6-2022

Low Academic Outcomes: A Result of Food Insecurity and Student Mental Health During COVID19

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Low Academic Outcomes: A Result of Food Insecurity and Student Mental Health During COVID-19

by

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A Thesis
Submitted to the Honors College of
The University of Southern Mississippi
in Partial Fulfillment
of Honors Requirements

May 2022

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ABSTRACT

Food insecurity has significantly increased throughout the United States as a result of the COVID-19 pandemic. Many schools switched to remote learning and children lost access to free school meals, affecting them psychologically and academically. This study examined the relationship between food insecurity and low academic outcomes, accounting for student mental health, such as anxiety, depression, and ADHD, as well as parental involvement as a possible protective factor against mental health. The current study administered a survey through Amazon's MTurk to reach a diverse group of participants across the United States. Data analysis from the study can conclude that food insecurity has a significant effect on student mental health, as well as student GPA; however, parental involvement has no effect on improving students' mental health and mediating mental health and GPA. This study supports numerous research on the effects of food insecurity on mental health but contributes new findings to the effects of COVID-19 on student mental health and GPA. Higher levels of food insecurity lead to higher levels of anxiety, depression, inattention, and/or hyperactivity, in turn resulting in a lower overall GPA. Parental involvement moderated the relationship between anxiety/ depression and inattention but did not moderate the relationship between hyperactivity and GPA. These results provide significant implications for parents, teachers, school districts, and lawmakers to find ways to address food insecurity. Policies and programs implementing a take-home meal system, or ways of distributing food to those students affected by COVID-19 may be particularly effective. COVID-19 notwithstanding, 5 use of these programs may increase academic performance among those who struggled with food insecurity before and following COVID-19.

Keywords: *food insecurity, COVID-19, student mental health, academic success, pandemic, parental involvement, ADHD, depression, anxiety, inattention, hyperactivity*

DEDICATION

I am dedicating this thesis to my parents, Kris and Racheal Cole. Without the two of you, I would not be where I am today. Thank you for your constant support, encouragement, and for always expecting me to do my best. You mean the world to me. I love you both

ACKNOWLEDGMENTS

I would like to thank my thesis advisor, Dr. Micheal Fitzgerald, for guiding me through this process and offering continued support. He has made this entire process so much easier and has pushed me to always give my best. Thank you for all the knowledge you have shared, the time you have dedicated, and your patience throughout this journey. I am truly grateful for you and could not have asked for a better advisor.

I would also like to thank the Honors College for supporting me mentally, academically, and financially. Each faculty members'support has not gone unnoticed. You have been a blessing to many students throughout the years, and I am forever grateful for all you have done.

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LIST OF ABBREVIATIONS

ADHD	Attention Deficit Hyperactivity Disorder
COVID-19	Coronavirus Pandemic 2019
FAO	Food and AgricultureAssociation
FDA	Food and DrugAdministration
GPA	Grade PointAverage
MTurk	Amazon Mechanical Turk
NIHQ	National Institute for Children's Health Quality
NRC	National Research Council
US	United States

CHAPTER I: INTRODUCTION

Food insecurity is a public health problem that is associated with children's academic and socioemotional functioning. Food insecurity is defined as ‘‘limited or uncertain availability of nutritionally adequate and safe foods or limited or uncertain ability to acquire acceptable foods in socially acceptable ways’’ (Hamilton, 1997, pg. 50). Food insecurity has long been a public health problem in the United States and increased substantially during the COVID-19 pandemic. According to the COVID Impact Survey, food insecurity has increased by 130% since 2018. One of the more prominent reasons food insecurities has increased is that nearly 93% of children in America experienced new online learning and lost access to school meals (US. Census, 2020). Food insecurity poses several problems to children as those who experience greater food insecurity are at increased risk for academic, emotional, and cognitive problems (Ke, 2015; Thomas, 2019).

Among the deleterious outcomes associated with food insecurity, mental health problems are particularly salient (Chilton, 2007, Portela-Parra, 2019; Thomas, 2019). Food insecurity has been associated with symptoms of anxiety, depression and attention deficit and hyperactivity disorder (ADHD) (Men, et al., 2021; Myers, 2020). Such mental health problems pose additional risk among children who are food insecure, as it has been well established that mental health problems have a profound impact on academic achievement. The elevated mental health problems reported during COVID-19 as a consequence of greater food insecurity may play an important role in understanding 2 student academic achievement during the pandemic. Academic achievement is a complex and multifaceted construct including grade point average, standardized test scores, and

desire to pursue a college education. Mental health problems may impact student's academic success and achievement via increased stress, compromised immune functioning, poor self-efficacy skills, low motivation, and poorer cognitive functioning (Brannlund, et al., 2017; Martinez, 2020; Mundy, et. Al., 2017).

Despite these findings there is little research about the relationship between child mental health and academic outcomes among children who come from food insecure households. Prior research has noted that mental health problems mediate the relationship between food insecurity and academic outcomes among college students (Martinez, 2020; Phillips, 2018), so it is plausible that we would expect similar effects among children during a global pandemic. Therefore, the goal of the current study to examine mental health problems, including symptoms of depression, anxiety and ADHD, as mediators linking food insecurity during the COVID-19 pandemic to the academic achievement of children in grades 2nd through 5th. Children at this age are better able to self-regulate, understand the importance of education, show independence in completion of routines, feel a strong need for achievement, and begin more challenging work in school that requires more thought (Mullen, G., 2019; Wisconsin Child Welfare Training System, 2012).

The relationship between student mental health problems and academic achievement is likely to be influenced by a variety of factors and parental involvement may be one such factor. Students suffering from mental health problems stemming from 4 food insecurity may experience lower academic outcomes; however, parental involvement could possibly be a protective factor. A promising way of improving a students' educational outcome is parental educational involvement, or parents' active

participation in the educational lives of their children (Benner, 2016). When parents encourage their children to do their best in school, stress the importance of education, stay involved in the schools through parent/teacher communication, help their children with their homework and ask them about their day, and overall remain involved in the child's education as a whole, their children will understand the importance of their academic success and strive to increase achievement (Engin, 2020; Ntekane 2018; Samoray, 2019). Using a moderated mediation analysis, this study examined if symptoms of depression, anxiety, and ADHD mediate the association between food insecurity and student grade point average. Parental involvement as a moderator of the relationship between each of the mental health problems and student grade point average to determine if the indirect effects of food insecurity on GPA through mental health were conditional based on levels of parental involvement.

CHAPTER II: LITERATURE REVIEW

Food Insecurity

Food insecurity may negatively impact students and is distinguished from direct hunger. Food insecurity does not always mean the people in the household are hungry, but if there is a lack of access to nutrient dense foods then the household is considered food insecure (FAO, 2003; Hamilton, 1997). One of the fundamental conceptual issues surrounding food insecurity and hunger is determining whether food insecurity and hunger represent unique, but related constructs or represent a singular construct. Hunger has been defined as, "the uneasy or painful sensation caused by a lack of food, the recurrent and involuntary lack of access to food" (NRC; National Research Council, 2006, p. 47). On the other hand, the Food and Agriculture Organization (FAO) defines food insecurity as "not having adequate physical, social, or economic access to food for an active and healthy life" (FAO, 2003, Ch.2). One of the primary conceptual differences between hunger and food insecurity is that hunger can be a short-term feeling, but food insecurity tends to be more chronic and may extend over longer periods of time (Barrett et al., 2013). Hunger also seems to be more of a physiological experience or feeling, whereas food insecurity is the result of an absence of adequate nutrition. Often times the lack of adequate nutrition is the result of structural problems in larger social systems rather than individual or familial based issues. For example, food insecurity can manifest as families having to use inconsistent and unreliable public transportation to get groceries because high quality foods are not available within a reasonable distance to travel. This is an example of living in a "food desert" where despite availability of food, the available food is unhealthy, high in preservative, sugar, fat, and other nutrients that should only be

consumed in moderation rather than the foundation of their diet. According to the Food and Agriculture Association, when a person is hungry for an extended period and does not consume a sufficient number of calories on a regular basis, hunger becomes chronic, which is also referred to as undernourishment (FAO, 2021). The sensation of hunger is not classified as food insecurity because it is not always a result of an extended lack of access to quality foods. An additional conceptual difference between food insecurity and hunger is that hunger is typically more temporary, whereas food insecurity tends to be a chronic experience due to factors outside the family's control reflecting possible longterm hunger if there is a lack of calories, and nutrient inadequacy. Many articles use hunger and food insecurity interchangeably; however, hunger is a different concept that should be measured as such (National Research Council, 2006).

COVID-19 Impact on Families and Students

The COVID-19 pandemic has had a profound impact on family life and created a large amount of uncertainty across the globe and problems obtaining basic human necessities. Among the most pressing issues potentiated by the pandemic is food insecurity. For example, nearly one in five households with children under the age of 12 experienced food insecurity as a result of the COVID-19 pandemic (Bauer, 2020). Further, the COVID-19 pandemic has tripled food insecurity among households with children in the United States (Fitzpatrick, 2020; Niles, 2020; Schanzebach, 2020). The increases in the number of food insecure households can be attributed to a variety of factors including job loss, furlough, and reduced working hours (Lund, 2020). In addition to food insecurity being caused by financial issues, it may also exacerbate

existing structural issues (e.g., lack of transportation to access food or greater competition for more limited food resources). In order to feed their families parents that no longer have a steady income have resulted in visiting food banks. For reference, during the pandemic food banks across the country report skyrocketing demand, with upwards of 30% being firsttime users of the charitable food system (Nataga, 2020).

