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THE RELATIONSHIPS BETWEEN FOOD SECURITY STATUS, FOOD INSECURITY COPING STRATEGIES, AND DEPRESSION AMONG SINGLE FEMALE CAREGIVERS

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A THESIS APPROVED FOR THE

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Table of Contents

CHAPTER 1: INTRODUCTION vi
Background 1
Purpose of Study 5
Research Questions 5
Significance 7
Delimitations 8
Assumptions 8
Operational Definitions 8
CHAPTER 2: REVIEW OF LITERATURE 11
Overview of Food Insecurity in the US 11
Food Insecurity Among Single Female Caregivers 12
Health Implications of Food Insecurity 13
Dietary and Related Implications 13
Psychological and Mental Health Implications 15
Food Insecurity Coping Strategies 18
Categorizing Food Insecurity Coping Strategies 21
Policy Level Food Insecurity Coping Strategies 24
Community Level Food Insecurity Coping Strategies 26
Interpersonal Level Food Insecurity Coping Strategies 27
Intrapersonal Level Food Insecurity Coping Strategies 28
CHAPTER 3: METHODOLOGY 31
Research Design 31
Sample and Recruitment 31
Data Collection 33
Measures 33
Food Insecurity Coping Strategies. 34
Depression (CES-D-10) 38
COVID-19 39
Sociodemographic Controls 40
Data Analysis 40
CHAPTER 4: RESULTS 42
Participant Sociodemographic Information 42
Key Study Variables 47

Food Security Status 47
Coping Strategies 47
CESD-10 53
Research Q1 54
Research Q2 55
Policy Coping Strategies 55
Community Coping Strategies 56
Interpersonal Coping Strategies 57
Intrapersonal Coping Strategies 57
Research Q3 60
Policy Coping 60
Community Coping 61
Interpersonal Coping 61
Intrapersonal Coping 62
CHAPTER 5: DISCUSSION 66
Discussion 66
Implications 70
Future research 71
Limitations 71
Conclusions 72
References 73
Appendix A: Missing Data for Key Variables 96
Appendix B: Food Insecurity Coping Questions and Answer Frequencies 97
Policy Coping Index 97
Community Coping Index 97
Interpersonal Coping Index 98
Rationing Scale (Intrapersonal) 98
Tradeoffs Scale (Intrapersonal): 99
Shopping Strategies Scale (Intrapersonal) 100
Appendix C: Bivariate Correlations 101
Appendix D: RQ3 Linear Regression with All Variables 103
Appendix F: Sample Survey 104

Abstract

Background: Food insecurity is an ongoing problem in the United States. Certain groups, such as single females heading a household tend to be disproportionately impacted. This study examines food security status among single female caregivers of children and investigates the relationships between food security status, depression, and various food insecurity coping strategies.

Methods: Cross-sectional survey data was collected among a convenience sample of single female caregivers (n=94). The survey included measurements assessing food security status, various food insecurity coping strategies, depression, and sociodemographic variables. We examined the relationships between key variables using a series of linear and logistic regressions.

Results: Depressive symptoms were high among our sample, with over 70% of participants surpassing the scale's cutoff for likely depression. There was a significant relationship between higher levels of food insecurity and increased depressive symptomology after controlling for sociodemographic controls ($p = .004$). We also found that higher levels of food insecurity were associated with use of more community, interpersonal, and intrapersonal coping strategies (p-values $< .05$). Greater use of community coping, interpersonal coping, and shopping and tradeoffs (intrapersonal) coping strategies were associated with increased depressive symptoms (p-values $< .05$).

Conclusion: The high rates of food insecurity and depression among our sample reiterates the need for further study and intentional interventions among single female caregivers. Examining food insecurity coping strategies may provide deeper insight into understanding food insecurity as well as help to clarify the relationship between food insecurity and depression.

CHAPTER 1: INTRODUCTION

Background

The national prevalence of household food insecurity in the US was 10.2% in 2021 (Coleman-Jensen et al., 2022). This represents 13.5 million households that indicated they were food insecure at some point during the year (data gathered in December of 2021) (Coleman-Jensen et al., 2022. Although food insecurity affects many households in the US, it disproportionately affects certain demographic groups more than others. For example, in 2021, 26.5% of households below 185% of the poverty threshold were food insecure (Coleman-Jensen et al., 2022). Higher rates of food insecurity than the aforementioned national average were also shown for households headed by single fathers (16.2%), non-Hispanic Black (19.8%), and Hispanic households (16.2%) (Coleman-Jensen et al., 2022). Among households headed by a single female caregiver, rates of food insecurity reached 24.3% (Coleman-Jensen et al., 2022). These rates of food insecurity exceed the 6% target in the Healthy People 2030 objectives (Office of Disease Prevention and Health Promotion, n.d.).

