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Food Insecurity And Physical And Mental Health Of Elementary School Children In A Rural, Appalachian Mississippi Community

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FOOD INSECURITY AND PHYSICAL AND MENTAL HEALTH OF ELEMENTARY SCHOOL CHILDREN IN A RURAL, APPALACHIAN MISSISSIPPI COMMUNITY

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ABSTRACT

Household food insecurity has been associated with poor physical health and behavioral and psychological problems in children. This study examined differences in parent/caregiver-perceived child health and parent/caregiver-reported behavioral and psychological problems by food security status of elementary school children (Kindergarten through 6th grade) living in rural, Appalachian Mississippi. This study used a cross-sectional survey of elementary school parents/caregivers recruited at three elementary schools in an economically-distressed Appalachian MS county. Data were analyzed using IBM SPSS (versions 23, 2015) to assess for differences in HLTH (t-test), BEHAV (Chi Square), and PSYCH (Chi Square) by household food security status. The relationship of HFSS to HLTH, BEHAV, and PSYCH (Kendall's tau_b) was also assessed. Parent/caregiver participants (n=467/1144, 41% response rate) were 34±8 years. Tables 6 and 7 describe participant characteristics. Participants were predominately female (n=425/461, 92%), White (n=264/465, 56.8%), married (n= 243/453, 53.6%) and educated with some college or higher (n=256/451, 55.5%). Regarding food security status, 72.6% of participants were food secure, and 17.4% of participants were food insecure. Parent/caregiver- perceived child health was significantly higher in those living in food secure (4.1 ± 0.9), compared to food insecure households (3.8 ± 0.9) (p=.011). Those living in fully food secure households had significantly higher perceived general health (4.1 ± 0.9), compared

to those living in not fully food secure households (3.9 ± 0.8) (p=.003). As food security worsened, health worsened (r= -.096, p=.042). A greater proportion of children living in food insecure households, compared to food secure households had parent/caretaker reported behavioral problems (p=.009). A greater proportion of children living in not fully food secure, compared to fully food secure households had parent/caretaker reported behavioral problems (p=.012). There were no differences between psychological problems and food secure, compared to food insecure households (p=.676). No significant differences were observed between parent/guardian reported psychological problems and those living in fully food secure, compared to not fully food secure households (p= .551). Household food security status was significantly correlated with behavioral problems (tau_b = -0.126, p=.004), but not psychological problems (tau_b = -0.032, p=.472). Exploring nutrition interventions in schools and communities that help to alleviate household food insecurity is warranted.

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CHAPTER I

INTRODUCTION

In recent years, food insecurity has gained a great deal of attention across disciplines. Food security is defined as "access by all people at all times to enough food for an active healthy, life" (Anderson, 1990, pp. 1575-1576). Food insecure households have limited and uncertain availability of nutritionally adequate and safe foods and uncertain ability to acquire them. (Anderson, 1990, Coleman-Jensen, Gregory, Singh 2016). The 2016 estimates for the United States showed that 12.3% of U.S. households were food insecure at some point in time during 2016 (Coleman-Jensen, Gregory, Singh 2017). Of all households with children under the age of 18, 83.5% were food secure at some time during the year 2016, and 16.5% of households with children were food insecure at some time during the year 2016 (Coleman-Jensen et al., 2017). In Mississippi, 18.7% of households experienced food insecurity with 6.9% of households experiencing very low food insecurity (Coleman-Jensen et al, 2017).

Starvation, malnutrition, and malnutrition-related diseases and conditions characterize the obvious impacts of food insecurity. However, implications of food insecurity extend far beyond these nutrition outcomes. Perceived consequences of low food security among parents and children include trade-offs, compromised mental health, and compromised child well-being (Chilton, Cutts, Ettinger de Cuba, Knowles, and Rainowich, 2016). Children that are living in poverty display poor cognitive outcomes, compromised school performance, and a higher risk

for antisocial behaviors and mental disorders (Yoshikawa, Aber, and Beardslee, 2012). Previous research focused on children has shown positive associations between food insecurity and poor mental and physical health. Poor health, psychosocial problems, frequent stomachaches and headaches, increased odds of hospitalization, increased chronic illness, and higher levels of iron deficiency with anemia have been reported in children living food insecure households (Gunderson and Kreider, 2009).

The U.S. Department of Health and Human Services has issued a call to work toward ending food insecurity and mental disorders in youth by the year 2020 (U.S. Department of Health and Human Services, 2015). Identifying the links between food security status and health, both physical and mental, is imperative to establishing interventions to address and resolve both food insecurity and poor health. This study examined differences in parent/caregiver-perceived child health and parent/caregiver-reported behavioral and psychological problems by food security status of elementary school children (Kindergarten through 6th grade) living in rural, Appalachian Mississippi. Table 1 summarizes the research questions and hypotheses for this study.

Table 1

Research Questions and Hypotheses

Research Question	Null Hypothesis
What are the differences in parent/caregiver perceived physical health problems in elementary school children living in food secure, compared to food insecure, households?	There are no differences in parent/caregiver reported physical health problems in elementary school children living in food secure, compared to insecure, households.

What are the differences in parent/caregiver perceived physical health problems in elementary school children living in fully food secure, compared to not fully food secure, households?	There are no differences in parent/caregiver reported physical health problems in elementary school children living in fully food secure, compared to not food secure, households.
What are the differences in parent/caregiver reported behavior problems in elementary school children living in food secure, compared to food insecure, households?	There are no differences in parent/caregiver reported behavioral problems in elementary school children living in food secure, compared to food insecure, households.
What are the differences in parent/caregiver reported behavior problems in elementary school children living in fully food secure, compared to not fully food secure, households?	There are no differences in parent/caregiver reported behavioral problems in elementary school children living in fully food secure, compared to not fully food secure, households.
What are the differences in parent/caregiver reported psychological problems in elementary school children living in food secure, compared to food insecure, households?	There are no differences in parent/caregiver reported psychological problems in elementary school children living in food secure, compared to food insecure, households.
What are the differences in parent/caregiver reported psychological problems in elementary school children living in fully food secure, compared to not fully food	There are no differences in parent/caregiver reported psychological problems in elementary school children living in fully food secure, compared to not fully secure,

secure, households?	households.
What are the associations between household food security status and behavior, physical health, and psychological problems in elementary school children?	There are no associations between household food security status and behavior, health, and psychological problems in elementary school children.

CHAPTER II

REVIEW OF LITERATURE

Purpose

This study examined differences in parent/caregiver-perceived child health and parent/caregiver-reported behavioral and psychological problems by food security status of elementary school children (Kindergarten through 6th grade) living in rural, Appalachian Mississippi.

In Mississippi, 18.7% of households were food insecure at some time in 2016 (Coleman-Jensen et al., 2016). Food insecurity in children is associated with a broad spectrum of both nutrition and non-nutrition-related outcomes including poor psychological and cognitive development, negative academic outcomes, increased health and disease risks, and inadequate intake of nutrients (Holben and Bergen-Marshall, 2017). Children in food insufficient households have lower general health status and more negative symptoms than those in food sufficient households (Weinreb et al., 2002; Alaimo, Olson, Frongillo, 2001). In children aged 12 through 17 years, household food insecurity is associated with lower psychosocial function and lower total health-related quality of life (Weinreb et al., 2002; Alaimo et al., 2001; Alaimo, Olson, Frongillo, 2002). Additionally, food insufficiency and hunger have been associated with poor mental health outcomes and academic difficulties among school-aged children (Weinreb et al., 2002; Alaimo et al., 2001; Alaimo et al., 2002). This review of literature discusses household food insecurity, general health and psychological health among children, and the relationship of

those factors.

The Problem

In 2016, among U.S. households with children under the age of 18, 8 percent (30.1 million households) demonstrated food insecurity in both children and adults; comparatively, 8.5 percent of households showed that only adults were food insecure (Coleman-Jensen et al., 2017). Parents often attempt to protect their children from the effects of food insecurity, which has the potential to damage the food environment in a variety of ways such as decreased frequency of family meals and decreased fruit and vegetable intake. (Bauer, Berge, Hearst, Neumark-Sztainer, 2012; Fram et al., 2011; Chilton et al., 2016). By working extra hours to increase household income, parental work-related stress can produce confounding effects associated with the household food environment. Caregiver- mediated effects due to food insecurity could also be linked to the alteration of the food environment.

Parental employment status and work-life stress affects the family food environment, and mothers and fathers have reported compromised characteristics, such as decreased family meal time, decreased encouragement of healthful eating, decreased fruit and vegetable consumption, and increased frequency of fast food intake (Bauer et al., 2012). Work-life stress among both parents has been associated with fewer family meals per week, less fruit and vegetable consumption, and less encouragement of healthy eating habits of their children (Bauer et al., 2012).

