disrupted Parenting.** Disrupted parenting is captured using the Parental Warmth Scale, which only appears in the 1997 Child Development Supplement.<sup>3</sup> This is a 6-item scale that measures parental warmth through parental behaviors like showing physical affection or playing with children. Following PSID protocol, the scale is constructed as an average score of the six items. In order to be consistent with the other mediators, each individual item on the scale is reverse coded so that activities that occur "every day" are the low score (0) and those that are "not in the past month" are the high score (5). With this reverse coding, a higher score would suggest a lower degree of parental warmth and a higher degree of disrupted parenting.

### *Covariates*

All covariates are drawn from 1997 for families captured in the first iteration of the Child Development Supplement and from 2013 and 2014 for families captured in the second iteration of the Child Development Supplement. Standard demographic, household, and economic variables linked to food insecurity are included. These include the age of the child [in years], the

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<sup>3</sup> Since the Parental Warmth Scale does not appear in the 2014 Child Development Supplement, the disrupted parenting variable is not included in the analysis of the 2014 cohort.

gender of the child [female = 1], a categorical variable distinguishing the race of the child (only in 1997), a continuous variable for the number of children in the household under age 18, a continuous variable for the number of people in the household, the employment status of the parent [currently working = 1], a categorical variable for the educational attainment for both the mother and the father [no high school, some high school, high school diploma/GED, some college, or a college degree], a continuous measure of total household income, an indicator for receipt of food stamps in previous years [yes = 1], and an indicator for low birth weight [5.5 pounds or less = 1].

### **Methodology**

Two different models are employed to test the relationship between food security and child mental health. A panel fixed effects model is used to study the change within individual children between 1997 and 2002 while controlling for time-invariant characteristics. There are likely characteristics within each family that impact the likelihood of being food insecure as well as individual characteristics that can predispose a child to anxiety or depression. This model controls for these individual characteristics, allowing for the net effect of food security on mental health to be observed.<sup>4</sup> Ordered logistic regression is used to examine this question cross-sectionally in both 1997 and 2014. This method accounts for the categorical nature of the dependent variable, but to check the sensitivity of this method, Ordinary Least Squares (OLS) regression is also used. Unlike ordered logistic regression, OLS regression treats the dependent variable as continuous and its categories as equidistant.

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<sup>4</sup> In addition to the panel fixed effects described here, ordered logistic fixed effects are also calculated using the BUC (Blow-Up and Cluster) estimator in Stata and code obtained from a working paper by Baetschmann, Staub, & Winkelmann (2011). While the BUC estimator does not allow clustering by family or robust calculations of standard errors, results are similar to those obtained through panel fixed effects. These results are available upon request.

A series of models are estimated across all methods. In the first iteration, only the main predictor and outcome variables are included. In the second iteration, the mediators are added. In the third, the covariates are included instead of the mediators. In the final iteration, all variables are included.

#### *Panel Fixed Effects*

$$\text{MentalHealth}_{it} = \alpha_i + \beta_1 \text{FoodSecurity}_{it} + \beta_2 \text{Distress}_{it} + \beta_3 \text{Problems}_{it} + \beta_4 \text{Disrupted}_{it} + X\beta_{it} + v_i + \epsilon_{it}$$

In this equation, MentalHealth is the outcome of interest for individual child  $i$  in time  $t$ ,  $\alpha_i$  is the intercept for each individual child,  $\beta_1$  is the coefficient of interest,  $X\beta_i$  is a vector of covariates,  $v_i$  is the portion of the error term that is individual specific, and  $\epsilon_{it}$  is the part of the error term that is random variation.

#### *Ordered Logistic Regression*

$$\text{MentalHealth} = \alpha + \beta_1 \text{FoodSecurity}_y + \beta_2 \text{Distress} + \beta_3 \text{Problems} + \beta_4 \text{Disrupted} + X\beta_{it} + \epsilon_{it}$$

In this equation, MentalHealth is the outcome of interest,  $\alpha$  is the population intercept, FoodSecurity is the measure of food security in year  $y$  (1997 or 2014),  $\beta_1$  is the coefficient of interest,  $X\beta_i$  is a vector of covariates, and  $\epsilon_{it}$  is the error term.

#### *Supplemental Analysis*

In order to test the strength and validity of the results obtained in the fixed effects and ordered logistic regression models, supplemental analysis is conducted. There is evidence to suggest that any affirmative response on the food security scale is indicative of some level of food insecurity, so to test the sensitivity of the results achieved in the main analysis, food insecurity is recoded as a binary variable where one or more affirmative responses is coded as 1 (Bronte-Tinkew, et al., 2007). This sensitivity analysis follows the same analytic plan that is used in the main analysis.