Healthy People 2030 established reducing food insecurity as a national goal, indicating the salient influence that food insecurity can have on people's health and wellbeing. Food insecurity is consistently shown to be associated with a variety of negative physical and mental health outcomes, such as increased rates of diabetes, obesity, depression among women, chronic disease, and poor self-reported health (Holben & Pheley, 2006; Huddleston-Casas et al., 2009; Seligman et al., 2007; Siefert et al., 2001; Stuff et al., 2004; Vozoris & Tarasuk, 2003). These adverse physical and mental health outcomes are particularly concerning for single female caregivers given that they experience disproportionately high rates of food insecurity (Coleman-Jensen et al., 2022) and have been found to report of lower levels of social support and more chronic stress, depression, and anxiety when compared to their married peers (Cairney et al.,

2003; DeKleyen et al., 2006; Liang et al., 2019; Maclean et al., 2004). M. A. Martin & Lippert (2012) found that food insecure single mothers were at an increased risk of being overweight or obese in comparison to their married or cohabiting peers and single food-insecure fathers. Food insecurity has been associated with higher odds of having a mental illness or mental health diagnosis, with even greater odds for women, single parent households, and those reporting stress and social isolation (M.S. Martin et al., 2016; Muldoon et al., 2013). Many studies have reported associations between depression and food insecurity among females, but more research is needed among subpopulations, such as single caregivers, who may be particularly vulnerable to adverse mental health outcomes linked to food insecurity due to the intersection of multiple risk factors (Maynard et al., 2018).

One potential explanation for how food insecurity plays a role in this association is the way that households utilize food insecurity coping strategies. Some studies have highlighted the importance of understanding the utilization of food insecurity coping strategies as a source of stress and cognitive burden (Anater et al., 2011; Edin et al., 2013; Kinsey et al., 2019; Seligman & Berkowitz, 2019). The management of food resources may take up a significant amount of time and mental energy and reduce one's abilities to focus on other important tasks or goals (Edin et al., 2013; Kinsey et al., 2019; Seligman & Berkowitz, 2019). However, little research has been done to examine whether there are differences in mental health based on the food insecurity coping strategies a household employs.

Households at risk of food insecurity typically employ a variety of coping strategies to prevent and manage hunger (Feeding America, n.d.) and to maximize their resources. Although food insecurity is not necessarily an indication of hunger, some studies have reported that parents, especially mothers, tend to deprive themselves of either high quality food or a sufficient

quantity of food to ensure their children have what they need (M. A. Martin & Lippert, 2012; McIntyre et al., 2003; Olson, 2005). Various food insecurity coping strategies have been commonly noted in food insecure households, such as pawning items to pay for food; stretching food by limiting amounts eaten; buying more inexpensive, calorie dense foods; and postponing payment of a bill to buy food (Anater et al., 2011; Kempson et al., 2003; Weinfield at al., 2014). Other coping strategies utilized in food insecure households may increase or marshal social support and social cohesion, which have been demonstrated to reduce the risk of food insecurity among samples of women and mothers (Ashe & Lapane, 2018; King, 2017). For example, in their study among Supplemental Nutrition Assistance Program (SNAP) users, Kinsey et al. (2019) emphasized the importance of participants' dependence on social support when coping with food insecurity—participants reported relying on those around them to get through the month. Other coping strategies linked to social support and cohesion include planting a garden, attending a church fellowship dinner, or sharing a meal with friends and family (Kempson et al., 2003; King, 2017; Pinard et al., 2016). Although the relationship between food insecurity and depression among women has been well established and summarized in the literature (Maynard et al., 2018), less is known about *why* this relationship exists. In order to develop effective intervention strategies and reduce food security and the associated adverse mental health outcomes, further research is needed to clarify the relationship between food security status, use of food insecurity coping strategies, and depression among single female caregivers.