Children's experiences with food insecurity have the potential to deeply impact development through childhood. The confounding effects of poverty among children extends into compromised hippocampal and amygdala development, which significantly impacts stressful event and emotional processing ability (Baab et al., 2013). With the urgent nature of

household food insecurity, behavior problems, and mental disorders among youth in the United States, the U.S. Department of Health and Human Services has issued a call to improve mental health and reduce household food insecurity by the year 2020 (U.S. Department of Health and Human Services, 2015). Understanding the detrimental impacts of food insecurity and its association with childhood developmental and behavioral problems presents a possible avenue to identify interventions that address both food insecurity and behavioral problems.

Food Insecurity in the United States

To understand the link between food insecurity, developmental problems, and behavior problems, the many facets of food security (prevalence, demographics, geographic location) must be understood. Since 1995, the U.S. Department of Agriculture, in collaboration with the U.S. Census Bureau, has used an annual food security survey conducted by the U.S. Census Bureau to collect information on food access, food adequacy, food spending, and food source assistance for U.S. households. In a broad sense, food security is defined as "access by all people at all times to enough food for an active, healthy life" (Anderson, 1990; Coleman-Jensen et al., 2016). Of all U.S. households, 87.7% were food secure in 2016, compared to the 87.3% food secure households in 2015 (Coleman-Jensen et al., 2016) and 86.0% food secure households in 2014 (Coleman-Jensen, Gregory, Singh, 2014). While these statistics demonstrate a trend for improvement of food security status in the United States, food insecurity continues at unacceptable rates and is greater than the goals of Healthy People 2020 (U.S. Department of Health and Human Services, 2015). Food insecurity, a household-level economic and social condition of limited or uncertain access to adequate food was documented to be substantially higher in households with incomes that meet and/or fall below the Federal poverty line. Additionally, food insecure households can be further classified into two categories: 1)

households with low food security; and 2) households with very low food security. A household with low food security is characterized by insufficient money or resources for food, but it often deflects significant disturbances in actual food intake by consuming only a few basic foods. However, households with very low food security would be characterized by such a severe lack of resources for food that one or more household members would experience a substantial disruption and reduction in food intake. The food security survey characterizes very low food insecurity in households without children as reporting six or more food insecure conditions and households with children as reporting eight or more food insecure conditions. In 2016, 6.1 million households nationwide reported these specific conditions: 1) 98% worried that their food supply would run out before they were able to get money to buy more food; 2) 97% reported that the food they purchased did not last and they did not have enough to purchase more; 3) 95% stated that they were unable to afford balanced meals; 4) 97% disclosed that an adult cut the size of their meals because there was not enough money for food; and 5) 33% reported that an adult did not eat for an entire day because there was not enough money for food (Coleman-Jensen et al., 2016). Differences in food insecurity exist across demographic and geographic groups, but food insecurity and income are strongly correlated.

While 38.3% of households with income below the poverty line reported food insecurity, only households with income 185% above the poverty line reported food insecurity (Coleman-Jensen et al., 2016). While annual income can be identified as a strong contributing factor to food security status, it is important to note that significant differences in food security status were found across varying groups. In 2016, food insecurity rates were higher than the national average for households with incomes near or below the federal poverty line, households with children headed by single women or men, women and men living alone, and African American-

and Hispanic-headed households (Coleman-Jensen et al., 2017). While the common thread of food insecurity exists between all of these groups, noting the differences in household characteristics emerges as a crucial factor in developing and implementing population-specific interventions. Along the same line, region-specific characteristics were found to demonstrate differences in food security across the United States. The prevalence of food insecurity was highest in households located in rural (nonmetropolitan) areas (15%) and in principal cities within metropolitan areas (14.2%). It was lower in suburbs, exurbs, and other metropolitan areas outside of principal cities (9.5%). Regionally, food insecurity was highest in the South (13.5%), followed by the Midwest (12.2%), the West (11.5%), and the Northeast (10.8%) (Coleman-Jensen et al., 2016). Figure 1 (USDA ERS, 2016) provides a visual representation of regional food security status in the United States.

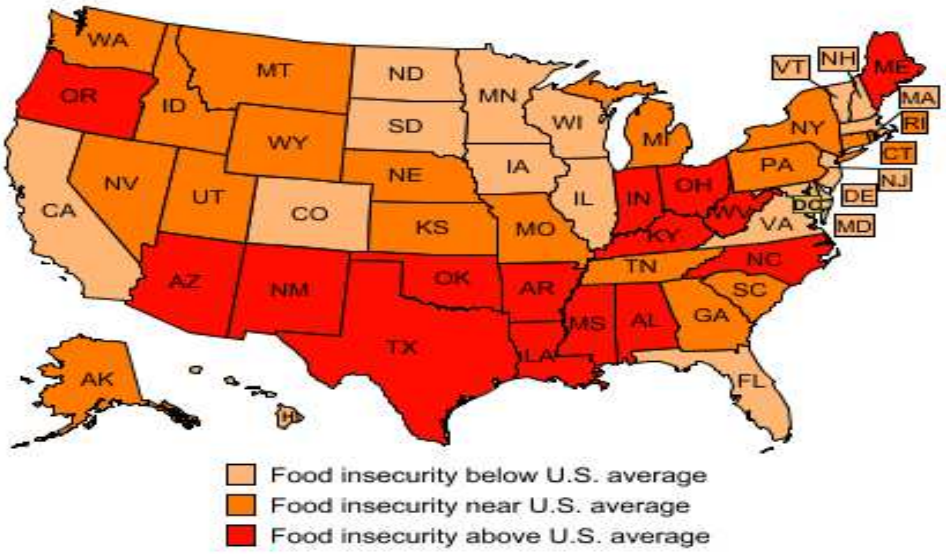

Figure 1 *Regional Food Security Status in the US* (USDA ERS, 2016)

A primary aspect of household food security status is money spent on food. Food spending is measured in two ways in the current population survey. First, weekly spending per person per household is measured. Second, food spending is compared to the U.S. Department of Agriculture's Thrifty Food Plan that represents a national standard for a low-cost, nutritious diet that meets dietary standards for people in specific age and gender categories (U.S. Department of Agriculture, 2015). For the first half of 2017, estimated food cost for the typical household (family of 4: couple, 20-50 years and children, 6-8 and 9-11 years) per week was $173.20 (Coleman-Jensen et al., 2017).

To bridge the gap between low income and food spending, a variety of programs have been developed to aid households in having adequate food supply. The U.S. Department of Agriculture's Food and Nutrition Service provides 15 food and nutrition assistance programs. Table 2 lists the three largest programs and provides information about each.

Table 2

Food and Nutrition Assistance Programs in United States

Nutrition Assistance Program	Purpose	US Participation in 2016	Website
Supplemental Nutrition Assistance Program (SNAP)	To offer nutrition assistance to eligible, low-income individuals and families and provide economic benefits to communities	44.2 million	https://www.fns.usda.gov/snap/supplemental-nutrition-assistance-program-snap
National School Lunch Program (NSLP)	To provide nutritionally balanced, low-cost lunches to children each school day	31.1 million	https://www.fns.usda.gov/nslp/national-school-lunch-program-nslp
Special Supplemental Program for Women, Infants, and Children (WIC)	To provide federal grants to States for supplemental foods, health care referrals, and nutrition education for low-income, pregnant, breastfeeding, and non-breastfeeding postpartum women, and to infants and children up to age five who may be at nutritional risk	7.7million	https://fns.usda.gov/wic/women-infants-and-children-wic

In 2016, 44.2 million people, or 13.7% of Americans, per month were served by SNAP (USDA, 2016). The effectiveness of programs, such as SNAP, has often been questioned, but evidence has shown improved food security status in households receiving SNAP benefits (Dean, Nalty, Sharkey, 2013). Food-spending patterns of SNAP households differ from those of non-SNAP households in that SNAP households spend less overall income on food, and grocery store spending accounts for a larger share of food spending than non-SNAP households (Tiehen, Newman, Kirlin, 2017). Differences also exist among SNAP households with and without children and with and without a married head of household. In SNAP households with children, food spending is lower than in SNAP households without a married head (Tiehen et al., 2017). The findings of a Texas study which examined child-hunger and SNAP participation revealed that child hunger was reduced in households that utilized SNAP benefits (Dean et al., 2013). SNAP benefits were found to contribute to 80% of the food-at-home (grocery store) spending among SNAP households with income 50% below the Federal poverty guidelines (Tiehen et al., 2017). The use of the programs provides insight into how food insecure households across the nation use food and nutrition assistance to meet the needs of their households.

Food Insecurity, Mental Health, and Behavior

Research has identified low income as the primary cause of food insecurity (Gundersen, Kreider, Pepper, 2011). Low average wages, low participation in food and nutrition assistance programs, residential instability, high tax burdens, high housing costs, and high unemployment rates have been documented as increasing the probability of food insecurity in households with children (Bartfeld and Dunifon, 2006). Another study that assessed the mutual existence of poverty and food insecurity found that as the income-to-needs ratio decreases, food insecurity

increases (Wright, Kaushal, Waldfogel, Garfinkel, 2014). Behavioral studies have demonstrated a distinct association between poverty and poor childhood developmental outcomes, including unsupportive parenting, lack of caregiver education, poor nutrition, and increased levels of stressful and traumatic life events (Shonkoff, Garner, Seigel, 2012). For children, the confounding effects of living in low income and food insecure households have been linked to compromised developmental outcomes and both internalizing and externalizing behavioral problems (Liu, Raine, Venables, Mednick, 2004). This link can occur through multiple avenues, including parent-mediated factors.