Further sensitivity analysis will exploit the fact that the 2014 Child Development Supplement cohort also contains children between the ages of 13 and 18. These children were dropped from the main analytic sample in order to create consistency with the 1997 cohort that contains only children age 12 and under. The relationship between food insecurity and child mental health is tested cross-sectionally for children between the ages of 13 and 18 in the 2014 Child Development Supplement using ordered logistic regression and the same analytic plan followed in the main analysis.

## CHAPTER FOUR

### RESULTS

#### **Descriptive Statistics**

Table 3 shows descriptive statistics comparing the four food insecurity categories for children included in the 1997 Child Development Supplement. The sample consists of 2,279 children ages 4 through 12. The vast majority of these children (78%) are classified as having high food security (no affirmative responses on the Food Security Survey Module) while nine percent are classified as having marginal food security (1 or 2 affirmative responses), 10% of children are classified as having low food security (3-7 affirmative responses), and three percent of children are classified as having very low food security (8 or more affirmative responses). White children make up nearly half of the sample, but black children and the other minority groups (which make up less than 10% of the entire sample), are disproportionately distributed across the food security categories denoting at least some degree of food insecurity. The mean family income for families with high food security is nearly double that of families experiencing just marginal food security, with the income gap even wider for families experiencing greater degrees of food insecurity.

Table 3. Descriptive Statistics for Key Variables and Covariates by Household Food Security Status in 1997 for Children Ages 4-12

Characteristic	Food Security Status				
	All (n = 2,279)	High (n = 1,786)	Marginal (n = 197)	Low (n = 231)	Very low (n = 65)
<b>Race</b>					
White	.47 (.010)	.53 (.012)	.29*** (.033)	.24*** (.028)	.20*** (.050)
Black	.40 (.010)	.37 (.011)	.61 (.035)	.49*** (.033)	.60*** (.061)
Hispanic	.07 (.005)	.05 (.005)	.07 (.018)	.17*** (.024)	.11* (.039)
Asian or Pacific Islander	.02 (.003)	.02 (.003)	.01 (.007)	.03 (.010)	0 (0)
Mean family income (\$)	47,742.92 (1998.81)	53,901.41 (1221.16)	28,148.40*** (1615.93)	24,467.46*** (1373.04)	20,630.29*** (1699.29)
Female	.49 (.010)	.49 (.012)	.46 (.036)	.51 (.033)	.46 (.062)
Household Size	4.24 (.026)	4.19 (.027)	4.22 (.098)	4.66*** (.101)	4.14 (.168)
Number of children in the Household	2.42 (.022)	2.33 (.024)	2.54*** (.082)	2.91*** (.087)	2.52 (.147)
Household Head is Employed	.86 (.007)	.90 (.007)	.74*** (.031)	.73*** (.029)	.66*** (.059)
<b>Highest Education completed by Head of Household</b>					
No HS education	.05 (.004)	.04 (.005)	.03 (.011)	.12*** (.021)	.08 (.033)
Some HS education	.17 (.008)	.14 (.008)	.26*** (.031)	.26*** (.023)	.31*** (.058)
HS graduate	.34 (.010)	.33 (.011)	.45*** (.036)	.35 (.031)	.32 (.058)
Some college	.21 (.009)	.22 (.010)	.17 (.027)	.20 (.026)	.23 (.053)
College degree	.20 (.008)	.24 (.010)	.05*** (.015)	.04*** (.012)	0*** (0)
<b>Highest Education Completed by Head of Household's Spouse</b>					
No HS education	.04 (.004)	.02 (.004)	.03 (.012)	.11*** (.020)	.05 (.026)
Some HS education	.08 (.006)	.07 (.006)	.09 (.086)	.10* (.020)	.15*** (.045)
HS graduate	.21 (.009)	.23 (.010)	.17* (.027)	.14*** (.023)	.11** (.039)
Some college	.18 (.008)	.20 (.009)	.20 (.029)	.10*** (.019)	.03*** (.022)
College degree	.15 (.007)	.18 (.009)	.06*** (.016)	.03*** (.010)	.03*** (.022)

Table 3. (continued)