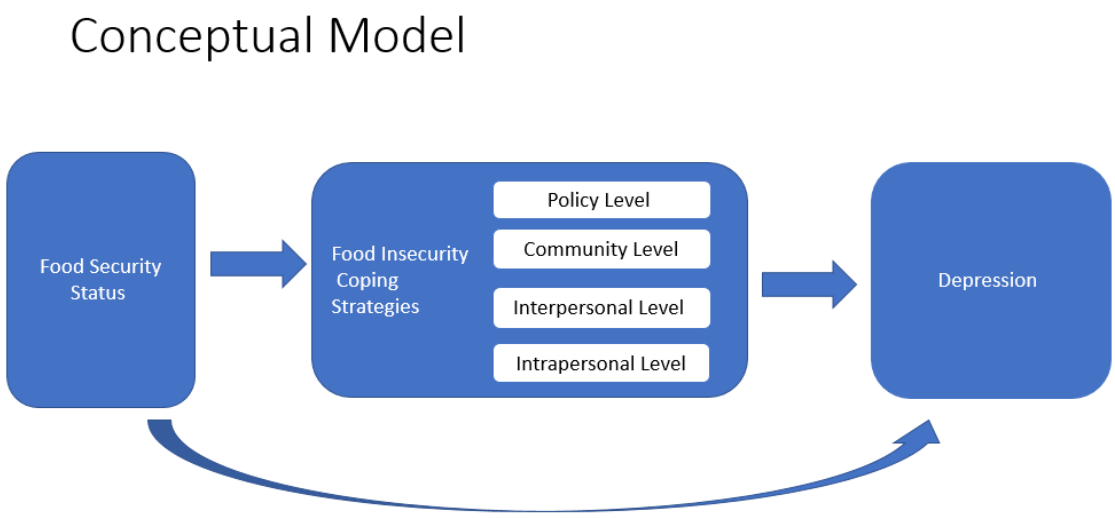
To better understand and conceptualize relationships between food security status, food insecurity coping strategies, and depression among single female caregivers, a simplified version of the Transactional Model of Stress and Coping and the Social Ecological Model (SEM) will be

used (see conceptual model below). The Transactional Model of Stress and Coping (Lazarus & Folkman, 1984) is built on the idea that when individuals are facing stressful events, they first evaluate and appraise the situation and then make efforts to cope with their circumstances. The ways that they cope have implications for the outcomes of the coping process such as their psychological well-being, health behaviors, and health outcomes (Glanz et al., 2015). This study focuses on the constructs and relationships within the Transactional Model of Stress and Coping most relevant to our research questions: stressors (food insecurity), coping (food insecurity coping strategies), and the related outcome (mental health), as illustrated in the conceptual model below.

This study will also utilize the SEM to provide a framework for the way that food insecurity coping strategies are examined and discussed. The SEM is based on Urie Bronfenbrenner's (1992) ecological systems theory. Ecological models are built on the idea that there are various interconnected levels of influence that impact a person's lifestyle, health behaviors, and ultimately health: intrapersonal, interpersonal, organizational, community, physical environment, and public policy (Glanz et al., 2008, p. 466).

Accordingly, the SEM provides predefined categories that allow for a more comprehensive examination of food insecurity coping strategies. It can serve as a guide to identifying primary prevention leverage points to facilitate improved nutrition and mental wellbeing among single female caregivers who suffer from food insecurity. Seligman and Berkowitz (2019) discuss the importance of understanding food insecurity coping strategies as behavioral responses to food insecurity, which in turn impact health outcomes of individuals and populations; they utilize a social-ecological type framework for organizing their discussion of coping strategies. In their discussion, food insecurity coping strategies fell into the

following categories: individual, household, community, and policy and systems strategies. They suggested that many of the individual and household level coping strategies utilized have the potential to pose health and nutritional risks yet are often employed before people turn to policy-level coping strategies like participation in the Supplemental Nutrition Assistance Program (SNAP) (Seligman & Berkowitz, 2019), a pattern also reported by Mammen and colleagues (2009).



Purpose of Study

The purpose of this study was to investigate food insecurity coping strategies utilized by single female caregivers and to further understand the relationships between food security status, food insecurity coping strategies spanning multiple levels within the social-ecological framework (i.e. policy, community, interpersonal, intrapersonal), and depression among this population. This study was based on primary data collection using a survey and drawing from a convenience sample of single female caregivers aged 18-65 in the US.

Research Questions

Research Question 1: Is there a relationship between level of food security and depression among single female caregivers?

H_1: There is a significant positive relationship between food security status and depression among single female caregivers, with higher levels of food insecurity associated with higher indicators of depressive symptoms

H_0: There is no significant relationship between food security status and depression among single female caregivers

Research Question 2: Are there associations between food security status and the use of a variety of food insecurity coping strategies reflecting the different levels within the social-ecological framework among single female caregivers?