Although parents and children may coexist in the same food insecure environment, research documents a complex relationship of the ways that parents and children independently perceive and experience the effects of food insecurity. Some studies have found that parental stress related to work, poverty, and food insecurity can have negative effects within households. Parental stress in food secure environments has been shown to negatively affect the household food environment and children's eating habits. For instance, there is a negative correlation between cohabitating parents who both experience work-life stress and frequency of family meals per week, fruit and vegetable consumption, and encouragement of healthy eating habits of children (Bauer et al., 2012). Parental stress may impact children's experiences with food insecurity in deeper ways than the surface of the food environment. Research has revealed a correlation between mental illness, food insecurity, stress, and social isolation, where higher levels of food insecurity and lower levels of socioeconomic status have been positively correlated with increased risk of mental disorders in adolescents (McLaughlin et al., 2012). Individuals living in food insecure environments may perceive themselves as experiencing a greater level of stress due to economic hardship and lack of resources (Martin, Maddocks, Chen,

Gilman, Colman, 2016). Therefore, they may be at a greater risk of developing or experiencing mental illness. Furthermore, the increased severity of household food insecurity has been shown to have a positive correlation with mental disorders among U.S. children and adolescents (Burke, Martini, Cayur, Hartline-Grafton, Meade, 2016).

A complex aspect of this parent-child dynamic includes the ways in which parents perceive children's experiences with food insecurity. Although parents may work to shield children from the implications of food insecurity, children may still be aware of the lack of food (Connell, Lofton, Yadrick, Rehner, 2005). Parents are not always aware of their children's experiences with food insecurity, which has the potential to extend into detrimental emotional and physical effects, communication problems, domestic violence, geographical isolation, job loss, and developmental challenges (Blake et al., 2011). Children's experiences with food insecurity exists in three domains, including cognitive awareness, emotional awareness, and physical awareness (Fram et al., 2011; Bernal, Frongillo, Herrera, Rivera, 2012). Cognitive awareness refers to an active knowledge that there is not enough food for the households and includes an understanding of the different ways family food is managed. Emotional awareness refers to emotions, such as fear, worry, sadness, or anger, are present in relation to food insecurity. Physical awareness refers to physical feelings of hunger, weakness, or pain related to lack of food. In addition to being aware of food insecurity, children may attempt to take responsibility for attempting to reduce food insecurity through participating in adult strategies, initiating strategies, and generating resources (Fram et al., 2011; Bernal et al., 2012). This means that children may participate in adult methods of managing food, may initiate ways to stretch food and food resources, and may generate resources to acquire additional food and food resources for purchasing food (Fram et al., 2011; Bernal et al., 2012).

Parent or caregiver-mediated factors, such as stress or depression, resulting from low household income and food insecurity have not been studied extensively, particularly in relation to behavioral disturbances. However, some studies have begun to investigate this avenue more in-depth. Research has demonstrated that "toxic stress" among children is an effect of severe economic hardship (Shonkoff et al., 2012). Per Shonkoff (2012), "toxic stress" is characterized by the stress of economic hardship and deprivation in combination with related adversities, such as neglect, violence, abuse, and household instability. One study examining the perceived consequences of low food security among parents experiencing depressive symptoms and their children found three primary effects of low household food security (Chilton et al., 2016). Trade-offs, using funds to pay for necessities other than food, compromised mental health, and compromised child well-being were reported as negative effects of low food security (Chilton et al, 2016). Furthermore, parents reported sadness, depression, and behavioral problems among their children (Chilton et al., 2016). These findings suggest a strong link between child health and behavior with food insecurity, but further studies are needed.

As discussed earlier, children's stress in relation to food insecurity and related factors has profound effects on child mental health (Shonkoff et al., 2012; Chilton et al., 2016). Neuroimaging research provides further evidence by showing that brain development, and, therefore, mental health is also compromised. There is limited research on brain development of impoverished children, but a small study documented altered brain development in preschool children who participated in an annual neuroimaging assessment from ages 3 to 6 years (Baab et al., 2013). White matter, cortical gray matter, hippocampus, and amygdala volumes were measured along with the observational measurement of hostility and caregiver support (Baab et

al., 2013). The Preschool Age Psychiatric Assessment measured stress often associated with the exposure to poverty and revealed that impoverished children showed lower volumes of white matter, cortical gray matter, hippocampus, and amygdala volumes. Findings showed that caregiver support, hostility, and life stress were specific to hippocampal development, further suggesting that poverty and life stressors associated with poverty significantly impact brain development (Baab et al., 2013). The amygdala and hippocampus are heavily involved in regulating stress and processing emotions, which suggests the link between altered brain development and behavior problems as a result of poverty-related experiences. Furthermore, this study determined that stressful life events associated with poverty were associated with smaller left side hippocampal volume, which is a controlling factor of emotion (Baab et al., 2013).

While direct causality cannot be determined from these studies, further literature reveals a strong association between food security status and behavioral disorders. A two-year community-based study found a higher prevalence of internalizing and externalizing behavioral problems in children who lived in households meeting the U.S. federal poverty standard, rather than non-poor households, and in children who lived in food insecure households, compared to food insecure households (Slopen, Fitzmaurice, Williams, Gilman, 2010). This study further revealed that children from persistently food insecure homes were 1.47 times more likely to have internalizing problems, such as depression, anxiety, and withdrawal. Children whose status moved from food secure to food insecure were more likely to have externalizing problems, including aggression, hyperactivity, and noncompliance, when compared to children from persistently food secure households (Slopen et al., 2010).

Further research investigating childhood malnutrition and development of behavior problems showed similar findings. A longitudinal study assessed behavior of children exhibiting

signs of malnutrition beginning at age three, and behavior was assessed again at ages 8, 11, and 17. The results indicated that childhood malnutrition had a strong association with higher scores for externalizing behavior problems (Liu et al., 2004). Understanding the implications of food insecurity in relation to children's developmental outcomes is critical in developing a new avenue for prevention of poor behavioral, physical, and psychological outcomes.

Food Insecurity and Child Health Outcomes

Previous research has shown positive associations between food insecurity and poor health in children. Poor health, psychosocial problems, frequent stomachaches and headaches, increased odds of hospitalization, increased chronic illness, and higher rates of iron deficiency with anemia have been reported in children living food insecure households (Gunderson and Kreider, 2009). Children from food insecure household have also been reported to have a higher prevalence in dental caries than children from food secure households (Chi, Masterson, Carle, Mancl, Coldwell, 2014).

Food insecurity is an important, yet often overlooked, risk factor for poor child health. Impoverished families, specifically those of Hispanic or African American ethnicity, exhibiting a lower education level are reported to be at greater risk for physical and mental health problems (Winkleby, Robinson, Sundquist, Kraemer, 1999). Children living in food insufficient households have decreased general health status and increased negative symptoms when compared to children in food sufficient households (Alaimo et al., 2001; Weinreb et al., 2002). In a qualitative study on health disparities in rural Appalachia, focus group participants reported that financial constraints prevent them from seeking health care as well as provider location, hours, and lack of medical insurance (Bernal et al., 2012; Gustachall, Thompson, Lawrence, 2017).

CHAPTER III

METHODS

IRB Approval

This study was reviewed by The University of Mississippi's Institutional Review Board (IRB) prior to the collection of data. (IRB approval number for this study is #17x-062). The school district in Calhoun County also agreed to participate. Written approval from the school district was obtained through the county school administration office

Design

Using a cross-sectional survey, this study examined differences in parent/caregiver-perceived child health and parent/caregiver-reported behavioral and psychological problems by food security status of elementary school children (Pre-Kindergarten through 6th grade) living in rural, Appalachian Mississippi. A subset of data from the Farm-to-YOUth! program was utilized.

Participants

Participants were 1,144 parents/caregivers with children attending three elementary schools in the rural, Appalachian area of Calhoun County, Mississippi, in October 2016. At the time of the study in 2016, Calhoun County, MS, was a completely rural, economically distressed county according to the current Rural-Urban Continuum Code and Appalachian Regional

Commission (USDA 2013; ARC, 2018). The poverty rate in Calhoun County, Mississippi, in 2016 was 21.9% (U.S. Census Bureau, 2016). Calhoun County, MS, was not designated as having persistent poverty as a county but was designated as having persistent child poverty (USDA, 2013). Inclusion criteria for participation self-identifying a parent or caregiver at least 18 years of age with at least one child attending elementary school and being the primary individual responsible for food preparation. In the case that any survey was completed by an individual less than 18 year of age, data were excluded. Participants of any race, gender, employment status, and marital status were included. Only one parent household member could participate in the study. Participation was completely voluntary, and each parent that chose to participate will completed one survey for each child attending elementary school. Recruitment involved distributing informed consent and survey materials to each child attending the three schools. In schools where all grades are not contained within the same building, surveys were distributed to the classrooms that met the criteria of kindergarten through sixth grade. The study was of minimal risk to participants.