Characteristic	Food Security Status				
	All	High	Marginal	Low	Very low
Low birth weight	.39 (.010)	.38 (.011)	.39 (.035)	.43 (.033)	.38 (.061)
Received food stamps in 1996	.21 (.009)	.15 (.009)	.35*** (.034)	.46*** (.033)	.57*** (.062)
Received food stamps in 1997	.17 (.008)	.12 (.008)	.28*** (.032)	.42*** (.032)	.42*** (.062)
Age of Child	8.00 (.055)	7.96 (.062)	7.97 (.190)	8.29* (.170)	8.18 (.331)
Child Mental Health Score	1.57 (.028)	1.49 (.031)	1.72** (.101)	1.86*** (.088)	2.26*** (.191)
Parent Psychological Distress	.03 (.005)	.02 (.004)	.08*** (.025)	.03 (.015)	.11*** (.048)
Interparental Relationship Problems	1.10 (.026)	1.14 (.029)	1.01 (.098)	.90*** (.090)	1.04 (.18)
Disrupted Parenting	.30 (.012)	.26 (.013)	.39*** (.049)	.47*** (.049)	.38* (.084)

Note: Data are drawn from the PSID Child Development Supplement I (1997).  $N = 2,279$ . P-values are obtained using two-sample t-tests. High food security is the reference category.

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ .

On average, children in the sample with greater food security tend to be white, to live in households with higher incomes, and are more likely to have parents who have earned at least a college degree and are employed than children in the sample experiencing some degree of food insecurity. These children who are classified as highly food secure are also much less likely to have received benefits through a government nutrition assistance program in the past year.

Table A1 in the Appendix shows the descriptive statistics comparing the four food insecurity categories for children that were included in the 2014 Child Development Supplement. In this sample, there are 2,426 children between the ages of 4 and 12. Sixty-one percent of children are classified as having high food security, 14% are classified as having marginal food security, 16% as having low food security, and 9% as having very low food security. Like the

1997 sample, children with greater food security are more likely to live in households with higher incomes and have parents who are employed and have earned at least a college degree in comparison to children who are experiencing food insecurity. They are also much less likely to have received benefits through a government nutrition assistance program in the preceding years.

These descriptive statistics for both cohorts suggest that food insecurity is just one piece of the vast economic disadvantage that some of the families included in the sample face.

### **Inferential Analysis**

To examine if food insecurity predicts child mental health, ordered logistic regression and Ordinary Least Squares (OLS) regression was used to look at the relationship cross-sectionally in both 1997 and 2014. Fixed effects modeling was then used to look at this relationship longitudinally between 1997 and 2002.

#### *Cross-sectional Results*

Table 4 presents the results of the cross-sectional analysis of children in the 1997 Child Development Supplement using ordered logistic regression.<sup>5</sup> Greater severity of food insecurity predicts a higher score on the anxiousness/depression subscale, indicating a greater degree of anxiety and depression and worse child mental health. The coefficients for marginal and low food security are relatively similar across all models, with the model predicting mental health scores that are nearly two times worse for children experiencing marginal or low food security. All effects are statistically significant at the 5% level, with the vast majority being significant at the 1% level. The coefficient on very low food security is over twice as large as those of marginal and low food security, suggesting that the severest cases of food insecurity are predictive of significantly poorer mental health. The logistic model predicts mental health scores

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<sup>5</sup> The results of the OLS regression analysis were consistent with the ordered logistic regression results and are presented in Table A2 in the Appendix.

that are nearly four times worse for children experiencing the severest category of food insecurity, an effect that is significant at the 1% level across all models.

Table 4. Ordered Logistic Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 1997

	(I)	(II)	(III)	(IV)
Marginal food security	1.79** (.410)	1.64** (.381)	1.88*** (.444)	1.75** (.417)
Low food security	1.92*** (.327)	1.76*** (.320)	1.87*** (.354)	1.82*** (.346)
Very low food security	4.02*** (1.48)	3.97*** (1.58)	3.60*** (1.22)	3.72*** (1.23)
Pseudo R-squared	.0099	.0183	.0248	.0316
Wald chi2 statistic	32.13	102.25	138.43	194.87

Note: Data are drawn from the PSID Child Development Supplement I (1997). N = 2,279. Models are weighted using the 1997 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress, Interparental Relationship Problems, and Disrupted Parenting. Control variables include age, gender, race, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. Coefficients are reported as odds ratios.

Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators. Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Table 5 presents the ordered logistic regression results for the 2014 Child Development Supplement sample. These results also show a positive relationship between food insecurity and child mental health that increases in magnitude as the degree of food insecurity also increases. This relationship is significant at the 1% level across all categories and specifications in this model. In comparison to the 1997 sample, however, the coefficients are smaller in magnitude despite being similarly statistically significant. Interestingly, when covariates are included in the OLS model, there is not a significant relationship between being categorized as food secure and

the child mental health score, although the relationship is positively significant at the 1% level for the other three categories that experienced some degree of food insecurity.<sup>6</sup>

Table 5. Ordered Logistic Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 2014

	(I)	(II)	(III)	(IV)
Marginal food security	1.58*** (.280)	1.57*** (.267)	1.88*** (.362)	1.88*** (.336)
Low food security	1.95*** (.334)	1.86*** (.317)	2.54*** (.407)	2.42*** (.399)
Very low food security	2.17*** (.547)	2.05*** (.536)	2.77*** (.716)	2.65*** (.694)
Wald chi2 statistic	21.84	1480.72	75.81	1666.06
Pseudo R2	.0091	.0157	.0218	.0289

Note: Data are drawn from the PSID Child Development Supplement II (2014). Some control variables are drawn from the 2013 iteration of the PSID main interview. N = 2,426. Models are weighted using the 2014 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress and Interparental Relationship Problems. Control variables include age, gender, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. Coefficients are reported as odds ratios.

Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables.

Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators.

Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

### *Longitudinal Results*

Table 6 presents the results of the longitudinal analysis of the effect of food insecurity on child mental health between 1997 and 2002 using fixed effects modeling. In reference to children with a high food security status, these results suggest a more moderate effect of food insecurity on poor child mental health. Unlike the cross-sectional results, only for the very low food security category is this effect statistically significant, and it is only at the 10% level.

<sup>6</sup> Table A3 in the Appendix presents the results for OLS regression. Except for the lack of a statistically significant relationship between being classified as food secure and the child mental health score, the results obtained through OLS were otherwise consistent with the ordered logistic regression results.

Table 6. Panel Fixed Effects Results (1997-2002): Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 1997

	(I)	(II)
Constant	1.57*** (.073)	1.49*** (.145)
Marginal food security	.08 (.136)	.06 (.135)
Low food security	.33 (.208)	.33* (.201)
Very low food security	.48* (.267)	.52* (.276)
R-squared	.0309	.0443
F-statistic	1.02	.

Note: Data are drawn from the first two waves of the PSID Child Development Supplement I (1997 & 2002). N=1,838. Models are weighted using the 2002 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress, Interparental Relationship Problems, and Disrupted Parenting. In the case of missing F-statistic, Stata did not report one so as not to be misleading.

Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) includes the mediators.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Most of these models suggest a strong relationship between food insecurity and child mental health, but overall, food insecurity explains very little of the variation in child mental health, even when controlling for parental factors and demographic and socioeconomic characteristics.

### *Supplemental Analysis*

Other studies have suggested that any affirmative response on the Food Security Survey Module suggests some degree of food insecurity. As seen in the main analysis, when food insecurity was recoded as a binary variable with children categorized as being food secure (no affirmative responses) or food insecure (any affirmative response), the children that were food secure are more likely to be white, live in households with a higher income, have parents who are more likely to be employed and to have graduated from college, and are less likely to have received Food Stamps in the preceding year in comparison to children who are classified as

having some degree of food insecurity. Like the main analysis, this supplemental analysis shows a positive and significant relationship at the 1% level between food insecurity and a greater degree of anxiety and depression in children in both the ordered logistic and OLS models (see Tables A4 through A7 in the Appendix). The magnitude of this relationship is attenuated, however, likely due to the fact that the food security categories where some degree of food insecurity was exhibited are collapsed into one.

The 2014 Child Development Supplement also allowed for the analysis of older children between the ages of 13 and 18. The demographic characteristics of these children are generally similar to the demographic characteristics of the younger cohorts.<sup>7</sup> OLS only significantly predicts a higher level of anxiety and depression for the children classified as having very low food security, significant between the 1% and 5% levels across all models (see Table A9). Ordered logistic results are similar, predicting mental health scores that are over two times worse for children experiencing very low food security, significant at the 1% level (see Table A8). For both modeling strategies, the point estimates are smaller than those observed for the younger cohorts.

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<sup>7</sup> These descriptive statistics are available upon request.

## CHAPTER FIVE

### DISCUSSION

This study examined the impact of food insecurity on child mental health, specifically on measures of anxiety and depression in children between the ages of 4 and 12. While previous studies have examined the impact of food insecurity on various child outcomes, such as behavioral problems, academic achievement, and physical health, as well as the impact of food insecurity on adult mental health, very few studies have looked specifically at the impact of food insecurity on the mental health of children. The few studies that have were either very limited in scope (e.g. Weinreb, et al., 2002 looked only at a small sample of homeless families in Massachusetts) or qualitative in nature (e.g. Connell, et al., 2005; Knowles, et al., 2015). This study sought to fill this gap in the literature using panel data and quantitative methods.