H_1: Level of food security is negatively associated with utilizing policy level food insecurity coping strategies, with a lower level of food insecurity associated with use of a greater number of policy level coping strategies

H_2: Level of food security is positively associated with utilizing community level food insecurity coping strategies, with a higher level of food insecurity associated with use of a greater number of community level coping strategies

H_3: Level of food security is negatively associated with utilizing interpersonal level food insecurity coping strategies, with a lower level of food insecurity associated with use of a greater number of interpersonal coping strategies

H_4: Level of food security is positively associated with utilizing intrapersonal level food insecurity coping strategies, with a higher level of food insecurity associated with use of a greater number of intrapersonal coping strategies

$H_{01\text{-}04:}$ There is no significant association between food security status and the use of policy level, community level, interpersonal level, or intrapersonal level coping strategies

Research Question 3: Are there relationships between the use of food insecurity coping strategies reflecting the social-ecological framework and depression among single female caregivers?

H_1: There is a significant negative association between the use of policy-level food insecurity coping strategies and depression, with the use of a greater number of policy-level coping strategies associated with less depressive symptomology

$H_{2:}$ There is a significant positive association between the use of community level food insecurity coping strategies and depression, with the use of a greater number of community level coping strategies associated with more depressive symptomology

$H_{3:}$ There is a significant negative association between the use of interpersonal level food insecurity coping strategies and depression, with the use of a greater number of interpersonal coping strategies associated with less depressive symptomology

$H_{4:}$ There is a significant positive association between the use of intrapersonal level food insecurity coping strategies and depression, with the use of a greater number of intrapersonal coping strategies associated with more depressive symptomology

$H_{01\text{-}04:}$ There are no significant relationships between the use of policy level, community level, interpersonal level, or intrapersonal level coping strategies and depression

Significance

While the various food insecurity coping strategies utilized by households in the US have been described and conceptually categorized in the literature (Anater et al, 2011; Kempson et al.,

2003; Parker et al., 2007; Wood et al., 2009), calls have been made for more attention to the unique vulnerabilities of food insecure females, especially female caregivers (Ivers & Cullen, 2011; Olson, 2005). This study builds on these bodies of research by providing insight on the potential consequences of food insecurity and associated coping strategies reflecting multiple levels within the social-ecological framework for the mental wellbeing of a group that experiences a disproportionate amount of food insecurity—single female caregivers. Moreover, by better understanding the varied and diverse ways in which single female caregivers are coping with food insecurity, policymakers and community health workers can tailor programs and policies to meet the unique needs of this population. This research may also illuminate shortcomings in existing programs and provide direction for improvement.

Delimitations

The delimitations of this study are that surveys were conducted among single female caregivers ages 18 to 65. They had to be the primary caretaker of at least one child under the age of 18 that lived with them at least 50% of the time. The convenience sample was largely drawn from central Indiana and the greater Oklahoma City area.

Assumptions

Study assumptions are that self-report survey questionnaires were answered honestly, and that social desirability did not impair the accuracy of the survey results. We assumed that participants understood the questions asked and answered accordingly. This study also assumed that participants would be conscious of the food insecurity coping strategies that they utilize. However, certain behaviors may not have been reported for those who utilize these coping strategies unconsciously or habitually (Edin et al., 2013)

Operational Definitions

Food insecurity: "Food insecurity exists whenever the availability of nutritionally adequate and safe foods or the ability to acquire acceptable foods in socially acceptable ways is limited or uncertain." (Anderson, 1990, p. 1560)

Hunger: "An individual-level concept...should refer to a potential consequence of food insecurity that, because of prolonged, involuntary lack of food, results in discomfort, illness, weakness, or pain that goes beyond the usual uneasy sensation" (National Research Council, 2006, p. 48)

Food Insecurity Coping Strategies: These strategies are framed and described in a variety of ways throughout the literature. For the purposes of this study, food insecurity coping strategies refer broadly to the various behaviors employed to avoid food insecurity, manage the impact of food insecurity, or prevent all or select household members from experiencing hunger. These strategies are used by household heads to provide by 1) obtaining more food and 2) stretching their existing food resources (Kempson et al., 2003). Though food insecurity can lead to hunger, those who are food insecure do not necessarily experience hunger, perhaps in part due to the effectiveness of coping strategies employed to avoid it. Unfortunately, some food insecurity coping strategies can be detrimental to the health of those who utilize them (Holben & Marshall, 2017). Some households utilizing food insecurity coping strategies may not meet the identified thresholds indicating food insecurity, as their use of these strategies helps them to avoid food insecurity (Bezuneh & Yiheyis, 2020; Edin et al., 2013).