Procedure

A survey packet to take home (Appendix B), and a cookbook as incentive were provided to each child in each elementary school. They survey was intended to be completed by the parent/caregiver of the child bringing home the survey who is responsible for food preparation in the home. Parents/caregivers self-selected whether they would participate or not. Parents/caregivers were provided the opportunity to withdraw participation at any time by letter, telephone call, or in person communication. Additionally, parents/caregivers were provided the option to skip any questions they did not wish to answer. The consent form informed participants that no identifiable information would be included for the purpose of the study and that all

information would remain confidential. Subject numbers were assigned to each survey completed to ensure that participants remain anonymous and that data are paired correctly. Upon completing one survey for each child in the household, parents/caregivers returned the materials to the investigators in a single envelope for collection and analysis. Parental/caregiver data were only included once in the dataset.

Measures/Materials

Food security status was determined by the U.S. Household Food Security Scale, using the method of Bickel, Nord, Price, Hamilton, and Cook (2000). The guide to food security measurement used in this thesis is provided in Appendix A. Survey (Appendix B) questions were from the U.S. Household Food Security Survey Module (USDA ERS, 2012). Not all survey questions were used for the purposes of this thesis. Only the food security, child health, behavioral, and psychological-related questions were utilized. Following questions related to food security, participants answered validated questions related to the child health and child behavioral problems and psychological problems.

Analysis

Data were analyzed using IBM SPSS (version 24, Chicago, IL) for data entry and analysis. Tables 3 and 4 show the research questions, analyses, variables, and measurements used in this thesis.

Table 3

Research Questions and Analysis Method

What are the differences in parent/caregiver perceived physical health problems in elementary school children living in food	Independent Samples T-test

secure, compared to food insecure, households?	
What are the differences in parent/caregiver perceived physical health problems in elementary school children living in fully food secure, compared to not fully food secure, households?	Independent Samples T-test
What are the differences in parent/caregiver reported behavior problems in elementary school children living in food secure, compared to food insecure, households?	Chi-Square
What are the differences in parent/caregiver reported behavior problems in elementary school children living in fully food secure, compared to not fully food secure, households?	Chi-Square
What are the differences in parent/caregiver reported psychological problems in elementary school children living in food secure, compared to food insecure, households?	Chi-Square
What are the differences in parent/caregiver reported psychological problems in	Chi-Square

elementary school children living in fully food secure, compared to not fully food secure, households?	
What are associations between household food security status and behavior, physical health, and psychological problems in elementary school children?	Kendall's tau_b

Table 4

Research Variables, Definitions, Measurement, and Coding

Research Variable	Definition	Measurement
Household Food Security Status	USDA Category, based upon the 10 item food security module	0= High food security 1-2= Marginal food security 3-5= Low food security 6-10= Very low food security
Food Security Status Scale Score	Scale Score, based upon number of positive responses	0=0.0 1= 1.2 2= 2.2 3= 3.0 4= 3.7 5= 4.4 6= 5.0 7= 5.0 8= 6.4 9= 7.2 10= 7.9

Food Secure/Food Insecure	USDA Category, based upon 10 item food security module	0-2= Food secure 3-10= Food insecure
Fully Food Secure/ Not Fully Food Secure	USDA Category, based upon 10 item food security module	0=Fully Food Secure 1-10= Not Fully Food Secure
Health	Self-identified perceived health	Excellent Very Good Good Fair Poor
Behavior	Self-identified behavior problems	Yes No
Psychological Problems	Self-identified psychological problems	Yes No

CHAPTER IV

RESULTS

Participant Characteristics

Parent/caregiver participants (n=467/1144; 41% response rate) were 34±8 years. Tables 5 and 6 describe participant characteristics. Participants were predominately female (n=425/461, 92%), White (n=264/465, 56.8%), married (n= 243/453, 53.6%) and educated with some college or higher (n=256/451, 55.5%). Regarding food security status, 72.6% of participants were food secure, and 17.4% of participants were food insecure.

Table 5

Characteristics of Parent/Caregiver Participants

Characteristic (n)		n	%
Gender (461)	Female	425	92.2
	Male	36	7.8
Race (465)	American Indian or Native Alaskan	1	0.2
	Asian Native	3	0.6
	Black or African American	141	30.3
	Hispanic	54	11.6
	White	264	56.8

Highest Level Education Completed (461)	Less than high school education	72	15.6
	High School Graduate-Diploma or GED Equivalent	133	28.9
	Some College or Higher	256	55.5
Marital Status (453)	Married	243	53.6
	Widowed	11	2.4
	Divorced	52	11.5
	Separated	18	4.0
	Single/Never Married	129	28.5

Table 6

Household Food Security Status of Parent/Caregiver Participants (n=455)

Household Food Security Status			n	%
Food Secure[a]	High Food Security	Fully Food Secure[c]	308	60.9
	Marginal Food Security	Not Fully Food Secure[d]	59	11.7
Food Insecure[b]	Low Food Security		56	11.1
	Very Low Food Security		32	6.3

[a]High Food Security and Marginal Food Security
[b]Low Food Security and Very Low Food Security
[c]High Food Security
[d]Marginal Food Security, Low Food Security, and Very Low Food Security

Children of participants were 7±2 years of age and were predominately male (n=235/461, 51%), and White (n=246/460, 53.5%). Table 7 describes the children of participants.

Table 7

Gender, Race, and Grade of Children of Parent/Caregiver Participants

Characteristic (n)		n	%
Gender (461)	Male	235	51.0
	Female	226	49.0
Race (460)	American Indian or Native Alaskan	2	0.4
	Asian Native	6	1.3
	Black or African American	173	37.6
	Hispanic	30	6.5
	White	246	53.5
	Other	2	0.4
Grade (460)	Preschool (Age 4)	55	12.0
	Kindergarten	53	11.5
	1	125	27.2
	2	78	17.0
	3	74	16.1
	4	44	9.6
	5	14	3.0
	6	17	3.7

Table 8 summarizes the frequencies of parent/caregiver-perceived child health, reported behavioral problems, and reported psychological problems of children.

Table 8

Frequencies of Parent/Caregiver Participant Responses of Perceived Child Health and Reported Behavioral and Psychological Problems

Survey Question (n)	Response	n	%
In general, how would you rate your child's health? (463)	Poor	1	0.2
	Fair	17	3.7
	Good	104	22.5
	Very Good	178	38.4
	Excellent	163	35.2
In the past year, has your child been in trouble at school for behavior problems? (458)	Yes	70	15.3
	No	388	84.7
In the past year, has your child seen the school counselor or another counselor/medical professional for anxiety, depression, behavioral, or psychological problems? (457)	Yes	27	5.9
	No	430	94.1

Regarding health, parent/caregiver-perceived child health was significantly higher in those living in food secure (4.1 ± 0.9), compared to food insecure, households (3.8 ± 0.9) (p=.011). Those living in fully food secure households had significantly higher parent/caregiver-perceived child health (4.1 ± 0.9), compared to those living in not fully food secure households (3.9 ± 0.8) (p=.003). Household food security was significantly associated with child health (r= -.096, p=.042), with health significantly worsening as food security worsened.

Table 9 summarizes the responses regarding behavioral and psychological problems by

food security status.

Table 9

Differences in Parent/Caregiver Participant-Reported Behavioral and Psychological Problems of Children by Food Security Status

Participant-reported Problem (n)		Yes n (%)	No n (%)	p value
Food Secure vs. Food Insecure				
Behavioral Problems[a]	Food Secure (363)	47 (13.0)	316 (87.0)	.009
	Food Insecure (87)	21 (24.1)	66 (75.9)	
Psychological Problems[a]	Food Secure (363)	21 (5.8)	342 (94.2)	.676
	Food Insecure (86)	6 (7.0)	80 (93.0)	
Fully Food Secure vs. Not Fully Food Secure				
Behavioral Problems[a]	Fully Food Secure (304)	37 (12.2)	267 (87.8)	.012
	Not Fully Food Secure (146)	31 (21.2)	115 (78.8)	
Psychological Problems[a]	Fully Food Secure (306)	17	289	.551

	(5.6)	(94.4)
Not Fully Food Secure (143)	10	133
	(7.0)	(93.0)

[a] Chi-Square Test

A greater proportion of children living in food insecure households, compared to food secure, households had parent/caregiver- reported behavioral problems (p=.009). Similarly, a greater proportion of children living in not fully food secure, compared to fully food secure, households, had parent/caregiver-reported behavioral problems (p=.012).

There were no differences between psychological problems and food secure, compared to food insecure, households (p=.676). Additionally, no significant differences were observed between parent/caregiver reported psychological problems and those living in fully food secure, compared to not fully food secure, households (p= .551).