Drawing on the framework of the Family Stress Model, which suggests an indirect pathway between economic pressures and child outcomes that is mediated by parental factors, this thesis proposed a direct pathway between the economic pressure of food insecurity and child mental health and examined three hypotheses: (1) food insecurity predicts higher levels of anxiety and depression among children; (2) greater food insecurity predicts greater levels of anxiety and depression; and (3) poor parental mental health further exacerbates this relationship between food insecurity and child mental health.

Consistent with prior research, this study documents the adverse and pervasive impact of food insecurity on child outcomes. Results indicated that experiencing food insecurity does indeed predict higher levels of anxiety and depression among children between the ages of 4 and 12, a result that is consistent with the first hypothesis. Consistent with the second hypothesis, as

the degree of food insecurity worsened, predicted child mental health also worsened. Children who were the most food insecure, those categorized as having very low food security, were predicted to have the highest levels of anxiety and depression while children who were the most food secure were predicted to have the lowest levels of anxiety and depression. This study did not find strong evidence in favor of the third hypothesis; in some cases, measures of psychological distress in parents were associated with increases in child anxiety and depression. In other cases, these measures were associated with decreases in child anxiety and depression.

Previous research suggests that poor parental mental health predicts worsened outcomes for children (e.g. Bronte-Tinkew, et al., 2007; Weinreb, et al., 2002; Whitaker, et al., 2006). The lack of consistency between this finding and the third hypothesis examined in this study is likely a result of the variables that were used to operationalize the concept of parental mental health. Variables indicating psychological distress, relationship problems, and parenting problems do not fully capture mental health and are simply proxies for a concept not otherwise measured in the Child Development Supplement of PSID.

### *Limitations*

Despite the contribution of this study, several limitations do exist. Very few nationally representative datasets contain information that permits the examination of food security and mental health outcomes, and this is particularly true for examining mental health outcomes among children. While PSID contains measures for both constructs, food security was measured in only a few iterations of the biennial survey and was not measured in either the 2002 or 2007 waves of the Child Development Supplement, impeding the ability to examine the longitudinal relationship between food insecurity and child mental health for a longer interval. Further, no food security data was collected prior to 1997, and none was collected between 2003 and 2014.

This makes it impossible to examine if there is a differential impact between persistent food insecurity and what is often termed as sporadic food insecurity (cycling into and out of food insecurity) on child mental health. Some research has suggested that the food security status of a family can vary throughout the course of a single month and that additional episodes of food insecurity are associated with worsened outcomes for children (Gassman-Pines & Schenk-Fontaine, 2019; Johnson & Markowitz, 2017). The lack of consistent food insecurity data makes it impossible to explore this in the current study.

This study would have also been bolstered by longitudinal data for the 2014 cohort of children; unfortunately, the 2019 wave of data for this second cohort of children is not yet available. Future research should take advantage of the new design of the 2014 iteration of the Child Development Supplement as it captures information on all PSID children under the age of 18 and will continue to add all new children that are born to families in the sample, mirroring the design of the National Longitudinal Survey of Youth (NLSY) Child and Young Adult cohort. Assuming that future waves of the Child Development Supplement include food security and child mental health variables, this may make it possible to have a clearer look at the long-term effect of food insecurity on mental health in childhood, as well as the effect of this adverse childhood experience on mental health in adulthood and on other life outcomes.

Operationalizing the mental health status of children is also particularly tricky. The information captured in the anxiety and depression subscale of the BPI is reported by parents, not by the children themselves. Qualitative studies have indicated that parents believe that they can protect their children from the effects of food insecurity, but children report their own awareness of the problem, so child reports of mental health may be theoretically better than assessments that are provided by the parents (Connell, et al., 2005). However, child reports at this age are

difficult to obtain; when Connell, et al. (2005) interviewed children between the ages of 11 and 16, they could only ask the children about the experience of other children that they know rather than their own direct experience with food insecurity. The children in the current study were even younger, as they were all under the age of 13. In this case, parental reports of mental health are likely the best available option.

Notwithstanding these limitations, however, the current study adds to the body of work examining the effects of food insecurity, providing evidence of a substantial link between food insecurity and child anxiety and depression. Future research that addresses some of these limitations could further strengthen this evidence.

### *Policy Implications*

The federal government spends billions of dollars on nutrition assistance programs each year that are designed to help alleviate food insecurity, but the reality is that many families are still experiencing food insecurity and suffering from its pervasive effects, as evidenced by a large body of research, as well as the present study. In addition to suggesting the strong link between food insecurity and poor child mental health, this study indicates that while families experiencing food insecurity are more likely to receive food stamps (now known as SNAP) than families that are food secure, not all families that are eligible and in need of assistance actually receive it. With all of the recent proposed changes to SNAP and the expected effects of these cuts on other programs, like eligibility for the National School Lunch Program (NSLP), this study suggests that access to nutrition assistance programs is of vital importance and should be expanded, rather than decreased.