Conceptual Background on Food Insecurity and Academic Outcomes

The relationship between students experiencing food insecurity and poorer academic success among elementary aged children is evident in the United States and has been particularly salient during COVID-19. Multiple studies have found that food insecurity is associated with a lower GPA and academic success (Bruening et al., 2018; Payne-Sturges et al., 2017; Woerden et al., 2019). According to the Institute of Medicine (2014), lower levels of academic success have been partially attributed to poor diet. Proper minerals, vitamins, and nutrients are vital to student academic outcomes. The human brain needs sufficient energy to perform the cognitive functions (e.g., critical thinking) associated with academic success (Woodhouse, 2012). Although children living in food-insecure households may still meet daily calorie requirements, the foods consumed are low in nutritional value. On the other hand, if the body is not getting sufficient calories or nutrition, the body can go into survival mode, only sending available calories to vital organs to maintain functioning. This could mean that the brain could only be using calories to survive, instead of performing at optimal levels. The neurons in the brain feed off the macronutrients such as carbohydrates, proteins, and fats

consumed daily required for academic success (Gutierrez et al., 2013; Jirout et al., 2019; Kim et al., 2017).

The underlying biological dysfunction commonly found in children living in food insecure households may increase mental health problems that leave food insecure children at risk for poorer academic performance. Studies have consistently shown that food insecurity is one of the most powerful predictors of psychiatric and functional problems in children (Jackson et al., 2019; Poole-Di Salvo et al., 2016; Rutter, 1977). Students experiencing food insecurity might be more likely to have lower academic scores because of mental health problems limiting their full potential. Food insecurity within household increases the risk for mental health problems such as anxiety, depression, and inattention (Ke, 2010; Melchoir, 2012; Perez, 2012). The primary way in which food insecurity can manifest mental health problems is through altered physiological functioning potentiated by poor diet. For example, in a food-insecure household, the child's diet consists of foods high in refined sugar, sodium, and fat because this food is cheaper to buy in bulk. For example, food-insecure households buy less fruit, protein, seafood, and plant protein compared to food-secure households. (Gregory et al., 2019). In another study, participants restrict the quality and quantity of food as a strategy to save money (Zepeda, 2018). Children who consume high levels of sugar, sodium, and fat lack vital nutrients that come from fruits, vegetables, and protein sources, such as red meats, fish, chicken which are vital for psychological wellbeing and mental health (Rosen et al., 2021).

More specifically, consuming large amounts of refined sugars, sodium, and fat, and not enough iron rich sources may contribute to a child's hyperactivity and inattention

(Melchior, 2012). Anemia is a disorder which is principally characterized by a decline in the concentration of circulating erythro-cytes, or blood hemoglobin, and concomitant impairment of oxygen delivery to meet the body's physiological needs. Anemia is thought to be caused by nutritional deficiencies of iron, folate, and vitamin B12 (McLean, 2005). Anemia results has numerous psychological and academic consequences including a decreased ability to focus, poorer memory, lower standardized test scores, inability to complete tasks in an appropriate time frame, and contributes to lower GPA (University of California Davis, 2021). In fact, children living in food-insecure households are more than 30% more likely to develop anemia (Currie, 2005). Indeed, research has supported the conceptual link between food insecurity and ADHD. Children living in food insecure households often lack a nutritionally balanced diet which may enhance the likelihood of developing ADHD symptoms (Lu, 2019; Rongstad, 2018; Yavari, 2018). For example, one study found evidence that food insecurity has a positive relationship with ADHD symptoms such that greater food insecurity is linked to greater ADHD symptoms (Lu, 2019). In another study, it was found that food insecurity was associated with ADHD symptoms and the authors recommended that doctors should consider food insecurity as a contributing factor for ADHD (Yavari, 2018). Despite these two studies finding that food insecurity is linked to ADHD symptoms, it is unclear if the ADHD symptoms possibly caused by food insecurity have a significant effect on academics. Despite an association between food 15 16 insecurity and ADHD symptoms, the implications of elevated ADHD symptoms among children remain unclear and may be heightened during a pandemic. Numerous studies have also linked a poor diet and nutrient deficiencies common in food insecurity to depressive symptoms. Diets that are high in saturated fats

and refined carbohydrates are directly associated with depressive symptoms (O'Neil, 2014). Diets rich in Omega-3 Fatty Acids, minerals such as iron and zinc, and vitamins such as B-12 play an important role in the prevention and treatment of depression (Khalid, 2016). More specifically, amino acids that come from healthy diets directly contribute to the production of serotonin. When the diet lacks these essential amino acids, one is more likely to suffer from depression (Friedman, 2018). Depression in those living in food insecure households may be partially attributed to lacking vital nutrients for proper brain functioning, or from constant stress and worry over food availability (Cofino et al., 2019; Jung et el., 2019; Koury et al., 2020). Research shows food insecurity is highly associated with depressive symptoms in mothers; however, there is little research about the effects on children, so it is plausible that students in food insecure households may also manifest depressive symptoms. Children living in food insecure households may also experience higher levels of anxiety. This anxiety could be caused by several reasons, one of which is parental anxiety. Children are more likely to develop anxious and worried thoughts if they observe this behavior in their parents (McLaughlin et al., 2012; Zhu et al., 2019). Elevated levels of anxiety could possibly occur through worrying about the next meal the student will 17 have or through parental behavior about food related issues such as rationing nutritious 18 food, complaining about the lack of adequate food, or showing signs of stress while grocery shopping. Additionally, there are biological explanations linking food insecurity to anxiety. Research has also shown that certain nutritional deficiencies of Vitamin B12, zinc, and Omega-3 can lead to higher levels of anxiety (Anbari-Nogyni et al., 2020; Larrieu et al., 2018; Sarahswathy et al., 2019). There is not a significant amount of research available to conclude that children

living in food insecure households will likely develop anxiety; however, research has shown that parental anxiety about food insecurity, along with nutritional deficiencies, may cause anxiety in children (Connell et al., 2005). In accordance with the previous mentioned conceptual discussion, there are theoretical models that can also explain the possible associations between food insecurity, mental health, and academic performance.

Child Mental Health and Academic Outcomes

Symptoms of depression, anxiety, and ADHD may have a significant impact on children's academic achievement. Depressive symptoms can impair children's selfefficacy and motivation for academic success (Bandura, 1999). One of the most common depressive symptoms is low motivation, which in turn can negatively impact a child's academic outcomes. For example, a study found that children who observe depressive symptoms resulted in a half a letter grade drop in GPA compared to those who did not (Hysenbegasi, 2005). Children with higher levels of depressive symptoms have difficulty controlling negative emotions and consequently suffer academically (Ashiabi, 2008). Student mental and academic wellbeing is dependent upon a healthy diet and sufficient calories (Ke, 2015; Melchior, 2012; Perez-Escamilla' 2015). Likewise, the anxiety caused by the issue of food insecurity may distract the student from being able to involve themselves in the classroom. This could look like disinterest in school, poor relationships with peers and teachers, or lack of engagement. Anxiety can also cause poorer sleep quality, which can result in a student falling behind because they have a more difficult time learning, problem-solving, and listening (Chorney et al., 2008; Pagel et al., 2007). Students have a higher risk of developing anxiety coming from low-income

families (Najman et al., 2010; Weng, 2012). This might be caused by anxiety from worrying about food, nutritional deficiencies, or unstable environments. Difficulty concentrating in school through anxiety related reasons can lead to poorer grades, affecting the student's overall academic success due to the anxiety reducing student mental functioning. ADHD can negatively impact a student's education in many ways. Cognitive skills may be impacted by one or both symptoms of ADHD which are inattention, hyperactivity, impulsiveness (Arnold, et al., 2020). Studies have shown that students diagnosed with ADHD are associated with more impairment in reading, writing, and math, as well as social relationships, peer activities, and behavior in the classroom (Arnold, et al., 2020; Tamm, et al., 2021). These impairments may be a result of the student's difficulty sitting still, paying attention, and remaining focused. As a result of the ADHD symptoms potentiate difficulty remaining attentive and focused, children may only absorb some of the material that their teachers are providing. Despite the academic problems that children with depressive, anxiety, and ADHD have, not all children who experience such symptoms suffer poor academic performance, so it is important to identify protective factors that may discriminate those who struggle academically versus those who do not.

Parental Involvement as a Protective Factor

Mothers play a critical role in children's psychosocial and academic development and may serve as a protective factor for children's academic outcomes, reducing the academic problems children with mental health problems commonly experience. Children with parents that are more involved in their education may have fewer mental

health problems, even if they are living in food-insecure households. Previous studies have examined how parental involvement in education, ranging from help with homework to simply talking about school, helps children's academic achievement (Boonk, 2018; Jeynes, 2016; Samoray, 2019). Though food insecurity may be linked to mental problems such as ADHD depression, anxiety, and inattention, maternal involvement could be a contributing protective factor buffering the negative effects of mental health problems on children's academic achievement. During COVID-19 mothers were thrust into an educator role with the transition to online learning and such involvement may provide additional opportunities for their children to learn. On the other hand, children's learning was more dependent on parental involvement. Involved mothers can demonstrate to children that they care about their success and are willing to help their children succeed; thereby fostering a more positive outlook in children. On the other hand, if mothers are disengaged, their children may be less likely to feel the need to do well in school. Likewise, students may not grasp the material taught in class and may experience additional frustration from the lack of maternal support. Students with mothers that are not involved and are already experiencing mental health problems such as depression and anxiety, may have no sense of motivation to succeed in addition to the already existing negative connotation around education from their parents. There are multiple gaps throughout the literature, and very few studies that make it unclear which forms of involvement (i.e., Involvement in school, help with homework, motivation, etc.) serve their children best, as well as if maternal involvement can buffer the academic consequences of ADHD, depression, and anxiety. This study will contribute to closing

the gap and providing a better understanding of how maternal involvement protects against mental health issues, allowing students to perform better in school.