Finally, household food security status was significantly correlated with parent/caregiver-reported behavioral problems (tau_b = -0.126, p=.004), but not psychological problems (tau_b = -0.032, p=.472). As such, as food security worsened, behavioral problems worsened.

CHAPTER V

DISCUSSION

This study examined differences between household food security status in parent/caregiver-perceived child health and parent/caregiver-reported behavioral and psychological problems by food security status of elementary school children (Pre-Kindergarten through 6th grade) living in rural, Appalachian Mississippi. Perceived child health was higher in those children living in food secure, compared to food insecure, and fully food secure, compared to not fully food secure, households. Food security status was negatively associated with child health. A greater proportion of children living in food insecure, compared to food secure, and not fully food secure, compared to fully food secure, households had parent/caregiver reported behavioral problems. Behavioral problems were negatively correlated with household food security status. There were no differences in psychological problems among those living in food secure, compared to food insecure households, and fully food secure, compared to not fully food secure, households. Psychological problems and household food security status were not significantly correlated.

Rural Appalachia

It is important to highlight the context of these findings in relation to rural, Appalachian communities, such as the one examined in the present study. Poverty is higher and economic conditions are worse in some rural Appalachian counties, thus increasing the risk of food

insecurity and its nutritional and non-nutritional consequences (Pheley, Holben, Graham, & Simpson, 2002). In Calhoun County, MS, the current poverty rate is 21.9% (U.S. Census Bureau, 2016). Within the Calhoun County school district, 80.4% of K-12 students participate in the National School Lunch Program; 69.2% of students receive free lunch, and 11.1% of students receive reduced lunch; the average participation rate for NSLP in the United States is 52% (American Community Survey, 2015). This comparison demonstrates the urgency of alleviating food insecurity in rural, Appalachian communities. Some Appalachian areas experience higher rates of food security problems. Therefore, it is crucial for professionals developing intervention strategies to consider the negative health effects associated with food insecurity in this region.

Health

In this study, perceived child health was significantly higher in parent/caregivers living in food secure, compared to food insecure, households. Parent/caregiver- perceived child health was also higher in children living in fully food secure, compared to not fully food secure, households. Child health was significantly correlated to household food security status. These results are consistent with other research. In the United States, higher rates of hospitalization, iron deficiency anemia, chronic health conditions, stomach-aches and colds are reported among food insecure children (Coleman-Jensen et al., 2013). Other studies support this finding, as food insecure children are twice as likely to report being in fair or poor health and 1.4 times more likely to have asthma when compared to food secure children (Gunderson & Ziliak, 2015). The findings of the present study showed that as food security status worsened, perceived health worsened. This relationship is consistent with recent research which shows even marginal food security is associated with poor health and developmental outcomes in children (Cook, et al., 2013). This is further demonstrated in the present study which showed that perceived child

health was higher in those living in fully food secure, compared to not fully food secure, households. Health problems related to food insecurity may carry important implications on the utilization of healthcare and may increase demand for individual caregiving costs and national healthcare costs (Torres, 1996). A Canadian study found that total and mean healthcare costs increased with lower household food security status (Tarasuk et al, 2015). In rural, Appalachian communities where health outcomes are poor (Pheley et al, 2002), the healthcare cost burden associated with food insecurity may be higher. Considering that poor health related to food insecurity may start at a young age, healthcare may develop into a bigger burden as children age and if their health worsens. While more research is required to better understand this relationship, these findings point to the importance of expanding the response to food insecurity since it is a preventable health threat (Holben and Bergen-Marshall, 2017).

Behavioral Problems

Regarding behavioral problems, a greater proportion of children living in food insecure, compared to food secure, households had behavioral problems. Additionally, a greater proportion of children living in not fully food secure, compared to fully food insecure households had behavioral problems. Behavioral problems were negatively correlated with household food security status. The outcomes of this study are supported by previous research. One study found that increased severity and longevity of food insecurity is associated with greater levels of child behavioral problems (Reid, 2002). Additionally, Dunifon and Kowaleski-Jones (2003) found that food insecurity in school-aged children is associated with fewer positive behaviors. Further supporting the link between food insecurity and behavioral problems, food insecurity is strongly associated with externalizing behavioral problems, compared to internalizing behavioral problems (Reid, 2002). This supports the findings of our study, as we

defined internalizing behavioral problems as depression, anxiety, or other psychological problems in the separate variable "psychological problems" which was examined independently. Additionally, children from families that report multiple episodes of food insufficiency and hunger are more likely to experience behavioral and emotional problems, than children from the same community who do not report experiences of hunger (Kleinman et al., 1998). Of note, aggression and anxiety had the strongest link to hunger (Kleinman, et al., 1998). While causation cannot be determined, it is important to consider other factors that may contribute to the association between food insecurity and behavioral problems.

The mechanism in which food insecurity is associated with child behavior problems is not clear. Current studies suggest that this link may be a result of caregiver characteristics, including depression, general anxiety, and poor health (Siefert, Hefflin, and Williams, 2001). When controls for parental stress, warmth, and depression are applied, the association between food insecurity and behavioral problems no longer existed (Slack and Yoo, 2004). Still, our findings suggest a significant difference in behavioral problems between children of differing food security groups, where a greater proportion of children living in food insecure, compared to food secure, households had behavioral problems, and behavioral problems were negatively correlated with household food security status. This is consistent with other findings which indicate that behavior problems may persist among certain age groups of children, where children aged six to twelve years experienced behavior problems and food hardship even when parental characteristics are controlled for (Slack and Yoo, 2004). While the present study did not examine parental characteristics in relation to the presence of child behavioral problems and food security status, further research is warranted to better understand this potential association.

Psychological Problems

The present study found no significant differences in parent/caregiver-reported child psychological problems between households of differing food security status and no correlation between child psychological problems and household food security status. This finding is conflicting with the literature. The limited research related to food insecurity and psychological problems in children suggests that children who are raised in food insecure households appear to exhibit increased levels of anxiety, depression, hyperactivity, and inattention (Kleinman et al., 1998; Melchior, Caspi, Howard, Ambler, Bolton, 2009; Murphy et al., 1998). Persistent food insecurity is associated with both internalizing and externalizing behaviors problems after adjusting for potential confounding factors such as poverty (Slopen et al., 2010), but other research challenges this finding. Much of the existing literature suggests that the association between psychological problems in children from food insecure households may be due to mechanisms that mediate the two conditions. Food insecurity may be associated with exposure to poverty and low-income environments, parental psychopathology and parental depression, or it may independently predict children's psychological well-being (Ashiabi and Neal, 2008). Poor parental mental health is correlated with impaired parent child interactions, and maternal distress is significantly associated with the relationship of food insecurity and children's anxiety and their tendency to internalize problems (McLeod and Nonnemaker, 2002; Weinreb et al., 2002).

While causation cannot be determined from this thesis research, the findings of the present study are supported by Reid (2002), who found that externalizing behavior problems are more strongly associated with food insecurity, compared to internalizing behavior problems. One potential explanation for our findings is that child psychological problems were measured

by parent/caregiver self-report, compared to other studies which utilized the Child Behavior Checklist. Another possible explanation for the findings of the present study is that we measured only food security status against child psychological problems and did not include associated covariates, such as poverty and parental mental health, which may mediate the relationship of food insecurity and psychological problems in children. Lastly, our findings could be unique to the community in which the study was conducted.

It is important to note that the cross-sectional nature of much of the current research may not provide a complete understanding of the mechanism or mechanisms in which children's psychological problems develop alongside food insecurity or the long-term consequences of experiences with food insecurity in early childhood. Further research should include longitudinal studies.

Limitations

Several limitations of the study may impact the findings. First, we lack information regarding alternative food sources and participation in government programs aimed at reducing food insecurity. Although we did not have access to this information, our findings support that elementary school-aged children remain at risk for food insecurity and its direct and indirect effects. Second, we did not use a validated measure to assess for internalizing and externalizing behavioral problems. The use of such a measure in future research may provide a clearer picture of the types of behavioral problems associated with food insecurity. Third, we did not include a measure of parental characteristics that may mediate the relationship between food insecurity and behavioral problems outlined in other research studies. Lastly, a convenience sample was utilized. This may have led to under-representation of food insecure households, or over-representation of food secure households within the sample. The potential sampling bias may

also limit the generalizability of our findings. For example, only those interested in food and related issues may have responded.

In this study, we rely on self-report measures to examine relationships between food security and measures of child health, behavioral problems, and psychological problems. Parents/caregivers may not accurately report behavioral problems and psychological problems. Additionally, there is potential that our measure of these characteristics did not accurately capture the number of children who may have undiagnosed psychological problems or those who may not have visited a mental health professional despite having psychological problems. With respect to our outcome measures, the internal reliability for measuring psychological problems was moderate.