For example, there is a huge disparity between the number of women and children who are eligible for the WIC program and those who actually participate in it. In 2014, 80% of

eligible infants were receiving benefits, but there was a sharp decline in participation after infancy (Johnson, et al., 2017). At the age of 4, just 26% of eligible children received benefits. Stigma and a lack of understanding of how these nutrition assistance programs (as well as other programs within the broader social safety net) work are often cited as reasons for low participation rates. In the case of WIC, participants must reapply to the program at the end of each certification period, which typically last between 6 months and a year. Continuous enrollment throughout early childhood or an online recertification process could increase access and participation in this program and contribute to improved child outcomes.

A universal meal pilot program in Santa Clara County in California is also designed to increase participation in the NSLP, which provides free and reduced-price lunch and breakfast to students who fall below 185% of the federal poverty level. Of those students who are currently eligible for the NSLP in Santa Clara County, only about 68% participate in the lunch program and just 35% participate in the breakfast portion of the program (Bradshaw, 2020). Starting in the fall of 2020 and continuing through the spring of 2024, free breakfast and lunch will be provided for all students who attend schools where at least 70% of the student body is eligible to receive free and reduced-price meals. The hope is that this pilot will remove some of the barriers in place, including stigma and difficulties in accessing the program, that prevent students from participating in a county where an estimated one-third of all children face some degree of food insecurity (Bradshaw, 2020).

While school is an excellent place to start, there is great evidence to the importance of continuing and expanding the Summer Electronic Benefit Transfer for Children (SEBTC) program to reduce the meal gap that exists during the summer when students are not in school and do not have access to the NSLP. SEBTC piloted between 2011 and 2013 in ten states, and it

was found to reduce the prevalence of food insecurity by up to 30% while improving nutrition (Collins, et al., 2015). Instead of being expanded, however, this program is actually in jeopardy of being eliminated with the proposed cuts to the USDA budget.

There is evidence that some of these nutrition assistance programs have very positive impacts on reducing the prevalence of food insecurity and lifting families out of poverty, but there is also evidence that they do not do enough (Ratcliffe & McKernan, 2010). SNAP benefits do not cover the full cost of a meal, and many families are left scrambling at the end of the month when their benefits run out, an experience that increases both worry and uncertainty in addition to actual food insufficiency (Waxman, et al., 2018; Gassman-Pines & Schenck-Fontaine, 2019). Proposals to improve the program include increasing the purchasing power of benefits, addressing the geographic variation in prices with cost of living adjustments, revising benefits to better address the norms of food consumption, and disbursing benefits more frequently (Ziliak, 2016; Gassman-Pines & Schenck-Fontaine, 2019).

It is important to note that food insecurity is intertwined with a myriad of other problems, many of which are tied to resource scarcity, but some of which are not. Regardless, this study indicates that mental health should be an important consideration when evaluating the impact of resource scarcity, especially on children. Nutrition is of vital importance for early development and for sustaining a healthy and active lifestyle, and this research indicates that the mental health of children, like their parents, is greatly affected by inadequate access to food. As hard as parents may try, the research suggests that shielding children from all of the pervasive impacts of food insecurity is incredibly difficult, if not impossible.

APPENDIX

SUPPLEMENTARY TABLES

Table A1. Descriptive Statistics for Key Variables and Covariates by Household Food Security Status in 2014 for Children Ages 4-12