CHAPTER III: PRESENT STUDY

The current study examined symptoms of depression, anxiety, and ADHD as mediators linking food insecurity to academic performance during the COVID-19 pandemic among second through fifth grade children. Further, we examine maternal involvement as a moderator of the association between children's mental health problems and student GPA. The reason for choosing only mothers as the central source of information is because they tend to be the primary caregivers in households and are more involved in what their children do. According to the Census data, approximately 80.4% of custodial parents are mothers while only 19.6% of custodial parents (approximately 1 in 5) are fathers (US Census, 2020). Mothers are also more prevalent in low-income households, and we tend to see biological fathers not present. According to the Statista Research Department (2021), approximately 3.33 million children living with single mothers who never married were living below the poverty line in the U.S. in 2019. Only asking for students between grades second and fifth is due to the idea that they are more accustomed to routine, have more critical thinking abilities, are fully capable of determining right from wrong, have most likely developed or been diagnosed with, if any, mental health issues, and more self-regulated, (CDC, 2021). They also begin to develop a greater sense of responsibility and awareness of their actions, think more logically, assert their independence, and look for more opportunities to become responsible (Thompson, 2021). Based upon numerous studies and thorough research, it is evident that students are impacted in multiple ways by food insecurity within the household. The first hypothesis is that students living in more food insecure households will experience lower GPA and the relationship will be mediated by depression, anxiety,

and ADHD. The second hypothesis is that the indirect (mediated) effects are conditional based on levels parental involvement where high levels of parental involvement would reduce the impact of mental health problems on student GPA.

CHAPTER IV: METHODS

Recruitment and Data Collection

Data for the current study was collected via an anonymous online survey administered through Amazon Mechanical Turk (MTurk). MTurk is a crowd sourcing website where "workers" complete tasks and then are paid (Shank, 2016). MTurk also provides the study with data from a diverse population. We created a secure online survey using Qualtrics and posted it to the MTurk website. Manipulation checks were included throughout the survey and participants that "clicked" through the survey were excluded from the analysis. The manipulation checks are used to ensure participants are not simply clicking random answers. For example, the check will say, "select 'no' as the answer." If the participant were to check "yes," we would know they were likely not truly participating in the survey and "clicking through". Participation took an average of 11 minutes to complete approximately eighty questions. Once the participant completed the survey, 50 cents compensation was awarded.

Procedures

The data collected originally included 1294 participants. Through close observation and studying individual demographics, we were able to narrow down the results. Participants that took the survey more than once were filtered out so that only one attempt would be included in the final collection. Participants that did not complete the entire survey were eliminated, as well as those who attempted to take the survey but were non-females. This led the sample size to 520 participants. From this point, 107

participants were eliminated that only took the demographics section of the survey, along with respondents that did not live in the United States (n = 8). Respondents that completed the survey in an unreasonably fast amount of time were taken out, as their results are likely to be inaccurate. Twenty-five respondents failed the manipulation checks, resulting in deletion of their participation. After all participants were closely filtered, 400 accurate responses were left for data collection and assessment.

Participants

For this study, 400 participants included mothers of elementary students in grades 2nd through 5th who have experienced financial effects of COVID-19 such as furlough, job loss, increased work hours, food insecurity, etc. Measures Food Insecurity To measure food insecurity, this study adopted the CORE Food Security scale (Hamilton, 1997). The CORE Food Security scale consists of an 18-item scale ranging from 1) never true, 2) rarely true, 3) sometimes true, 4) often true, and 5) extremely true, that measures household food security in the last 12 months. An example item was “within the last twelve months I could not afford to feed my child a balanced meal.” The items were summed together, and higher scores reflect greater food insecurity

Child Mental Health

The NICHQ Vanderbilt Assessment Scales are used to measure student mental health problems. The NICHQ Vanderbilt Assessment Scales have subscales of defiance, conduct, anxiety / depression, and ADHD. The current study utilized anxiety / depression, and ADHD subscales. The NICHQ has been one of the leading measures for

determining student mental health (National Institute for Children's Health Quality). The survey is measured on a four-point scale included response of 1) never true, 2) occasionally, 3) often, or 4) very often to determine frequency of symptoms. An example item was, "my child seems fearful, anxious, or worried." The items on each of the respective subscales were summed together for a composite score with higher scores reflecting more severe problems.

Parental Involvement

In this study, parental involvement is measured by using the Parental Involvement: Model Revision Through Scale Development (Walker, 2005). There are multiple subscales of this survey measuring parental self-efficacy, parental perceptions, parental involvement, and parental role construction for involvement in education. For this study, only Appendix A: Parental Role Construction for Involvement in Education, and Appendix F: Time and Energy are used to measure parental involvement in their child's education, and the time spent being involved with the child's school. An example question from Appendix A is, "I believe it is my responsibility to help my child with homework." Appendix F had questions such as, "I have enough time and energy to communicate effectively with my child about the school day." The survey was measures using a 6-point scale ranging from, 1) disagree very strongly, 2) disagree, 3) disagree just a little, 4) agree just a little, 5) agree, 6) agree very strongly. These survey questions provide accurate measures for if, and how frequently the parent is involved in the student's academic life. Items from this section were summed.

Student GPA

The student GPA section consists of questions looking at overall GPA, along with individual subject grades ranking from A to F. Each letter grade was coded and corresponded with a variable, (A=4), (B=3), (C=2), (D=1), and (F=0). The respondents answered for the Fall semester of 2020. In Fall of 2020, some students were back in school, but the majority were online.

Covariates

Assessing Student Medical History

A series of questions addresses the student's past and current medical history. The questions consist of inquiring about anemia, learning disorders, ADHD, anxiety, depression, treatment for any of the above, and current medications. The importance of inquiring about these questions is to make sure that if students are showing symptoms of ADHD, depression, and anxiety we will be able to draw possible connections to food insecurity. Any medication that the student is on may cause the child to not show any of the above symptoms, or slightly suppress them. If the student has a history of exhibiting a learning disorder, food insecurity may not be the direct cause of poorer grades and/or participation. Results from students that answer "yes," or being on medication to control having one of the following: ADHD, depression, anxiety, learning disorder, will be closely looked at and taken into account. Learning disorders were dichotomously coded (1) and not having a learning disorder was coded as (0).

Demographics

Demographic questions included age, gender, marital status, household status, number of children, ethnicity, level of education, location in the United States, annual household income, and employment status.

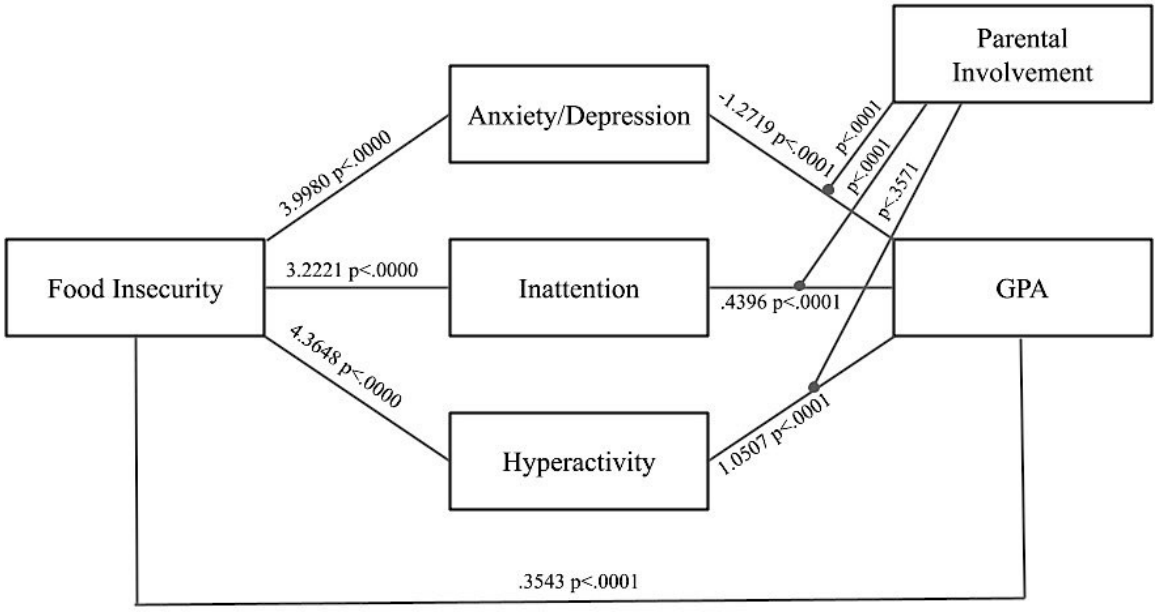
With the remaining data, the information gathered from the survey was coded to see clearer pathways. Participants with a white ethnicity were coded a (1) and all other minorities were coded (0). This is because the overall number of minorities was so large, but each individual ethnic group was a smaller number. The level of education was coded as (0) no education, (1) some education, (2) high school education, (3) bachelor's degree, (4) master's degree, (5) Ph.D., and (6) trade. Employment status was coded as (0) unemployed, and (1) employed. Employment included part-time (1) and unemployed job seekers (0). Marital status was coded (0) for single or dating and (1) for married. This information is important to consider for income purposes. It is also important to note that each family was receiving a stimulus check. Factors that were deemed unimportant such as the age of the mother and geographic location were taken out because there was no visible effect of these on household food insecurity.