Conclusions and Implications for Practice

Future exploration of this topic should include assessment of the duration and severity of food insecurity in relation to child health, behavioral, and psychological outcomes in children. Additionally, access to information regarding alternative food sources and participation in the National School Lunch Program, Special Supplemental Nutrition Program for Women, Infants, and Children, and Supplemental Nutrition Assistance Program, and other food and nutrition assistance programs may provide insight about the above-mentioned health outcomes in those children from non-participating households. Future research should include a longitudinal design to examine the impact of food insecurity and the above-mentioned health outcomes as children age. Additionally, household food security status and physical, mental, and behavioral health outcomes should also be measured in older children. Future research should also include a more in-depth assessment of behavioral and psychological problems to better understand the direct and indirect associations between food insecurity, externalizing behavioral problems, and

internalizing behavioral problems.

Based on the analyses of this study, there are several strategies aimed at improving care for children who may suffer from food insecurity and its multifaceted health consequences. First, health professionals for children should conduct more detailed assessments of food security, food intake, economic characteristics, and parental characteristics. An initial first step could include screening for household food insecurity (Holben and Bergen-Marshall, 2017). This may be accomplished during school registration periods or school nurse/counselor visits.

Second, professionals in child care settings and school settings should be aware that behavioral problems may be correlated with inadequate food consumption and household food insecurity. This awareness may provide improved interventions for those children suffering from behavior problems and living in food insecure households. Although this study found no correlation between household food security status and psychological problems in children, professionals in child care and school settings should also be aware of the potential mediators of child psychological problems and food security status. With this understanding, psychological interventions may better aimed at the potential multiple variables that may mediate this relationship.

Third, outreach efforts aimed at reducing food insecurity should continue and expand. When working to bridge the gap between food insecurity and poor health, nutrition professionals must also consider those barriers such as lack of financial resources which associated with food insecurity. With more alternative food sources and increased community resources, families may experience improved food security status before reaching the point in which negative health effects begin to occur. In doing so, children's general, behavioral, and psychological health may ultimately improve.

BIBLIOGRAPHY

Alaimo, K., Olsen, C., Frongillo, E. (2001). Food insufficiency and American school-aged children's cognitive, academic, and psychosocial development. *Pediatrics, 108(1),*44-53.

Alaimo, K., Olsen, C., Frongillo, E. (2002). Family Food Insufficiency, but Not Low Family Income, is Positively Associated with Dysthymia and Suicide Symptoms in Adults. *The Journal of Nutrition, 132(4),*719-725.

Anderson, S. (1990). Core Indicators of Nutritional State for Difficult to Sample Populations. *The Journal of Nutrition 120(1)*,1557-1576.

American Community Survey. (2015) Calhoun County, MS School District. Retrieved http://education-places.startclass.com/l/17298/Calhoun-County-School-District-MS#Overview%3A%20Public%20Schools&s=3cuyNF.

Appalachiain Regional Comission, (2018). ARC- Designated Distressed Counties, Fiscal Year 2018. Retrieved https://www.arc.gov/program_areas/ARCDesignatedDistressedCountiesFiscalYear2018.asp

Ashiabi, G., O'Neal, K. (2008). A Framework for Understanding the Association Between Food Insecurity and Children's Developmental Outcomes. *Child Development Perspectives, 2(2).* doi.org/10.1111/j.1750-8606.2008.00049.x

Baab, C., Barch, D., Luby, J., Belden, A., Botterton, K., Harms, M., Marrus, N., Nishino, T. (2013). The Effects of Poverty on Childhood Brain Development: The Mediating Effect of Caregiving and Stressful Life Events. *Journal of American Medical Association Pediatrics, 167 (12),*1135-1142.

Bartfeld, J., Dunifon, R. (2006). State-level Predictors of Food Insecurity among Households with Children. *Journal of Policy Analysis and Management, 25 (1),*921–942.

Bauer, K., Berge, J., Hearst, M., Neumark-Sztainer, D. (2012). Parental employment and work-family stress: Associations with family food environments, *Social Science and Medicine, 75(3),*496-504.

Bernal J., Frongillo E., Herrera H., Rivera J. (2012). Children live, feel, and respond to experiences of food insecurity that compromise their development and weight status in peri-urban Venezuela. *The Journal of Nutrition,142(1*),1343-1349.

Bickel, G., Nord, M., Price, C., Hamilton, W., Cook, J. (2000). Guide to Measuring Household Food Security, Revised 2000. U.S. Department of Agriculture, Food, and Nutrition Service. Retrieved https://fns-prod.azureedge.net/sites/default/files/FSGuide_0.pdf

Borak, J., Salipante-Zaidel, C., Slade, MD., Fields, CA. (2012). Mortality disparities in Appalachia; reassessment of major risk factors. *Journal of Occupational and Environmental Medicine,54(2)*,146-156.

Burke, M., Martini, L., Cayur, E., Hartline-Grafton, H., Meade, R. (2016). Severity of household food insecurity is positively associated with mental disorders among children and adolescents in the United States. *Journal of Nutrition,146 (10),* 2019-2026.

Casey P., Szeto K., Robbins J., Stuff J., Connell C, Gossett J., Simpson P.(2005). Child health-related quality of life and household food security. *Archives of Pediatric and Adolescent Medicine,159(1),*51-6.

Chi, D., Masterson, E., Carle, A., Mancl, L., Coldwell, S. (2014). Socioeconomic Status, Food Security, and Dental Caries in US Children: Mediation Analyses of Data from the National Health and Nutrition Examination Survey, 2007-2008. *The American Journal of Public Health, 104(5),*860-864.

Chilton, M., Cutts, D., Ettinger de Cuba, S., Knowles, M., Rainowich, J. (2016). "Do You Wanna Breathe or Eat?" Parent Perspectives on Child Health Consequences of Food Insecurity, Trade-Offs, and Toxic Stress, *Maternal and Child Health Journal, 20(1),* 25-32.

Coleman-Jensen, A., Gregory, C., Singh, A. (2013). *Household Food Security in the United States in 2012,* ERR 173. U.S. Department of Agriculture, Economic Research Service.

Coleman-Jensen, A., Gregory, C., Singh, A. (2014). *Household Food Security in the United States in 2013*, ERR 194. U.S. Department of Agriculture, Economic Research Service.

Coleman-Jensen, A., Gregory, C., Singh, A. (2016). *Household Food Security in the United States in 2015*, ERR 215. U.S. Department of Agriculture, Economic Research Service.

Coleman-Jensen, A., Gregory, C., Singh, A. (2017). *Household Food Security in the United States in 2016*, ERR 237. U.S. Department of Agriculture, Economic Research Service.

Connell, C., Lofton, K., Yadrick, K., Rehner, T. (2005). Children's experiences of food insecurity can assist in understanding its effect on their well-being. *Journal of Nutrition,135(7),*1683-90.

Cook J., Frank D., Berkowitz C., Black M., Casey P., Cutts D., …Levenson S. (2004). Food insecurity is associated with adverse health outcomes among human infants and toddlers. *Journal of Nutrition,134(6),*1432-1438.

Cook, J., Black, M., Chilton, M., Cutts, D., Ettinger de Cuba, S., Heeren, T.,…Frank, D. (2013). Are food insecurity's health impacts underestimated in the U.S. population? *Advances in Nutrition,4*,51-61

Dean,W., Nalty, C., Sharkey, J. (2013) Child hunger and the protective effects of supplemental nutrition assistance program (SNAP) and alternative food sources among Mexican-origin families in Texas border colonias. *BioMedCentral Pediatrics,13(143).*

Department of Health and Human Services. (2015). *Healthy People 2020 topics and objectives.* Retrieved from http://www.healthypeople.gov/2020/topics-objectives

Fram, M., Frongillo, E., Jones, S., Williams,R., Burke, M., DeLoach, K., Blake, C. (2011). Children are aware of food insecurity and take responsibility for managing food resources. *Journal of Nutrition, 141(1),*1114–1119.

Gunderson, C., Kreider, B. (2009). Bounding the effects of food insecurity on children's health outcomes. *Journal of Health Economics, 28(5),*971-983.

Gundersen, C., Kreider, B., Pepper, J. (2011). The Economics of Food Insecurity in the United States. *Applied Economic Perspectives & Policy,33(1)*, 281–303.

Gunderson, C., Ziliak, J. (2015). Food Insecurity and Health Outcomes. *Health Affairs, 34(11),*1830-1839.

Gutschall, M., Thompson, K., Lawrence, E. (2017). Addressing health disparities in rural nutrition practice: a qualitative model from rural appalachia. *Journal of Hunger and Environmental Nutrition*,*13(1),* 84-89. doi: 10.1080/19320248.2017.1337536.

Hair, N., Hanson, J., Wolfe, B., Pollak, S. (2015). Association of child poverty, brain development, and academic acheivement. *Journal of the American Medical Association, 169(9),* 822-829.

Holben, D., Berger-Marshall, M. (2017). Position of the Academy of Nutrition and Dietetics: Food Insecurity in the United States. *Journal of the Academy of Nutrition and Dietetics, 117(12),*1991-2002.