Levels of food security: Food security status is often categorized using four distinct levels (Economic Research Service, 2021b, "Ranges" section):

1) High food security: "no reported indications of food-access problems or limitations"
2) Marginal food security: "one or two reported indications—typically of anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in

diets or food intake”

3) Low food security: “reports of reduced quality, variety, or desirability of diet. Little or no indication of reduced food intake”

4) Very low food security: “reports of multiple indications of disrupted eating patterns and reduced food intake”

Single female caregivers: single (unmarried, separated, divorced, or widowed) females who are and are the primary caregivers of one or more children under the age of 18. This includes women who may not be the biological mother, but are the primary caregiver, such as an aunt, grandmother, or adoptive mother.

CHAPTER 2: REVIEW OF LITERATURE

The purpose of this study was to investigate a diverse range of food insecurity coping strategies utilized by single female caregivers and to further understand the relationships between these strategies, food security status, and depression among this population. This literature review begins with a discussion of food insecurity and its prevalence in the US, followed by a discussion of its related health consequences, especially mental health consequences. Throughout, special attention will be paid to how food insecurity disproportionately impacts single female caregivers. Following this, literature about food insecurity coping strategies will be discussed, including description and discussion of the Social Ecological Model (SEM) and how food insecurity coping strategies fit into policy, community, interpersonal, and intrapersonal levels.

Overview of Food Insecurity in the US

In 2021, the national prevalence of household food insecurity in the US was 10.2% (Coleman-Jensen et al., 2022), which surpassed the objective set by Healthy People 2030 of a 6% national food insecurity rate (Office of Disease Prevention and Health Promotion, n.d). Food insecurity can vary in duration, presenting a more permanent problem for some households while being more temporary or sporadic for others (Economic Research Service, 2021c). While one fourth of very low food secure households have infrequent bouts of food insecurity, lasting for one or two months of the year, approximately one fourth of food insecure households and one third of very low food secure households experience chronic food insecurity (Economic Research Service, 2021c). On average, households that are food insecure or very low food secure experience food insecurity 7 months out of the year (Economic Research Service, 2021c). In a qualitative study, Nieves and colleagues (2021) noted that households struggling with more

chronic food insecurity tended to have children or participate in SNAP; participants discussed how the end of the month was consistently a lean time for their households (Nieves et al., 2021).

The causes of food insecurity are complex, with a strong connection between poverty and food insecurity as evidenced by the high percentage of food insecure homes with income below 185% of the poverty line (Coleman-Jensen et al., 2022). And yet, income does not fully explain level of food security (Coleman-Jensen, 2011; Gundersen & Gruber, 2001; Nord, 2000). Other factors that have been discussed as contributors to food insecurity are employment status and kinds of employment (DeMarco et al., 2009; United States Conference of Mayors, 2016), unexpected events that put sudden strain on the budget (Bartfeld & Collins, 2017; DeMarco et al., 2009; Gundersen & Gruber, 2001), and location of residence (Coleman-Jensen et al., 2022; Dean & Sharkey, 2011). Household composition has also been discussed as an important factor in food insecurity—with children living in a married biological parent or stepparent homes at least risk for food insecurity, and single parent homes having elevated rates of food insecurity (Balistreri, 2018; Coleman-Jensen et al., 2022).

Food Insecurity Among Single Female Caregivers

While food insecurity impacts many Americans, rates are not evenly distributed throughout the US population. Households led by a single female experience particularly high rates of food insecurity. In their national report about food security in the US, Coleman-Jenson and colleagues (2022) discussed the groups which experience higher rates of food insecurity than the national average. For households with a non-Hispanic Black or Hispanic respondent, food insecurity rates were 19.8% and 16.2%, respectively (Coleman-Jensen et al., 2022). Households headed by a single man (16.2%) also significantly exceed the national average for food insecurity (Coleman-Jensen et al., 2022). Notably, households with children headed by a single

female experienced food insecurity at a higher rate than these other demographic groups with rates of food insecurity at 24.3% (Coleman-Jensen et al., 2022).