CHAPTER V: STATISTICAL ANALYSIS

A multistep approach was used to examine the associations among food insecurity, mental health problems, parental involvement, and GPA. The statistical analysis began by generating the correlations, means, and standard deviation among the study variables. Following the bivariate and descriptive analysis Hayes Macro (Hayes, 2017) was used to examine the moderated mediational model. The hypothesis was based on research into food insecurity affecting GPA, along with implications that mental health serves as a mediator and parental involvement could possibly be a moderated mediation to GPA. Students that live in food-insecure households are likely to have lower GPAs because of poor mental health; however, positive parental involvement could serve as a protective factor resulting in an unchanged or higher GPA. The hypothesis was tested by creating models that compared demographic factors, along with the results of the means from the specific survey questions with student GPA.

CHAPTER VI: RESULTS

Figure 1: Unstandardized Path Coefficients of the Moderated Mediation Model



The bivariate correlations between food insecurity and student GPA are presented in Table 1. The unstandardized path coefficients of the moderated mediation model are presented in Figure 1. Food insecurity was negatively associated with Fall 2020 GPA (r = -.36, p = .89). Food insecurity was positively associated with inattention (r = .70, p =.00), hyperactivity (r = .73, p = .00) and anxiety and depression (r = .78, p = .00). Student mental health and GPA proved to have a significant relationship. Inattention (r = -30, p = . 48) and hyperactivity (r = -.33, p = .04), and Anxiety and depression (r = -.39, p = .04) were negatively associated with GPA. Parental involvement had no significant correlation (r = -.10, p = .76) with GPA. However, with mental health, significance was found between parental involvement and inattention (r = .32, p = .001), as well as

anxiety/ depression (r = -.33, p = .001) as shown in graphs 1 and 2. Higher levels of parental involvement resulted in lower levels of inattention, whereas with anxiety / depression, higher levels of parental involvement resulted in lower GPA.

Table 1: Descriptive Statistics Among Independent, Mediating, Moderating, and Outcome Variables

	1	2	3	4	5	
1. Food insecurity	-					3.31 (.863)
2. Inattention	.696**	-				18.58 (4.323)
3. Hyperactivity	.726**	.821**	-			23.66 (5.557)
4. Anxiety / Depression	.776**	.790**	.807**	-		18.38 (4.857)
5. Parental Involvement	.292**	.295**	.270**	.229**	-	3.55 (1.112)
6. Fall 2020 GPA	-.356**	-.259**	-.325**	-.387**	-0.095	27.79 (4.910)
Note. ^ Correlation is significant at the **p<.01 level						

Figure 2: Parental Involvement and Inattention Interaction

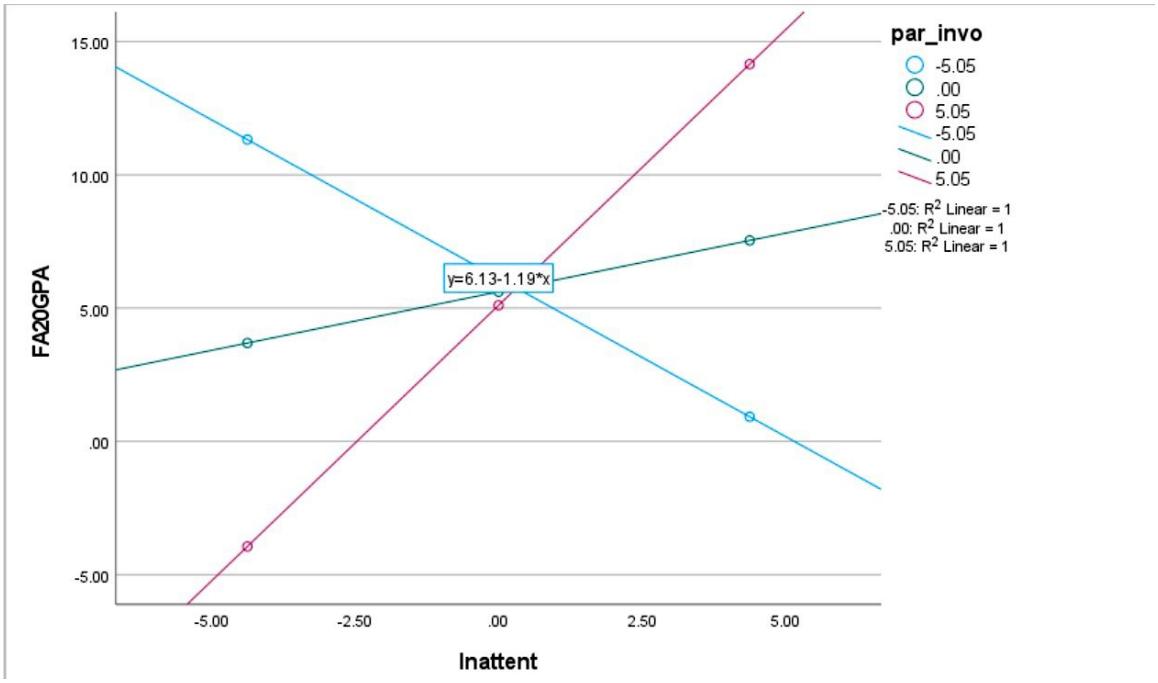
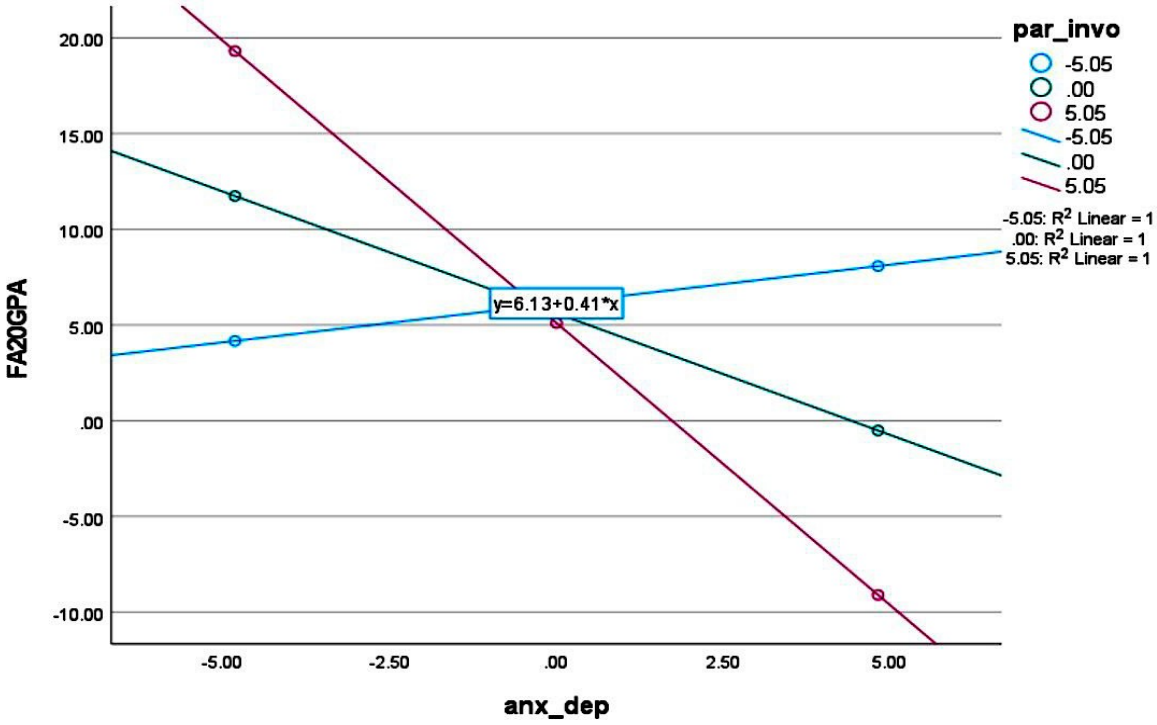


Figure 3: Parental Involvement and Anxiety/Depression Interaction



The effects of the mediation of mental health issues on food insecurity and GPA were observed and are presented in table 2. The results of the mediational model showed that food insecurity was not associated with Fall 2020 GPA (b = .35, p = .89); however, food insecurity was associated with each of the mental health outcomes. Food insecurity was positively associated with inattention (b = 3.22, p < .000) where the higher levels of food insecurity within a household, the higher levels of inattention students reported by mothers. It was found that food insecurity was positively associated with hyperactivity (b = 4.36, p <.001). Food insecurity was also associated with greater anxiety and depression (b = 3.998, p <.001). Regarding student mental health and GPA, there proved to be significant relationships. Inattention was associated with greater GPA (b = .439, p =

.05). Students that have attention problems had a lower GPA. Hyperactivity was positively associated with GPA (b = 1.05, p = .04). Anxiety / depression were also associated with GPA (b = -1.27, p = .04). Regarding the relationship between parental involvement as a protective factor and possible mediator between student mental health and GPA, the relationship was found to be non-significant. The moderating effects of parental involvement linking mental health problems to GPA were non-significant. More specifically, parental involvement did not modify the association between inattention and GPA (b = -3.827, p = .25). Likewise, the effects of parental involvement for hyperactivity (b = 4.48, p = .36) and anxiety and depression and GPA (b = 1.622, p = .10) did not modify the relationship with GPA. The overall test for parental involvement as a moderated mediator between inattention (b = 1.038, p = .85) and GPA, hyperactivity (b = .021, p = .72) and GPA, anxiety / depression (b = -1.329, p = 1.01) and GPA was non-significant.