Kleinman, R., Murphy, M., Little, M., Pagano, C., Wehler, K. Regal, M., Jellinek, S. (1998). Hunger in Children in the United States: Potential Behavioral and Emotional Correlates. *Pediatrics 101(1)*,E3.

Liu, J., Raine, A., Venables, P., Mednick, S. (2004). Malnutrition at age 3 years and externalizing behavior problems at 8, 11, and 17 years. *American Journal of Psychiatry, 161 (11),*2005-2013.

Martin, M., Maddocks, E., Chen, Y., Gilman, S., Colman, I., (2016). Food insecurity and mental illness: disproportionate impacts in the context of perceived stress and social isolation. *The Journal of Public Health, 132,*86-91.

McLaughlin, K., Green, J., Alegria, M., Costello, E., Gruber, M., Sampson, N., Kessler, R. (2012). Food Insecurity and Mental Disorders in National Sample of U.S. Adolescents. *Journal of the American Academy of Child and Adolescent Psychiatry,51(12),*1293-1303.

Melchior M, Caspi A, Howard L, Ambler A, Bolton H., Mountain, N., Moffit, T. (2009). The mental health context of food insecurity in families with young children. *Pediatrics, 24,*564-572.

Murphy, J., Wehler, C., Pagano, M., Little M., Kleinman, R., Jellinek M. (1998). Relationship between hunger and psychosocial functioning in low-income American children. *Journal of the American Academy of Child and Adolescent Psychiatry,37,*163–170.

Pheley, A., Holben, D., Graham, A., Simpson, C. (2002). Food security and perceptions of health status: a preliminary study in rural Appalachia. *Journal of Rural Health, 18(3),*447-454.

Reid, L. (2002). *The Consequences of Food Insecurity for Child Well-Being: An Analysis of Children's School Achievement, Psychological Well-Being, and Health.* Working Paper #137, Joint Center for Poverty Research, Northwestern University/University of Chicago. Retrieved from http://www.jcpr.org/wpfiles/Reid WP.pdf

Siefert, K., Heflin, C., Corcoran, M., Williams, D. (2001). Food Insufficiency and the Physical and Mental Health of Low-Income Women. *Women and Health 32*,159–177.

Shonkoff, J., Garner, A., Siegel, B. (2012). The lifelong effects of early childhood adversity and toxic stress. *American Academy of Pediatrics,129(1),*232-246.

Slack, K., Yoo, J. (2004). Food Hardship and Child Behavior Problems among Low Income Children. *Social Service Review 79 (3)*,511-536.

Slopen,N., Fitzmaurice, G., Williams, D., Gilman, S. Poverty, Food Insecurity, and the Behavior for Childhood Internalizing and Externalizing Disorders. (2010). *Journal of the American Academy of Child & Adolescent Psychiatry,49(5),*444-452.

Tarasuk, V., Cheng, J., de Oliveira, C., Dachner, N., Gunerson, C., Kurdyak, P. (2015). Association between household food insecurity and annual health care costs. *Canadian Medical Assciation Journal, 187(14*),429-436.

Tiehen, L., Newman, C., Kirlin, J. (2017). The Food-Spending Patterns of Households Participating in the Supplemental Nutrition Assistance Program: Findings From USDA's FoodAPS, EIB-176, *U.S. Department of Agriculture, Economic Research Service.*

T.M. Achenbach. Manual for the Child Behavior Checklist/4-18 and 1991 Profile. (1991) Department of Psychiatry, University of Vermont, Burlington, VT.

United States Census Bureau. (2016). *Small Income and Poverty Estimates Program.* Retrieved https://census.gov/programs-surveys/saipe.html

United States Department of Agriculture, Economic Research Service, (2012). *U.S. Adult Food Security Survey Module*. Retrieved https://www.ers.usda.gov/topics/food-nutrition-

assistance/food-security-in-the-us/survey-tools/#household

United States Department of Agriculture. (2013). Persistent Poverty Counties. USDA, ERS. Retrieved https://www.rd.usda.gov/files/RD-PersistentPovertyCountiesList2016.

United States Department of Agriculture. (2015). *Official USDA Food Plans: Cost of Food at Home at Four Levels, U.S. Average, January 2015*. Retrieved https://www.cnpp.usda.gov/sites/default/files/CostofFoodJan2015.pdf

United States Department of Agriculture, Economic Research Service. (2016). Economic Research Service, *using data from December 2014-2016 Current Population Survey Food Security Supplements*.

United States Department of Agriculture. (2016). *FNS Program Data and Statistics*. Retrieved https://www.fns.usda.gov/data-and-statistics.

Weinreb, L., Wehler, C., Perloff, J., Scott, R., Hosmer, D., Sagor, L., Gunderson, C. (2002). Hunger: its impact on children's health and mental health. *Pediatrics*,*110(4),*doi: 10.1542/peds.110.4.e41.

Winkleby, M., Robinson,T., Sundquist, J., Kraemer, H. (1999). Ethnic Variation in Cardiovascular Disease Risk Factors among Children and Young Adults: Findings from the Third National Health and Nutrition Examination Survey, 1988-1994. *Journal of the American Medical Association,28(11),*1006- 1013.

Wright, V., Kaushal, N., Waldfogel, J., Garfinkel, I. (2014). Understanding the link between poverty and food insecurity among children: does the definition of poverty matter? *Journal of Children and Poverty, 20 (1)*,1-20.

Yoshikawa, H., Aber, J., Beardslee,W. (2012). The effects of poverty on the mental, emotional, and behavioral health of children and youth: implications for prevention. *The American Psychologist,67(4),*272-284.

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APPENDICES

APPENDIX A: MEASUREMENT GUIDE FOR THE TEN-ITEM U.S. ADULT FOOD SECURITY SURVEY MODULE

Table 10

Measurement Guide for the Ten-Item U.S. Adult Food Security Survey Module

Number of Positive Questions/ Responses	Scale Score	USDA Food Security Category (Label)	USDA Food Security Category (Dichotomous)	Fully Food Secure versus Not Fully Food Secure
0	0.0	High Food Security	Food Secure	Fully Food Secure
1	1.2	Marginal Food Security		
2	2.2		Food Secure	Not Fully Food Secure
3	3.0			
4	3.7	Low Food Security	Food Insecure	Not Fully Food Secure
5	4.4			
6	5.0			
7	5.7			
8	6.4	Very Low Food Security	Food Insecure	Not Fully Food Secure
9	7.2			
10	7.9			

Table 11

Measurement Guide for the Six-Item Short Form of the Food Security Survey Module

Number of Positive Questions/ Responses	Scale Score	USDA Food Security Category (Label)	USDA Food Security Category (Dichotomous)	Fully Food Secure versus Not Fully Food Secure
0	0.0	High Food Security	Food Secure	Fully Food Secure
1	2.86	Marginal Food Security	Food Secure	Not Fully Food Secure
2	4.19			
3	5.27	Low Food Security	Food Insecure	Not Fully Food Secure
4	6.30			
5	7.54	Very Low Food Security	Food Insecure	Not Fully Food Secure
6	8.48			

APPENDIX B: FARM-TO-YOUTH! PRE-SURVEY

***Farm-to-YOUth!* Pre-Survey**

This survey is intended to be completed by the parent/caregiver of the child bringing home the survey who is responsible for food preparation in the home. Completion of this survey is completely voluntary and may cease at any time. No one will be able to identify you in any report resulting from this survey.

Tell Us About You and Your Household.

How old are you? _____	**What is your gender? (Circle one answer)**	Male	Female

What is your race? (Circle all that apply)					
American Indian or Native Alaskan	Asian Native	Black or African American	Hispanic	Hawaiian or Other Pacific Islander	White
Other (Please specify.)					

What is your highest level of education completed? (Check one box only)	
Less than High School	
High School Graduate – high school DIPLOMA or the equivalent (GED)	
Some College or Higher	

What is your current marital status? (Circle one answer)				
Married	Widowed	Divorced	Separated	Single/Never Married
If not married, do you have a live-in partner? Yes No				
Including you, how many people live in	_____Children less than 18 years	_____Adults		

your household?	of age	

What is <u>your</u> occupation type? **(Check one box only)**	
Working full-time (35 or more hours per week)	
Working part-time (fewer than 35 hours per week)	
Unemployed	
Student (either full or part-time)	
Social Security Disability	
Applying for Social Security	
Retired	
Other (Please explain)	

We are interested in how far you live from a grocery store? What is your address?

Do you currently have health insurance? (Circle one answer)		
No coverage/ self-pay	**Medicaid or Medicare only**	**Private insurance only (job/ school/ purchased)**

Do you belong to a church / religious group? (Circle one answer)	Yes	No

Do you smoke cigarettes/ tobacco?	Yes	No
Does someone in your household smoke?	Yes	No

In general my health is excellent, very good, good, fair, or poor. (Circle one answer)

Excellent	Very Good	Good	Fair	Poor	
If you are a woman, were you ever diagnosed with gestational diabetes or given birth to a baby weighing nine pounds or more? (Circle one answer)			I am not a woman.	Yes	No
Do you have a mother, father, sister, or brother with diabetes?				Yes	No
Have you ever been diagnosed with high blood pressure? (Circle one answer)				Yes	No
Have you ever been diagnosed with type 1 diabetes? (Circle one answer)				Yes	No
Have you ever been diagnosed with type 2 diabetes? (Circle one answer)				Yes	No
Are you physically active? (Circle one answer)				Yes	No
How much do <u>you</u> weigh? _____			Find your height in the left column and then circle one box in the row. <u>If you weigh less than the range of the left column, just circle your height</u>.		