Characteristic	Food Security Status				
	All (n = 2,426)	High (n = 1,476)	Marginal (n = 343)	Low (n = 396)	Very low (n = 211)
Mean family income (\$)	71,052.67 (1935.73)	91,091.11 (2976.26)	43,817.83*** (2072.51)	38,097.29*** (1498.21)	37,001.25*** (2937.27)
Household Size	4.35 (.027)	4.29 (.033)	4.48** (.078)	4.35 (.067)	4.55*** (.121)
Number of children in the Household	2.57 (.025)	2.42 (.029)	2.79*** (.071)	2.70*** (.06)	2.99*** (.109)
Household Head is Employed	.78 (.008)	.86 (.009)	.72*** (.024)	.63*** (.024)	.65*** (.033)
Highest Education completed by Head of Household					
No HS education	.01 (.002)	.01 (.002)	.01 (.006)	.02* (.007)	.01 (.008)
Some HS education	.16 (.007)	.11 (.008)	.23*** (.023)	.25*** (.021)	.25*** (.032)
HS graduate	.27 (.009)	.25 (.011)	.32*** (.025)	.29* (.023)	.31** (.031)
Some college	.28 (.009)	.26 (.011)	.27 (.024)	.37*** (.024)	.27 (.031)
College graduate or beyond	.27 (.009)	.37 (.149)	.15*** (.019)	.07*** (.013)	.12*** (.023)
Highest Education Completed by Head of Household's Spouse					
No HS education	.01 (.002)	.01 (.002)	.01 (.006)	.00 (.003)	.00 (.005)
Some HS education	.05 (.004)	.02 (.004)	.06*** (.012)	.09*** (.015)	.12*** (.023)
HS graduate	.12 (.007)	.11 (.008)	.15* (.019)	.15** (.018)	.11 (.022)
Some college	.21 (.008)	.23 (.011)	.18** (.021)	.18** (.020)	.11*** (.022)
College graduate or beyond	.27 (.009)	.38 (.013)	.14*** (.019)	.08*** (.013)	.08*** (.018)
Low birth weight	.12 (.007)	.12 (.009)	.16** (.021)	.13 (.018)	.09 (.021)

Table A1. (continued)

Characteristic	Food Security Status				
	All	High	Marginal	Low	Very Low
Received food stamps in 2011 and/or 2012	.35 (.010)	.20 (.011)	.52*** (.027)	.57*** (.026)	.71*** (.032)
Age of Child	7.83 (.051)	7.73 (.065)	7.97 (.137)	7.93 (.130)	8.09** (.179)
Child Mental Health Score	1.09 (.026)	.93 (.030)	1.13*** (.067)	1.31*** (.067)	1.79*** (.107)
Parent Psychological Distress	.03 (.003)	.01 (.003)	.02 (.007)	.03*** (.009)	.12*** (.022)
Interparental Relationship Problems	1.51 (.024)	1.70 (.027)	1.25*** (.071)	1.25*** (.066)	1.10*** (.092)

Note: Data are drawn from the PSID Child Development Supplement II (2014). Some demographic information is drawn from the 2013 iteration of the main PSID interview.  $N = 2,426$ . P-values are obtained using two-sample t-tests. High food security is the reference category.

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$ .

Table A2. OLS Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 1997

	(I)	(II)	(III)	(IV)
Constant	1.48*** (.044)	1.59*** (.141)	1.18*** (.366)	1.26*** (.404)
Marginal food security	.46*** (.174)	.40** (.172)	.48*** (.162)	.45*** (.161)
Low food security	.47*** (.141)	.40*** (.146)	.45*** (.139)	.44*** (.140)
Very low food security	1.09*** (.293)	1.06*** (.306)	1.01*** (.255)	1.03*** (.261)
R-squared	.0328	.0608	.0862	.1070
F-statistic	9.70	6.63	4.83	5.06

Note: Data are drawn from the PSID Child Development Supplement I (1997).  $N = 2,279$ . Models are weighted using the 1997 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress, Interparental Relationship Problems, and Disrupted Parenting. Control variables include age, gender, race, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators. Specification (IV) includes all variables.

\*  $p < .10$ , \*\*  $p < .05$ , \*\*\*  $p < .01$

Table A3. OLS Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 2014

	(I)	(II)	(III)	(IV)
Constant	.98*** (.045)	.89*** (.084)	-.15 (.478)	-.45 (.503)
Marginal food security	.32** (.142)	.32** (.134)	.43*** (.147)	.42*** (.135)
Low food security	.49*** (.127)	.46*** (.127)	.65*** (.119)	.62*** (.122)
Very low food security	.63*** (.184)	.59*** (.193)	.75*** (.190)	.73*** (.192)
R-squared	.0298	.0437	.0677	.0844
F-statistic	7.57	.	4.40	.

Note: Data are drawn from the PSID Child Development Supplement II (2014). Some control variables are drawn from the 2013 iteration of the PSID main interview. N = 2,426. Models are weighted using the 2014 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress and Interparental Relationship Problems. Control variables include age, gender, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. In the case of missing F-statistics, Stata did not report one so as not to be misleading. Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators. Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Table A4. Ordered Logistic Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 1997 with Food Security Status Coded as a Binary Variable

	(I)	(II)	(III)	(IV)
Food insecure	2.10*** (.289)	1.94*** (.284)	2.06*** (.307)	1.99*** (.301)
Pseudo R-squared	.0084	.0166	.0237	.0303
Wald chi2 statistic	28.94	97.37	114.99	178.32

Note: Data are drawn from the PSID Child Development Supplement I (1997). N = 2,279. Models are weighted using the 1997 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress, Interparental Relationship Problems, and Disrupted Parenting. Control variables include age, gender, race, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. Coefficients are reported as odds ratios.

Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators. Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Table A5. OLS Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 1997 with Food Security Status Coded as a Binary Variable

	(I)	(II)	(III)	(IV)
Constant	1.48*** (.044)	1.58*** (.142)	1.15*** (.365)	1.21*** (.402)
Food insecure	.56*** (.111)	.50*** (.114)	.55*** (.107)	.53*** (.108)
R-squared	.0273	.0549	.0818	.1021
F-statistic	25.63	7.24	4.65	5.00

Note: Data are drawn from the PSID Child Development Supplement I (1997). N = 2,279. Models are weighted using the 1997 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress, Interparental Relationship Problems, and Disrupted Parenting. Control variables include age, gender, race, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators. Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Table A6. Ordered Logistic Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 2014 with Food Security Status Coded as a Binary Variable

	(I)	(II)	(III)	(IV)
Food insecure	1.85*** (.242)	1.78*** (.232)	2.29*** (.312)	2.22*** (.296)
Pseudo R-squared	.0085	.0153	.0211	.0284
Wald chi2 statistic	21.94	1487.77	70.57	1690.98

Note: Note: Data are drawn from the PSID Child Development Supplement II (2014). Some control variables are drawn from the 2013 iteration of the PSID main interview. N = 2,426. Models are weighted using the 2014 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress and Interparental Relationship Problems. Control variables include age, gender, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. Coefficients are reported as odds ratios.

Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators. Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Appendix Table A7. OLS Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 4-12 in 2014 with Food Security Status Coded as a Binary Variable

	(I)	(II)	(III)	(IV)
Constant	.98*** (.045)	.91*** (.083)	-.42 (.495)	-.14 (.470)
Food insecure	.46*** (.098)	.44*** (.097)	.56*** (.098)	.58*** (101)
R-squared	.0273	.0417	.0821	.0647
F-statistic	22.55	.	.	4.53

Note: Data are drawn from the PSID Child Development Supplement II (2014). Some control variables are drawn from the 2013 iteration of the PSID main interview. N = 2,426. Models are weighted using the 2014 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress and Interparental Relationship Problems. Control variables include age, gender, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. In the case of missing F-statistics, Stata did not report one so as not to be misleading. Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables. Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators. Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Table A8. Ordered Logistic Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 13-18 in 2014

	(I)	(II)	(III)	(IV)
Marginal food security	1.06 (.289)	.97 (.268)	1.08 (.298)	1.01 (.280)
Low food security	1.63** (.358)	1.33 (.333)	1.73** (.423)	1.49 (.400)
Very low food security	2.28*** (.695)	2.04** (.584)	2.26*** (.606)	2.03*** (.527)
Pseudo R-squared	.0071	.0182	.0170	.0295
Wald chi2 statistic	10.51	41.63	84.64	126.91

Note: Data are drawn from the PSID Child Development Supplement II (2014). Some control variables are drawn from the 2013 iteration of the PSID main interview. N = 999. Models are weighted using the 2014 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress and Interparental Relationship Problems. Control variables include age, gender, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt. Coefficients are reported as odds ratios.

Specification (I) includes only the independent (food security status) and dependent (child mental health score) variables.

Specification (II) also includes the mediators. Specification (III) includes all control variables but not the mediators.

Specification (IV) includes all variables.

\* p<.10, \*\* p<.05, \*\*\* p<.01

Appendix Table A9. OLS Regression Results: Child Mental Health Outcomes by Household Food Security Status for Children Ages 13-18 in 2014

	(I)	(II)	(III)	(IV)
Constant	1.20*** (.076)	1.05*** (.120)	1.37 (.974)	1.85* (.971)
Marginal food security	-.002 (.210)	-.07 (.206)	-.02 (.209)	.04 (.218)
Low food security	.325 (.199)	.19 (.227)	.27 (.219)	.36* (.202)
Very low food security	.69*** (.268)	.61** (.261)	.56** (.240)	.67*** (.247)
R-squared	.0204	.0518	.0835	.0468
F-statistic	2.83	5.76	16.81	30.14

Note: Data are drawn from the PSID Child Development Supplement II (2014). Some control variables are drawn from the 2013 iteration of the PSID main interview. N = 999. Models are weighted using the 2014 child probability weight provided by PSID, and robust standard errors are clustered by family per PSID recommendation. Mediators include Parent Psychological Distress and Interparental Relationship Problems. Control variables include age, gender, number of children under 18 in the household, household size, parental education, parental employment status, low birth weight, and food stamp receipt.

\* p<.10, \*\* p<.05, \*\*\* p<.01

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