Table 2: Unstandardized Direct Effects

Predictor	Outcome	Significance (p)	b(SE)
Food Insecurity	GPA	0.89	0.36
Food Insecurity	Anxiety / Depression	0.001	3.998
Food Insecurity	Inattention	0.001	3.22
Food Insecurity	Hyperactivity	0.000	4.36
Anxiety / Depression	GPA	0.04	-1.27
Inattention	GPA	0.05	0.439
Hyperactivity	GPA	0.04	1.05
Parental Involvement	GPA	0.25	-3.827

CHAPTER VII: DISCUSSION

This study sought to understand the relationship and effects of food insecurity during the COVID-19 pandemic on student GPA through symptoms of depression, anxiety, and ADHD. The study hypothesized that student mental health problems would mediate the association between food insecurity and GPA. It was also hypothesized that parental involvement might serve as a moderator between student mental health and GPA. It was found that food insecurity was indirectly associated with lower student GPA through mental health problems. More specifically, the results indicate that higher levels of food insecurity present a strong, positive relationship to inattention, hyperactivity, and symptoms of anxiety and depression. However, the data suggests that mental health is associated with student GPA differently. Higher levels of inattention and hyperactivity contribute to a lower GPA, while anxiety and depression have the opposite effect and resulted in a higher GPA. Parental involvement moderated the relationship between anxiety / depression and inattention but did not moderate the relationship between hyperactivity and GPA.

The results of this study conclude that food insecurity has a significant effect on students' mental health. Looking at the relationship between food insecurity and inattention, it was found that mothers who reported greater levels of food insecurity also reported that their children struggled to pay attention and were more hyperactive. Children who have a diet that does not meet caloric standards, or consumption of food that does not provide the proper nutrients increases the risk for ADHD symptoms (Lu et al., 2019). Symptoms of ADHD in children often are linked to poor dietary intake, on the

contrary, children that meet the dietary recommendations for their age show less symptoms of ADHD (Azadbakht et. al., 2012; Loewen et. Al., 2020). For example, Rongstad (2018) examined the relationship between food insecurity and symptoms of ADHD in young children and found that children living in food insecure households were significantly more diagnosed with ADHD than those who were not at risk for food insecurity.

Food insecurity was also found to have a significant effect on anxiety and depression. Numerous studies have previously shown that greater food insecurity was associated with higher levels of depression (Arenas et al., 2019; Thomas et al., 2019). Diets that are high in saturated fats and refined carbohydrates are directly associated with depressive symptoms (O'Neil, 2014). Amino acids found in nutrient dense diets contribute to the production of serotonin on the brain; therefore, a lack of sufficient nutrients can lead to depression (Markus, 2008). This study is also an advancement on food insecurity research due to the diversity of race, as well as new information about the effects of food insecurity on elementary aged children. Previous studies primarily focus on white students (Smith et al., 2018), as well as college students (Phillips et al., 2018; Maroto et al., 2015).

One of the primary contributions that this study makes is by documenting that there are academic performance implications among children living in households characterized by greater food insecurity. This association was partially explained by children's mental health problems. The hypothesis that food insecurity contributed to a lower GPA through mental health problems such as inattention, hyperactivity, anxiety/depression, but this hypothesis was only partially supported. It was found that

higher levels of inattention and hyperactivity contributed to a lower overall GPA. This is most likely due to the inability to sit still and concentrate with classes being online, difficulties with behavioral issues, cognitive functions, and overall academic impairment (Keilow et al., 2018; CDC, 2021). These attention problems may be exacerbated by the shift to online education due to COVID-19. Contrary to hyperactivity and inattention, anxiety and depression were associated with a higher overall GPA. One explanation for this unexpected finding is that anxiety and depression were measured together, so the unique contributions of anxiety and depression cannot be determined. Most research shows that higher levels of depression lead to a poorer GPA, while several studies have found that higher levels can actually improve GPA (Steinmayr, 2016). Depressed students may hold more negative beliefs about their academic self-efficacy, have little interest in school, or have less energy to put towards learning. Anxiety may actually increase GPA because of students worrying about grades and striving to do well, studying harder, or overapplying themselves to earn higher grades. Another possible explanation is that parents were completing student's schoolwork for them, and they may be more likely to do so if their child was anxious or depressed. During COVID-19, parents were tasked with becoming the primary educator which was an additional stressor for many parents on top of economic, health, and relational stress potentiated by COVID-19 (Said et al., 2020; Smith et al., 2022). Consequently, mothers may have helped their children in a way beyond what would be normally available because of their added role as an educator. The overall results contribute to a clearer understanding of the effects that food insecurity has on mental health and GPA on elementary students, whereas much of the existing literature looks more specifically at the effects on college students.

Parental involvement was found to moderate the relationship between student mental health and student GPA, as represented in Graphs 1 and 2. The relationship between inattention and GPA was found to be moderated by parental involvement such that when parental involvement was low (-1 SD) and at the mean, the relationship between inattention and ADHD did not fluctuate. When parental monitoring was high, even children with high levels of ADHD reported increases in GPA. This could be due to parents offering support, redirecting, and helping the child refocus. The association between symptoms of anxiety/depression and GPA were also found to be moderated by parental involvement. When parental involvement was low (-1 SD), the child's GPA increased. When parental involvement was at the mean level or high (+1 SD) it was found that the association between anxiety/depression and GPA actually decreased. In other words, higher levels of parental involvement may cause additional stress on the child, and the parent may put too much pressure on their student. While previous research shows parental involvement may contribute to a higher GPA by helping with homework through talking about school with their children, providing additional opportunities for learning, or by offering support and encouragement, the results of this study indicate that involvement did influence the relationship between child mental health and academic performance, but in different ways. These findings with anxiety and depression and GPA were in contrast to previous research (Bailey, 2017; Gonzalez-De Hass, 2005) which highlighted that parental involvement is key in student success. This could be attributed to several factors. One possible explanation is that parents may put too much pressure on the student to do well in school. During the COVID-19 pandemic, most schools resulted in online learning, so it is possible that parents could have become less patient and more

irritable with their child because they may have been confused about how to help their child or stressed about becoming their child's primary educator. It may be that parental distress could also lead to higher levels of depression and anxiety in the student. Lastly, as much as mothers would like to shelter their children from any harm, parenting can't overcome the biological issues associated with food insecurity.

CHAPTER VIII: LIMITATIONS

The current study had numerous strengths including contributing to a clearer understanding of the effects that food insecurity has on mental health and GPA on elementary students, and documenting that there are academic performance implications among children living in households characterized by greater food insecurity. However, this study is not without limitations. One major limitation was within the measurement. Anxiety and depression were measured together so it remains unclear why there were associations with greater GPA. Symptoms for anxiety and depression are not always similar and may not produce the same effect on GPA. Further research would be needed to determine individual effects of parental involvement as a moderator between depression and anxiety and GPA. A second limitation is that GPA was measured based on parents reports rather than school records. The use of school records would provide a more precise GPA as parents may only have used estimates. A third limitation is that this study was cross sectional in nature and data was collected from many individuals in a short period of time. Correlations were found between food insecurity, mental health, and GPA; however, these correlations could be further investigated in a longitudinal study.

The final limitation for this study is that only one informant was used for assessment of student mental health. Assessing child perspectives on mental health or parental involvement would enhance the results.

CHAPTER IX: CONCLUSION

In this study, a multistep approach was used to examine possible associations among food insecurity, mental health problems, parental involvement, and GPA. This study indicates that there is a co-occurring relationship between students that live in food-insecure households and lower GPAs, through poor mental health; however, contrary to the hypothesis, parental involvement had no affect and did not serve as a protective factor resulting in an unchanged or higher GPA. Parents that reported higher levels of food insecurity also reported that their child presented symptoms of ADHD, depression and/or anxiety. In turn, students that presented mental health issues also were found to have a lower GPA. While further research is needed to establish clear effects of parental involvement on student mental health, our results are consistent with previous studies and conclude that food insecurity directly affects student mental health, as well as GPA.

APPENDIX A: IRB APPROVAL LETTER

Office *of*
Research Integrity

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

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NOTICE OF INSTITUTIONAL REVIEW BOARD ACTION

The project below has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services regulations (45 CFR Part 46), and University Policy to ensure:

- The risks to subjects are minimized and reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered involving risks to subjects must be reported immediately. Problems should be reported to ORI via the Incident template on Cayuse IRB.
- The period of approval is twelve months. An application for renewal must be submitted for projects exceeding twelve months.

PROTOCOL NUMBER: IRB-21-127
PROJECT TITLE: The Impact of Food Insecurity on Academic Outcomes
SCHOOL/PROGRAM: Child and Family Studies, Curriculum and Instruction
RESEARCHER(S): Kristen Cole, Michael Fitzgerald

IRB COMMITTEE ACTION: Approved
CATEGORY: Expedited
7. Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

PERIOD OF APPROVAL: July 2, 2021

Donald Sacco Jr.

Donald Sacco, Ph.D.
Institutional Review Board Chairperson

REFERENCES

Abramovitch, A., Dar, R., Mittelman, A., & Schweiger, A. (2013). Don't judge a book by its cover: ADHD-like symptoms in obsessive compulsive disorder. Journal of Obsessive Compulsive and Related Disorders, 2(1), 53–61. doi: 10.1016/j.jocrd. 2012.09.001.

Agostoni, C., Nobile, M., Ciappolino, V., Delvecchio, G., Tesei, A., Turolo, S., Crippa, A., Mazzocchi, A., Altamura, C., & Brambilla, P. (2017). The Role of Omega-3 Fatty Acids in Developmental Psychopathology: A Systematic Review on Early Psychosis, Autism, and ADHD. *International Journal of Molecular Sciences*, *18*(12), 2608–. https://doi.org/10.3390/ijms18122608

Alaimo, K., Olson, C. M., & Frongillo, E. A., Jr. (2001). Food insufficiency and American school-aged children's cognitive, academic, and psychosocial development. Pediatrics, 108, 44–53.

American Psychological Association. Anxiety. Available at: http://www.apa.org/topics/anxiety/. Published 2017. Accessed May 4, 2021.