Height	Weight (lbs.)		
4' 10"	119-142	143-190	191+
4' 11"	124-147	148-197	198+
5' 0"	128-152	153-203	204+
5' 1"	132-157	158-210	211+
5' 2"	136-163	164-217	218+
5' 3"	141-168	169-224	225+
5' 4"	145-173	174-231	232+
5' 5"	150-179	180-239	240+
5' 6"	155-185	186-246	247+
5' 7"	159-190	191-254	255+
5' 8"	164-196	197-261	262+
5' 9"	169-202	203-269	270+
5' 10"	174-208	209-277	278+
5' 11"	179-214	215-285	286+
6' 0"	184-220	221-293	294+
6' 1"	189-226	227-301	302+
6' 2"	194-232	233-310	311+
6' 3"	200-239	240-318	319+
6' 4"	205-245	246-327	328+

Tell Us About Your Food and Nutrition Habits and Behaviors.

I feel that I am helping my body by eating more fruits and vegetables. (Circle one answer)	Agree (Yes)	Agree or Disagree (Maybe)	Disagree (No)
I may develop health problems if I do not eat fruit and vegetables. (Circle one answer)	Agree (Yes)	Agree or Disagree (Maybe)	Disagree (No)
I feel that I can eat fruit or vegetables as snacks. (Circle one answer)	Agree (Yes)	Agree or Disagree (Maybe)	Disagree (No)
I feel that I can buy more vegetables the next time I shop. (Circle one answer)	Agree (Yes)	Agree or Disagree (Maybe)	Disagree (No)
I feel that I can plan meals or snack with more fruit during the next week. (Circle one answer)	Agree (Yes)	Agree or Disagree (Maybe)	Disagree (No)
I feel that I can eat two or more servings of vegetables at dinner. (Circle one answer)	Agree (Yes)	Agree or Disagree (Maybe)	Disagree (No)
I feel that I can plan meals with more vegetables during the next week. (Circle one answer)	Agree (Yes)	Agree or Disagree (Maybe)	Disagree (No)

In your household who is in charge of what foods to buy? (Circle one answer)	I Am	Shared Decision	Other Person
In your household who is in charge of how to prepare the food? (Circle one answer)	I Am	Shared Decision	Other Person

How would you best describe your diet? (Circle one answer)				
Excellent	Very Good	Good	Fair	Poor

Which one statement best fits you? (Check one box only.)	
I am not thinking about eating more fruit.	
I am thinking about eating more fruit…planning to start within six months.	
I am definitely planning to eat more fruit in the next month.	
I am trying to eat more fruit now.	
I am already eating 3 or more servings of fruit a day	

Which one statement best fits you? (Check one box only.)	
I am not thinking about eating more vegetables.	
I am thinking about eating more vegetables…planning to start within six months.	
I am definitely planning to eat more vegetables in the next month.	
I am trying to eat more vegetables now.	
I am already eating 3 or more servings of vegetables a day.	

Do you eat more than one kind of fruit daily? (Circle only one.)			
Never	Sometimes	Often	Always

Do you eat more than 1 kind of vegetable in a day? (Circle only one.)			
Never	Sometimes	Often	Always

During the past week, did you have citrus fruit (such as orange or grapefruit) or citrus juice? (Circle one.)	Yes	No

How many servings of vegetables do you eat each day?	Number_____

Do you eat 2 or more servings of vegetables at your main meal? Sometimes, often, always, or never? (Circle one.)			
Sometimes	Often	Always	Never

Do you eat fruit or vegetables as snacks? (Circle one.)	Yes	No
How many servings of fruits do you eat each day?	Number_____	

Which one statement best fits you? (Check one box only.)	
I am not thinking about gardening to grow vegetables for my household.	
I am thinking about gardening to grow vegetables for my household. …planning to start within six months	
I am definitely planning to garden to grow vegetables for my household in the next month.	
I am trying to garden to grow vegetables for my household.	
I am already gardening to grow vegetables for my household.	

Which one statement best fits you? **(Check one box only.)**	
I am not thinking about gardening to grow fruits for my household.	
I am thinking about gardening to grow fruits for my household. …planning to start within six months	
I am definitely planning to garden to grow fruits for my household in the next month.	
I am trying to garden to grow fruits for my household.	
I am already gardening to grow fruits for my household.	

Which of these statements best describes the food eaten in your household in the last 12 months? **(Check one box only.)**			
Enough of the kinds of food I/we want to eat			
Enough but not always the kinds of food I/we want			
Sometimes not enough to eat			
Often not enough			
Don't Know or Refused			
Here are some reasons why people don't always have <u>enough to eat</u>. For each one, please tell me if that is a reason why YOU don't always have enough to eat.	Yes	No	Don't Know
Not enough money for food			
Not enough time for shopping or cooking			
Too hard to get to the store			
On a diet			
No working stove available			
Not able to cook or eat because of health problems			

Here are some reasons why people don't always have <u>the quality or variety of food they want</u>. For each one, please tell me if that is a reason why YOU don't always have the kinds of food you want to eat.	Yes	No	Don't Know
Not enough money for food			
Kinds of food (I/we) want not available			
Not enough time for shopping or cooking			
Too hard to get to the store			
On a special diet			

In the past 12 months, (I/we) worried whether (my/our) food would run out before (I/we) got money to buy more.

(Circle only one.)

Often true	Sometimes true	Never true	Don't Know or Prefer Not to Answer

In the past 12 months, the food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.

(Circle only one.)

Often true	Sometimes true	Never true	Don't Know or Prefer Not to Answer

In the past 12 months, (I/we) couldn't afford to eat balanced meals.
(Circle only one.)

Often true	Sometimes true	Never true	Don't Know or Prefer Not to Answer

In the past 12 months, did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

(Check one box only)

Yes. Almost every month	Yes. Some months but not every month	Yes. Only 1 or 2 months	No.	Don't Know or Prefer Not to Answer

In the past 12 months, did you (personally) ever eat less than you felt you should because there wasn't enough money to buy food? (Check one box only)		
Yes	No	Don't Know or Prefer Not to Answer

In the past 12 months, were you (personally) ever hungry but didn't eat because you couldn't afford enough food? **(Check one box only)**		
Yes	No	Don't Know or Prefer Not to Answer

In the past 12 months, did you (personally) lose weight because you didn't have enough money for food? **(Check one box only)**		
Yes	No	Don't Know or Prefer Not to Answer

In the past 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food? **(Check one box only)**				
Yes. Almost every month	Yes. Some months but not every month	Yes. Only 1 or 2 months	No.	Don't Know or Prefer Not to Answer

Tell Us More About the <u>Child who Brought This Home From School</u>.

What is the child's age? _____	**What grade is the child in? _____**	
What is your child's gender? (Circle one answer)	Male	Female

What is your child's race? (Circle all that apply)

American Indian or Native Alaskan	Asian Native	Black or African American	Hispanic	Hawaiian or Other Pacific Islander	White
Other (Please specify.)					

In the past year, have you been told by a medical professional that your child is overweight or obese? (Circle one answer)	Yes	No
In the past year, have you been told by a medical professional that your child has low iron? (Circle one answer)	Yes	No
In the past year, has your child ever been in trouble at school for behavior problems? (Circle one answer)	Yes	No
In the past year, has your child seen the school counselor or another counselor/medical professional for anxiety, depression, behavioral, or psychological problems? (Circle one answer)	Yes	No

In general my <u>child's</u> health is excellent, very good, good, fair, or poor. (Circle one answer)				
Excellent	Very Good	Good	Fair	Poor

How would you best describe your <u>child's</u> diet? (Circle one answer)				
Excellent	Very Good	Good	Fair	Poor

Does <u>your child</u> eat more than one kind of fruit daily? (Circle only one.)			
Never	Sometimes	Often	Always

Does <u>your child</u> more than 1 kind of vegetable in a day? (Circle only one.)			
Never	Sometimes	Often	Always

During the past week, did <u>your child</u> have citrus fruit (such as orange or grapefruit) or citrus juice? (Circle one.)	Yes	No

How many servings of vegetables <u>does your child</u> eat each day?	Number_____

Does <u>your child</u> eat 2 or more servings of vegetables at your main meal? Sometimes, often, always, or never? (Circle one.)			
Sometimes	Often	Always	Never

Does <u>your child</u> eat fruit or vegetables as snacks? (Circle one.)	Yes	No
How many servings of fruits <u>does your child</u> eat each day?	Number_____	

Thank you for participating in our survey!

VITA

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