Economically, single mothers are consistently at a disadvantage, with income levels lower than both single fathers and the average US household (Lu et al., 2020). Instability in employment and schedule may also play a role in their elevated rates of food insecurity; the odds of food insecurity among single parents was associated with whether their job provided a routine schedule and hours (Coleman-Jensen, 2011). Single mothers may also fall through the cracks among certain food assistance programs, especially community programs. For example, Kempson et al. (2003) found that some mothers reported feeling overlooked by organizations that would deliver food to elderly or shut-in populations without extending these services to other clients who might benefit from them (p. 184). Single female caregivers are an important group to consider (Ivers & Cullen, 2011) as they are disproportionately susceptible to income disparity, food insecurity and several of its associated negative health outcomes.

Health Implications of Food Insecurity

The following sections will examine the negative health outcomes that have been linked to food insecurity, with an emphasis on studies that discuss the implications for women, and when available, single mothers.

Dietary and Related Implications

Those who are food insecure have been found to have worse diets than those who are food secure (Mousa & Freeland-Graves, 2019). For example, among a sample of parents, the food insecure were 3–4 times more likely to report fruits and vegetables being too expensive to buy (Bruening et al., 2012). In their review of dietary outcomes related to food insecurity, Hanson & Connor (2014) also reported that adults who were food insecure were more likely to

consume fewer fruits, vegetables, and dairy, as well as have reduced intakes of nutrients such as vitamin A and B-6, calcium, magnesium, and zinc when compared to food secure adults. Several studies have found food insecurity to be associated with higher rates of diabetes (Holben & Pheley, 2006; Seligman et al., 2007; Vozoris & Tarasuk, 2003), which may be due, in part, to the dietary deficiencies associated with food insecurity (Seligman et al., 2007).

These disparities in diet may be exacerbated among single female caregivers. For example, one study with low-income single mothers found that mothers were likely to sacrifice the quantity and quality of their own diets to ensure that their children had enough food to eat (McIntyre et al., 2003). One review reiterated the presence of this pattern among food insecure mothers more generally, discussing how it is a tendency of female caregivers to make these trade-offs for the benefit of their children (Olson, 2005). Tarasuk and colleagues (2007) reported that food insecure female caregivers in their sample had significant declines in the quality of their diet over the course of a month as resources ran out.

Several studies have shown a significant relationship between food insecurity and obesity, especially among women (Ashe & Lapane, 2018; Bruening et al., 2012; Holben & Pheley, 2006; Townsend et al., 2001) M. A. Martin & Lippert (2012) suggested that the gendered pressures of parenting and providing food for their families played a role in the increased risk for obesity among food insecure mothers. In their study investigating the relationship between food insecurity and obesity among women, they found that food insecure mothers were at greater risk for overweight and obesity when compared to food insecure fathers or men and women without children. Within the group of mothers, single mothers were at higher risk of being obese or overweight than married or cohabiting mothers (M.A. Martin & Lippert, 2012). In their recent study, Taylor et al., (2021) came to a similar conclusion, reporting that among their sample of

low-income mothers and fathers, women were more likely to report sacrificing their food intake to ensure that their children ate. They concluded that this pattern may play a role in the disproportionate vulnerability of women to obesity related to food insecurity (Taylor et al., 2021).

Psychological and Mental Health Implications

Besides affecting dietary quality and related health outcomes, food insecurity is believed to be a threat to social and mental health. Among a sample of public housing residents, food insecurity was associated with higher ratings of perceived stress, more personal problems (e.g., concern about being able to get credit), and lower social support (Quintaliani et al., 2021). Jessiman-Perreault & McIntyre (2017) reported that risk of adverse mental health outcomes increased with level of household food insecurity among a sample of adults in Canada. Stuff et al., 2004 reported that among a sample of adults in the Mississippi Delta, those who lived in food insecure households were more likely to have low scores on a general mental health measure.

The association between food security status and mental health has been explored using a variety of mental health measures (Maynard et al., 2018). For example, studies have examined distress (Laraia et al., 2006), mastery (Heflin et al., 2005), self-esteem (Laraia et al., 2006), anxiety (Laraia et al., 2006), or more general mental health (Lent et. al., 2009; Mathews et al., 2010) and their relationships to food security among female populations. The most frequently studied mental health outcome has been depression (Maynard et al., 2018). There are various ways to assess depression, with some measures intended to suggest likelihood of a clinical depression diagnosis and others assessing depressive symptomology more generally. One example of the latter is the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977), which has been commonly used in female populations to examine associations between

food security status and mental health. Because of its wide use, and therefore opportunities for comparison of results, the CES-D instrument will be used to assess the mental health of single female caregivers in this study. A psychometrically-validated CES-D short form will be used to reduce participant burden. In the following discussion, studies using other measures will also be discussed to provide a more complete picture of how food insecurity may impact a variety of mental health outcomes.