Anbari-Nogyni, Z., Bidaki, R., Madadizadeh, F., Sangsefidi, Z. S., Fallahzadeh, H., Karimi-Nazari, E., & Nadjarzadeh, A. (2020). Relationship of zinc status with depression and anxiety among elderly population. *Clinical nutrition ESPEN*, *37*, 233-239. https://doi.org/10.1016/j.clnesp.2020.02.008

Arenas, D. J., Thomas, A., Wang, J., & DeLisser, H. M. (2019). A systematic review and meta-analysis of depression, anxiety, and sleep disorders in US adults with food insecurity. *Journal of general internal medicine*, *34*(12), 2874-2882. https:// doi.org/10.1007/s11606-019-05202-4

Arnold, L. E., Hodgkins, P., Kahle, J., Madhoo, M., & Kewley, G. (2020). Long-term outcomes of ADHD: academic achievement and performance. *Journal of attention disorders*, *24*(1), 73-85. https://doi.org/10.1177/1087054714566076

Ashiabi, G. S., & O'Neal, K. K. (2008). A framework for understanding the association between food insecurity and children's developmental outcomes. *Child Development Perspectives*, *2*(2), 71-77. https://doi.org/10.1111/j.1750-8606.2008.00049.x

Azadbakht, L., & Esmaillzadeh, A. (2012). Dietary patterns and attention deficit hyperactivity disorder among Iranian children. *Nutrition*, *28*(3), 242-249. https://doi.org/10.1016/j.nut.2011.05.018

Bandura, A., Pastorelli, C., Barbaranelli, C., & Caprara, G. V. (1999). Self-efficacy pathways to childhood depression. *Journal of Personality and Social Psychology, 76*(2), 258–269. https://doi.org/10.1037/0022-3514.76.2.258

Barrett, C. B., Lentz, E., & Burton, L. M. (2013). Hunger and food insecurity. *The Oxford Handbook of Poverty and Society*.

Bauer, L. The COVID-19 Crisis Has Already Left Too Many Children Hungry in America. 6 May 2020. Available online: https://www.brookings.edu/blog/up-front/2020/05/06/the-covid-19-crisis-has-already-left-too-many-children-hungry-in-america/

Benner, A., Boyle, A., & Sadler, S. (2016). Parental Involvement and Adolescents' Educational Success: The Roles of Prior Achievement and Socioeconomic Status. *Journal of Youth and Adolescence*, *45*(6), 1053–1064. https://doi.org/10.1007/s10964-016-0431-4

Boonk, L., Gijselaers, H. J., Ritzen, H., & Brand-Gruwel, S. (2018). A review of the relationship between parental involvement indicators and academic achievement. *Educational Research Review*, *24*, 10-30. https://doi.org/10.1016/j.edurev.2018.02.001

Brännlund, A., Strandh, M., & Nilsson, K. (2017). Mental-health and educational achievement: the link between poor mental-health and upper secondary school completion and grades. *Journal of Mental Health*, *26*(4), 318-325. https://doi.org/10.1080/09638237.2017.1294739

Bruening, M., van Woerden, I., Todd, M., & Laska, M. N. (2018). Hungry to learn: the prevalence and effects of food insecurity on health behaviors and outcomes over time among a diverse sample of university freshmen. International Journal of Behavioral Nutrition and Physical Activity, 15(1), 9. https://doi.org/10.1186/s12966-018-0647-7

Campbell, C. C. (1991). Food insecurity: a nutritional outcome or a predictor variable? *The Journal of nutrition*, *121*(3), 408-415. https://doi.org/10.1093/jn/121.3.408

CDC. (2021, September 23). *Other concerns and conditions with ADHD*. Centers for Disease Control and Prevention. Retrieved December 7, 2021, from https://www.cdc.gov/ncbddd/adhd/conditions.html.

Centers for Disease Control and Prevention. (2021, January 26). What is ADHD? Retrieved April 28, 2021, from https://www.cdc.gov/ncbddd/adhd/facts.html

Center for Disease Control and Prevention. (2021, February 22). Middle Childhood Developmental Milestones. Retrieved July 15, 2021, from https://www.cdc.gov/

ncbddd/childdevelopment/positiveparenting/middle2.html

Chilton, M., Chyatte, M., & Breaux, J. (2007). The negative effects of poverty & food insecurity on child development. *Indian Journal of Medical Research*, *126*(4), 262.

Chorney, D. B., Detweiler, M. F., Morris, T. L., & Kuhn, B. R. (2008). The interplay of sleep disturbance, anxiety, and depression in children. *Journal of pediatric psychology*, *33*(4), 339-348. https://doi.org/10.1093/jpepsy/jsm105

Coffino, J. A., Spoor, S. P., Drach, R. D., & Hormes, J. M. (2021). Food insecurity among graduate students: prevalence and association with depression, anxiety and stress. *Public Health Nutrition*, *24*(7), 1889-1894. doi:10.1017/S1368980020002001

Connell, C. L., Lofton, K. L., Yadrick, K., & Rehner, T. A. (2005). Children's experiences of food insecurity can assist in understanding its effect on their well-being. *The Journal of Nutrition*, *135*(7), 1683-1690. https://doi.org/10.1093/jn/135.7.1683

Crosnoe, R., Mistry, R. S., & Elder, G. H., Jr. (2002). Economic disadvantage, family dynamics, and adolescent enrollment in higher education. Journal of Marriage and Family,64, 690–702. https://doi.org/10.1111/j.1741-3737.2002.00690.x

Currie, J. (2005). Health Disparities and Gaps in School Readiness. *The Future of Children, 15*(1), 117-138. Retrieved April 28, 2021, from http://www.jstor.org/stable/1602665

Dixon LB, Winkleby MA, Radimer KL. Dietary intakes and serum nutrients differ between adults from food-insufficient and food-sufficient families: Third National Health and Nutrition Examination Survey, 1988-1994. Journal of Nutrition 2001;131:1232-46. https://doi.org/10.1093/jn/131.4.1232

Dominguez, L. J., Barbagallo, M., Muñoz-Garcia, M., Godos, J., & Martinez-Gonzalez,

M. A. (2019). Dietary patterns and cognitive decline: Key features for prevention. *Current pharmaceutical design*, *25*(22), 2428-2442. https://doi.org/10.2174/1381612825666190722110458

Edin, K., & Lein, L. (1997). Making ends meet: How single mothers survive welfare and low-wage work. New York: Russell Sage Foundation. https://doi.org/10.2307/3343529

Engin, G. (2020). An Examination of Primary School Students' Academic Achievements and Motivation in Terms of Parents' Attitudes, Teacher Motivation, Teacher Self- Efficacy and Leadership Approach. *International journal of progressive education*, *16*(1), 257-276.

FAO. Trade reforms and food security: Conceptualizing the linkages. Rome: FAO; 2003

Fitzpatrick, K., Harris, C., & Drawve, G. (2020). Assessing US Food Insecurity in the United States during covid-19 pandemic. *Montana*, *34*, 3. https://doi.org/10.1080/19320248.2020.1830221

Food and Agriculture Organization of the United Nations. (2021). *Hunger and Food Insecurity*. Food and Agriculture Organization of the United Nations. http://www.fao.org/hunger/en/.

Friedman, M. (2018). Analysis, nutrition, and health benefits of tryptophan. *International Journal of Tryptophan Research*, *11*, 1178646918802282. https://doi.org/10.1177/1178646918802282

Furstenberg, F., Cook, T., Eccles, J., Elder, G. H., Jr., & Sameroff, A. (1999). Managing to make it: Urban families and adolescent success. Chicago, IL: University of Chicago Press.

Godos, J., Currenti, W., Angelino, D., Mena, P., Castellano, S., Caraci, F., ... & Grosso, G. (2020). Diet and mental health: Review of the recent updates on molecular mechanisms. *Antioxidants*, *9*(4), 346. https://doi.org/10.3390/antiox9040346

Gonzalez-DeHass, A. R., Willems, P. P., & Holbein, M. F. D. (2005). Examining the relationship between parental involvement and student motivation. *Educational psychology review*, *17*(2), 99-123. https://doi.org/10.1007/s10648-005-3949-7

Gregory, C. A., Mancino, L., & Coleman-Jensen, A. (2019). Food security and food purchase quality among low-income households: findings from the National Household Food Acquisition and Purchase Survey (FoodAPS) (No. 1477-2019-3005). 10.22004/ag.econ.292269

Gueldner, B. A., Feuerborn, L. L., & Merrell, K. W. (2020). Social and emotional learning in the classroom: Promoting mental health and academic success. Guilford Publications.

Gustafson, N. (2010). Nutrition and mental health. In Encyclopedia of Mental Disorders. Retrieved http://www.minddisorders.com/Kau-Nu/Nutrition-and-mental-health. html.

Gutierrez, J., Benna, N., Fernandez, K., Shanahan, A., & Cruz, D. (2013). A correlational investigation of the relationships among nutrition-related attitudes and behavior, body mass, and learning and verbal memory performance in college students. *The New School Psychology Bulletin*, *10*(1), 37-43.

Hamilton, W. L., Cook, J. T., Thompson, W. W., Buron, L. F., Frongillo, E. A., Olson, C. M., et al. (1997). Household food security in the United States in 1995: Summary report of the Food Security Measurement Project. Cambridge, MA: Abt.

Hayes, A. F. (2017). Introduction to mediation, moderation, and conditional process

analysis: A regression-based approach. Guilford publications.

Hughes, G., Panjawni, M., Tulcidas, P., & Byrom, N. (2018). Student mental health: The role and experiences of academics. http://hdl.handle.net/10545/622114

Hysenbegasi, A., Hass, S. L., & Rowland, C. R. (2005). The impact of depression on the academic productivity of university students. *Journal of mental health policy and economics*, *8*(3), 145.