There is a robust body of literature that has shown an association between food insecurity and depression among females and single mothers (Heflin et al., 2005; Huddleston-Casas et al., 2009; Siefert et al., 2001; Vozoris & Tarasuk, 2003; Zekeri, 2010). Whitaker et al., (2006) found that among their sample of mothers, the rate of mothers with a generalized anxiety disorder or occurrence of a major depressive episode went up as severity of food insecurity increased. Food insecurity has also been associated with higher odds of having a mental health diagnosis, with even greater odds for women and single parent households (Muldoon et al., 2013). Tarasuk and colleagues (2013) found that the presence of chronic mental and physical illnesses seemed to predict food insecurity. Longitudinal studies conducted recently have also suggested that among samples of low-income mothers, depression and other mental health diagnoses were predictive of food insecurity (Garg et al., 2015; Lombe et al., 2018). It is likely that the relationship between food insecurity and poorer mental health outcomes is bi-directional (Huddleston-Casas et al., 2009; Reesor-Oyer et al., 2021). While the study by Reesor-Oyer and colleagues seems to suggest that the association may be stronger for depression impacting food insecurity (2021), the study by Huddleston-Casas and colleagues (2009) likely suggests the reverse. For the purposes of this study, we chose to investigate the impact of food insecurity on depression in order to

explore the potential of food insecurity as a risk factor for depression among single female caregivers and also a potential focus of intervention for this vulnerable group.

Outside of the discussion of food security status, many studies have shown that compared to their married peers, single mothers consistently have worse mental health outcomes. When compared to married mothers, single mothers have reported lower overall health and indicated worse mental wellbeing across various measures such as anxiety, depression, stress, and feeling overloaded (Crosier et al., 2007; Liang et al., 2019; Maclean et al., 2004; Rousou et al., 2013) Cairney and colleagues (2003) reported that "compared to married mothers, single mothers were more likely to have suffered an episode of depression, to report higher levels of chronic stress… single mothers also reported lower levels of perceived social support, social involvement, and frequency of contact with friends and family than married mothers" (p.442). DeKleyen et al., (2006) reported a similar disparity when examining indicators of mental health among various family types, with unmarried individuals reporting the highest incidences of mental health problems. While comparing the health and mental health of single and partnered mothers, two studies suggest that these disparities in health are largely due to the decreased social support and financial adversity that single female caregivers often face (Crosier et al., 2007; Rousou et al., 2013).

A variety of factors have been discussed as possibly influencing relationships between food insecurity and adverse mental health outcomes. These include social support (Kollannoor-Samuel, 2011), lack of adequate nutrition (Heflin et al., 2005), and psychological distress associated with food shortage (Heflin et al., 2005; Maynard et al., 2018). Heflin et al. (2005) discusses how for women in food insecure households, stress may be an important aspect of understanding the cause of depression. One consideration that has not been explored extensively

in the literature is how the use of food insecurity coping strategies impact mental health (Liebe et al., 2022). Utilizing a variety of food insecurity coping strategies can require mental energy and attention from caregivers, perhaps imposing additional stress (Anater et al., 2011; Edin et al. 2013, Seligman & Berkowitz, 2019). In their study examining the coping strategies used by mothers during the SNAP cycle, Kinsey et al. (2019), discusses the importance of considering the mental strain that household heads face when managing resources and attempting to make ends meet. Kinsey and colleagues state that "the vigilant rationing required to stretch SNAP benefits over the monthly benefit cycle is a key example of the cognitive burden imposed by monthly volatility in resources" (2019, p. 6).

Food Insecurity Coping Strategies

Food insecurity coping strategies are the various behaviors employed to avoid food insecurity, manage the impact of food insecurity, or prevent all or select household members from experiencing hunger. Although these strategies are commonly discussed in the food insecurity literature, much of the research has been qualitative. Many of these studies have focused on capturing the breadth and variety of strategies used by households in the US (Ahluwalia et al., 1998; DeMarco et al., 2009; Hoisington et al., 2002; Kempson et al., 2003; Quandt et al., 2004). For example, Kempson et al. (2003) interviewed limited-resource residents in New Jersey, who reported 95 strategies for acquiring and managing food resources. These strategies ranged from participation in federal programs such as SNAP and Head Start, trading forms of public assistance, budgeting, pawning personal or household items, selling blood, accessing multiple food pantries, shopping for low-cost foods, removing mold or slime from foods before eating them, or limiting one's own eating to allow others in the household to eat. DeMarco and colleagues (2009) reported that their respondents' discussions of coping strategies

followed a few major themes: food stretching and the use of alternate food sources such as a garden, utilizing public assistance programs such as SNAP or WIC, utilizing private nutrition assistance such as food pantries, and relying on the social support of family and friends or a faith community.