Institute of Medicine. (2014). Investing in the health and well-being of young adults. Washington, DC: The National Academies Press. Jackson, D. B., Chilton, M., Johnson, K. R., & Vaughn, M. G. (2019). Adverse childhood experiences and household food insecurity: findings from the 2016 National Survey of Children's Health. *American journal of preventive medicine*, *57*(5), 667-674. https://doi.org/10.1016/j.amepre.2019.06.004

Janice Ke, MSc, Elizabeth Lee Ford-Jones, MD, Food insecurity and hunger: A review of the effects on children's health and behaviour, *Pediatrics & Child Health*, Volume 20, Issue 2, March 2015, Pages 89–91, https://doi.org/10.1093/pch/20.2.89

Jason M Nagata, Hilary K Seligman, Sheri D Weiser, Perspective: The Convergence of Coronavirus Disease 2019 (COVID-19) and Food Insecurity in the United States, *Advances in Nutrition*, 2020, nmaa126, https://doi.org/10.1093/advances/nmaa126

Jeynes, W. H. (2016). A Meta-Analysis: The Relationship Between Parental Involvement and African American School Outcomes. *Journal of Black Studies*, *47*(3), 195– 216.

https://doi.org/10.1177/0021934715623522

Jirout, J., LoCasale-Crouch, J., Turnbull, K., Gu, Y., Cubides, M., Garzione, S., ... & Kranz, S. (2019). How lifestyle factors affect cognitive and executive function and the ability to learn in children. *Nutrients*, *11*(8), 1953. https://doi.org/10.3390/nu11081953

Joan M. T. Walker, Andrew S. Wilkins, James R. Dallaire, Howard M. Sandler, & Kathleen V. Hoover−Dempsey. (2005). Parental Involvement: Model Revision through Scale Development. *The Elementary School Journal*, *106*(2), 85–104. https://doi.org/10.1086/499193

Johnson, J. T., & Su, L. J. Structural Analysis of the Relationship of Food Insufficiency to Disease Risk and Outcomes Among Adults from NHANES III Carol L. Connell, MS, RD Kathy Yadrick, PhD, RD.

Jung, S. E., Kim, S., Bishop, A., & Hermann, J. (2019). Poor nutritional status among low-income older adults: Examining the interconnection between self-care capacity, food insecurity, and depression. *Journal of the Academy of Nutrition and Dietetics*, *119*(10), 1687-1694. https://doi.org/10.1016/j.jand.2018.04.009

Keilow, Maria, Anders Holm, and Peter Fallesen. "Medical treatment of Attention Deficit/Hyperactivity Disorder (ADHD) and children's academic performance." *PloS one* 13.11 (2018): e0207905. https://doi.org/10.1371/journal.pone.0207905

Kim, J. Y., & Kang, S. W. (2017). Relationships between dietary intake and cognitive function in healthy Korean children and adolescents. *Journal of lifestyle medicine*,

7(1), 10. doi: 10.15280/jlm.2017.7.1.10

Khalid, S., Williams, C., & Reynolds, S. (2016). Is there an association between diet and depression in children and adolescents? A systematic review. *British Journal of Nutrition, 116*(12), 2097-2108. doi:10.1017/S0007114516004359

Konofal, E., Lecendreux, M., Arnulf, I., & Mouren, M. C. (2004). Iron deficiency in children with attention-deficit/hyperactivity disorder. *Archives of pediatrics &adolescent medicine*, *158*(12), 1113-1115. doi:10.1001/archpedi.158.12.1113

Koury, A. J., Dynia, J., Dore, R., Logan, J. A., Purtell, K. M., Joy, E., & Salsberry, P. (2020). Food insecurity and depression among economically disadvantaged mothers: Does maternal efficacy matter?. *Applied Psychology: Health and Well−Being*, *12*(2), 432-448. https://doi.org/10.1111/aphw.12191

Lareau, A. (2003). Unequal childhoods: Class, race, and family life. Berkeley, CA: University of California. https://doi.org/10.1525/9780520949904

Larrieu, T., & Layé, S. (2018). Food for mood: Relevance of nutritional omega-3 fatty acids for depression and anxiety. *Frontiers in physiology*, *9*, 1047. https://doi.org/10.3389/fphys.2018.01047

Loewen, O. K., Maximova, K., Ekwaru, J. P., Asbridge, M., Ohinmaa, A., & Veugelers, P. J. (2020). Adherence to life-style recommendations and attention-deficit/ hyperactivity disorder: A population-based study of children Aged 10 to 11 Years. *Psychosomatic medicine*, *82*(3), 305-315. doi: 10.1097/PSY.0000000000000787

Lozoff, B., Jimenez, E., & Smith, J. B. (2006). Double burden of iron deficiency in infancy and

low socioeconomic status: a longitudinal analysis of cognitive test scores to age 19 years. *Archives of pediatrics & adolescent medicine*, *160*(11), 1108-1113. doi:10.1001/archpedi.160.11.1108

Lu, S., Perez, L., Leslein, A., & Hatsu, I. (2019). The relationship between food insecurity and symptoms of attention-deficit hyperactivity disorder in children: a summary of the literature. *Nutrients*, *11*(3), 659. https://doi.org/10.3390/nu11030659

Lund S, Ellingrud K, Hancock B, Manyika J, Dua A. The near-term impact of coronavirus on workers. 2020. [cited 2020 Aug 22]. Available from: https://www.mckinsey.com/industries/public-sector/our-insights/lives-and-livelihoods-assessing-the-near-term-impact-of-covid-19-on-us-workers.

Markus C. R. (2008). Dietary amino acids and brain serotonin function; implications for stress-related affective changes. *Neuromolecular medicine*, *10*(4), 247–258. https://doi.org/10.1007/s12017-008-8039-9

Maroto, M. E., Snelling, A., & Linck, H. (2015). Food insecurity among community college students: Prevalence and association with grade point average. *Community College Journal of Research and Practice*, *39*(6), 515-526. https://doi.org/10.1080/10668926.2013.850758

Martinez, S. M., Frongillo, E. A., Leung, C., & Ritchie, L. (2020). No food for thought: Food insecurity is related to poor mental health and lower academic performance among students in California's public university system. *Journal of health psychology*, *25*(12), 1930-1939. https://doi.org/10.1177/1359105318783028

Maynard, M., Perlman, C., & Kirkpatrick, S. (2019). Food insecurity and perceived anxiety

among adolescents: An analysis of data from the 2009-2010 National Health and Nutrition Examination Survey (NHANES). *Journal of Hunger & Environmental Nutrition*, *14*(3), 339–351. https://doi.org/10.1080/19320248.2017.1393363

McLaughlin, K. A., Green, J. G., Alegría, M., Costello, E. J., Gruber, M. J., Sampson, N. A., & Kessler, R. C. (2012). Food insecurity and mental disorders in a nationalsample of US adolescents. *Journal of the American Academy of Child & Adolescent Psychiatry*, *51*(12), 1293-1303. https://doi.org/10.1016/j.jaac.2012.09.009

McLean, E., Cogswell, M., Egli, I., Wojdyla, D., & De Benoist, B. (2009). Worldwide prevalence of anemia, WHO Vitamin and Mineral Nutrition Information System, 1993–2005. *Public Health Nutrition, 12*(4), 444-454. doi:10.1017/ S1368980008002401

Melchior, M., Chastang, J. F., Falissard, B., Galera, C., Tremblay, R. E., Cote, S. M., & Bolvin, M. (2012). Food insecurity and children's mental health: A prospective birth cohort study. *PLoS One*, *7*(12). doi: 10.1371/journal.pone.0052615

Men, F., Elgar, F. J., & Tarasuk, V. (2021). Food insecurity is associated with mental health problems among Canadian youth. *J Epidemiol Community Health*. http://dx.doi.org/10.1136/jech-2020-216149

Mundy, L. K., Canterford, L., Tucker, D., Bayer, J., Romaniuk, H., Sawyer, S., ... & Patton, G.

(2017). Academic performance in primary school children with common emotional and behavioral problems. *Journal of School Health*, *87*(8), 593-601. https://doi.org/10.1111/josh.12531

Myers, C. A. (2020). Food insecurity and psychological distress: A review of the recent literature. *Current nutrition reports*, *9*(2), 107-118. https://doi.org/10.1111/josh.12531

Najman, J. M., Hayatbakhsh, M. R., Clavarino, A., Bor, W., O'Callaghan, M. J., & Williams, G. M. (2010). Family poverty over the early life course and recurrent adolescent and young adult anxiety and depression: a longitudinal study. *American journal of public health*, *100*(9), 1719-1723. https://doi.org/10.2105/AJPH.2009.180943

National Academies of Sciences, Engineering, and Medicine. 2019. *Monitoring Educational Equity*. Washington, DC: The National Academies Press. https://doi.org/10.17226/25389.

National Institute for Children's Health Quality. (2021, May 18). *NICHQ Vanderbilt Assessment Scales*. NICHQ. Retrieved February 18, 2022, from https://www.nichq.org/resource/nichq-vanderbilt-assessment-scales

National Research Council. (2006). Food insecurity and hunger in the United States: An assessment of the measure. National Academies Press.

Niles, M. T., Bertmann, F., Morgan, E. H., Wentworth, T., Biehl, E., & Neff, R. (2020). Food Access and Security during Coronavirus: A Vermont Study. doi: https://doi.org/10.1101/2020.12.01.20242024

Ntekane, A. (2018). Parental involvement in education. *Research Gate*, *1*, 1-5.

Olson CM, Rauschenbach BS, Frongillo EA, Kendall A. Factors contributing to household food insecurity in a rural upstate New York county. Family Economics Review 1997;10:2-17.

O'Neil, A., Quirk, S., Housden, S., Brennan, S., Williams, L., Pasco, J., Berk, M., & Jacka, F. (2014). Relationship between diet and mental health in children and adolescents: a systematic review. *American Journal of Public Health (1971)*, *104*(10), e31–e42. https://doi.org/10.2105/AJPH.2014.302110

Pagel, J. F., Forister, N., & Kwiatkowki, C. (2007). Adolescent sleep disturbance and school performance: the confounding variable of socioeconomics. *Journal of Clinical Sleep Medicine*, *3*(01), 19-23. https://jcsm.aasm.org/doi/pdf/10.5664/ jcsm.26740

Patton-López, M. M., López-Cevallos, D. F., Cancel-Tirado, D. I., & Vazquez, L. (2014). Prevalence and correlates of food insecurity among students attending a midsize rural university in Oregon. *Journal of nutrition education and behavior*, *46*(3), 209-214. https://doi.org/10.1016/j.jneb.2013.10.007

Payne−Sturges, D. C., Tjaden, A., Caldeira, K. M., Vincent, K. B., & Arria, A. M. (2017). Student hunger on campus: Food insecurity among college students and implications for academic institutions. American Journal of Health Promotion, 32(2), 349–354. https://doi.org/10.1177/0890117117719620

Perez-Escamilla, F., & de Toledo Vianna, R. P. (2012). Food Insecurity and the Behavioral and Intellectual Development of Children: A Review of the Evidence. *Journal of Applied Research on Children*, *3*(1), 9. http:// digitalcommons.library.tmc.edu/childrenatrisk/

Phillips, E., McDaniel, A., & Croft, A. (2018). Food insecurity and academic disruption among college students. *Journal of Student Affairs Research and Practice*, *55*(4), 353-372. https://doi.org/10.1080/19496591.2018.1470003

Poole-Di Salvo, E., Silver, E. J., & Stein, R. E. (2016). Household food insecurity and mental health problems among adolescents: what do parents report?. *Academic pediatrics*, *16*(1), 90-96. https://doi.org/10.1016/j.acap.2015.08.005

Portela-Parra, E. T., & Leung, C. W. (2019). Food insecurity is associated with lower cognitive functioning in a national sample of older adults. *The Journal of nutrition*, *149*(10), 1812-1817. https://doi.org/10.1093/jn/nxz120

Prado, Elizabeth L., Dewey, Kathryn G. Nutrition and brain development in early life, *Nutrition Reviews*, Volume 72, Issue 4, 1 April 2014, Pages 267–284, https://doi.org/10.1111/nure.12102

Rogers, M. A., Wiener, J., Marton, I., & Tannock, R. (2009). Supportive and controlling parental involvement as predictors of children's academic achievement: Relations to children's ADHD symptoms and parenting stress. *School Mental Health*, *1*(2), 89-102. https://doi.org/10.1007/s12310-009-9010-0

Rongstad, R., Neuman, M., Pillai, P., Birstler, J., & Hanrahan, L. (2018). Screening Pediatric Patients for Food Insecurity: A Retrospective Cross-Sectional Study of. *WMJ*, *122*, 30193021.

Rosen, A., Moore, J. (2021, August 23). *The Connection Between Diet and Mental Health*. The Center for Treatment of Anxiety and Mood Disorders. Retrieved January 1, 2022, from https://centerforanxietydisorders.com/diet-and-mental-

health/

Said, F. F., Jaafarawi, N., & Dillon, A. (2021). Mothers' Accounts of Attending to Educational and Everyday Needs of Their Children at Home during COVID-19: The Case of the UAE. *Social Sciences*, *10*(4), 141. https://doi.org/10.3390/socsci10040141

Samoray, C. (2019, May 13). Parental Involvement as a "Protective Factor" for Mental Health. Retrieved March 28, 2021, from https://education.umd.edu/news/03-29-19-parental-involvement-%E2%80%9Cprotective-factor%E2%80%9D-mental-health

Samaan, R. A. (2000). The influences of race, ethnicity, and poverty on the mental health of children. *Journal of Health Care for the Poor and Underserved*, *11*(1), 100-110. https://doi.org/10.1353/hpu.2010.0557

Saraswathy, K. N., Ansari, S. N., Kaur, G., Joshi, P. C., & Chandel, S. (2019). Association of vitamin B12 mediated hyperhomocysteinemia with depression and anxiety disorder: A cross-sectional study among Bhil indigenous population of India. *Clinical nutrition ESPEN*, *30*, 199-203. https://doi.org/10.1016/j.clnesp.2019.01.009

Schanzebach D, Pitts A. *How much has food insecurity risen? Evidence from the Census Household Pulse Survey.* 2020. [cited 2020 Aug 22]. Available from: https://www.ipr.northwestern.edu/documents/reports/ipr-rapid-research-reports-pulse-hh-data-10-june-2020.pdf.

Shank, D. B. (2016). Using crowdsourcing websites for sociological research: The case of Amazon Mechanical Turk. The American Sociologist, 47(1), 47-55. https://doi.org/10.1007/s12108-015-9266-9

Share Our Strength (2013). The crisis of childhood hunger. Retrieved from https://www.nokidhungry.org/problem/over- view

Smith, D., Thompson, C., Harland, K., Parker, S., & Shelton, N. (2018). Identifying populations and areas at greatest risk of household food insecurity in England. *Applied Geography*, *91*, 21-31. https://doi.org/10.1016/j.apgeog.2017.12.022

Smith, J. (2022). From “nobody's clapping for us” to “bad moms”: COVID−19 and the circle of childcare in Canada. *Gender, Work & Organization*, *29*(1), 353-367. https://doi.org/10.1111/gwao.12758

Steinmayr, R., Crede, J., McElvany, N., & Wirthwein, L. (2016). Subjective well-being, test anxiety, academic achievement: Testing for reciprocal effects. *Frontiers in psychology*, *6*, 1994. https://doi.org/10.3389/fpsyg.2015.01994

Tamm, L., Loren, R. E., Peugh, J., & Ciesielski, H. A. (2021). The association of executive functioning with academic, behavior, and social performance ratings in children with ADHD. *Journal of Learning Disabilities*, *54*(2), 124-138. https:// doi.org/10.1177/0022219420961338

Tapper-Gardzina, Y., & Cotunga, N. (2003). The Kids Café: A program to reduce child hunger. J*ournal of Pediatric Health Care,* 1*7,* 18–21. https://doi.org/10.1067/mph. 2003.30 Thomas, M. M., Miller, D. P., & Morrissey, T. W. (2019). Food insecurity and child health. *Pediatrics*, *144*(4). https://doi.org/10.1542/peds.2019-0397

Thompson, K. (2021, June 21). *Teaching Elementary-age Kids Responsibility*. ClimbtheLadder. Retrieved January 2, 2022, from https://climbtheladder.com/ teaching-elementary-age-kids-responsibility/

University of California Davis. (n.d.). *Lesson 9 – Nutrition and Academic Success*. Retrieved January 1, 2022, from https://cns.ucdavis.edu/sites/g/files/dgvnsk416/files/inline-files/fof_lesson_9_final.pdf

U.S. Census Bureau. Custodial mothers and fathers and their child support: 2015. Updated February 2020.

U.S. Census Bureau. (2020, August 26). Schooling During the Covid-19 Pandemic. Retrieved May 01, 2021, from https://www.census.gov/library/stories/2020/08/schooling-during-the-covid-19-pandemic.html

Walker, J., Wilkins, A., Dallaire, J., Sandler, H., & Hoover−Dempsey, K. (2005). Parental Involvement: Model Revision through Scale Development. *The Elementary School Journal, 106*(2), 85-104. doi:10.1086/499193

Weng, T., Hao, J., Qian, Q., Cao, H., Fu, J., Sun, Y., . . . Tao, F. (2012). Is there any relationship between dietary patterns and depression and anxiety in Chinese adolescents? *Public Health Nutrition, 15*(4), 673-682. doi:10.1017/ S1368980011003077

Wisconsin Child Welfare Training System. (2012). *Developmental Stages of Infants and Children*. Retrieved March 17, 2022, from https://fostercareresources.files.wordpress.com/2014/12/developmental-stages-of-infants-and-children.pdf

Woerden, I., Hruschka, D., & Bruening, M. (2019). Food insecurity negatively impacts academic performance. *Journal of Public Affairs*, *19*(3), https://doi.org/10.1002/ pa.1864

Woodhouse, A., & Mark, A. (2012). The relationship of food and academic performance: A preliminary examination of the factors of nutritional neuroscience, malnutrition, and diet adequacy. *Christian Perspectives in Education*, *5*(1), 1. https://

digitalcommons.liberty.edu/cpe/vol5/iss1/1

Wyatt, T. J., Oswalt, S. B., & Ochoa, Y. (2017). Mental Health and Academic Performance of First-Year College Students. *International Journal of Higher Education*, *6*(3), 178-187. http://www.sciedupress.com/ijhe

Yavari, H., Motlagh, A. D., Kermani, F. R., & Qorbani, M. (2018). Food insecurity and some associated socioeconomic factors among children with Attention Deficit Hyperactivity Disorder in Tehran: a case control study. *Journal of Nutritional Sciences and Dietetics*, *4*(3).

Zepeda, L. (2018). Hiding hunger: food insecurity in middle America. *Agriculture and human values*, *35*(1), 243-254. https://doi.org/10.1007/s10460-017-9818-4

Zhu, Y., Chen, X., Zhao, H., Chen, M., Tian, Y., Liu, C., ... & Qin, S. (2019). Socioeconomic status disparities affect children's anxiety and stress-sensitive cortisol awakening response through parental anxiety. *Psychoneuroendocrinology*, *103*, 96-10