Building on the insights from qualitative studies, quantitative studies have sought to ascertain which behaviors are the most common among low-income and food insecure populations (Anater et al., 2011; Pinard et al., 2016; Weinfield et al., 2014; Wood et al., 2009). In their study, Anater and colleagues (2011) asked about the use of 78 different coping strategies and examined which strategies were used most commonly among emergency food pantry users in New Jersey. Over three quarters of their sample reported that they prepared meals with inexpensive ingredients and purposefully bought on sale or cheap foods. Over half of their sample reported avoiding buying expensive foods, using coupons for food, eating meals at other people's homes, and skipping meals. Just under half of their sample (43%) reported that they were currently using SNAP. In the Hunger in America study, Weinfield and colleagues (2014) reported on the prevalence of food insecurity coping strategies among their sample of client households of various Feeding America programs. The purchase of inexpensive, unhealthy food in order to feed their families was a strategy utilized by 79% of the households surveyed and 84% of households with children. Over half of their sample also reported eating foods past their expiration date, receiving help from friends or family, and making choices between food and various other necessities. Just over half (55%) of their sample reported currently using SNAP (Weinfield et al., 2014).

A few studies have focused on the use of coping strategies among female samples and single female caregivers. McCurdy and colleagues (2015) examined how food security status and

shopping strategies used by low-income mothers related to BMI. They reported that greater use of shopping strategies to stretch food dollars, household food insecurity, and use of community food programs were associated with increased BMI. Stevens (2010) qualitatively examined food insecurity and food insecurity coping strategies among a sample of young single mothers, aged 15–24. These young mothers discussed various ways that they managed and accessed food resources for their household. A common theme was that they prioritized feeding their children, which sometimes meant skipping a meal for themselves. They also utilized federal resources such as SNAP and WIC, went to local food banks, bought low-cost foods with a long shelf life for the end of the month, and asked for help from family members. In a mixed-methods study, Zekeri (2007) examined coping strategies and depression among a sample of predominantly African American single mothers in rural Alabama. This study revealed that these mothers commonly utilized strategies such as relying on federal programs like SNAP, receiving informal assistance from family or absent fathers or boyfriends, utilizing community resources such as churches or food banks, and stretching food by making smaller and cheaper meals. The author noted that less than half (44%) of participants reported participation in SNAP. Non-participants noted that they were uncertain about their eligibility, felt that applying for benefits was not worth the hassle, or felt stigma around receiving government assistance (Zekeri, 2007).

Several studies have looked at coping strategies as they relate to the level of food insecurity severity for the household. Most of these studies suggest that the more severe the household's level of food insecurity, the greater the number of coping strategies they will use (Bartfield & Collins, 2017; Crespo-Bellido et al., 2020; Mayer et al., 2016; Pinard et al., 2016; Wood et al., 2007). Yet, among their sample of SNAP participants, Edin et al. (2013) found that many families who measured as food secure also reported regular use of food insecurity coping

strategies. Some of the households with the most severe food insecurity reported using fewer coping strategies than other households due to a lack of time, since many coping strategies require planning and attention to manage (Edin et al., 2013). Bezuneh & Yiheyis (2020) also noted that some households in their study measured as food secure yet reported a variety of cost cutting strategies in order to provide food for their household. More research is needed, particularly to provide insight into how different kinds of food insecurity coping strategies relate to food security status.

Food insecurity coping strategies have been organized and categorized in several different ways. Anater and colleagues (2011) compiled behaviors previously reported in qualitative studies to create a quantitative survey inquiring about the prevalence of 78 of coping strategies among a low-income sample in New Jersey. They then categorized the various strategies by the type of risk that they posed: nutrition, physical, food safety, financial, illegal/regulatory, or none known. Wood and colleagues (2009) conceptualized hunger-coping strategies as either internal or external to the household behaviors. Internal coping strategies are those that households employ when they have some amount of money to buy food and relate to how they utilize that money, while external coping strategies refer to the ways that households sought resources outside the home when money ran out. Similarly, several other studies have used social-ecological types of models to organize and guide their discussions of coping strategies and other factors related to food insecurity (Hanson et al., 2016; Mammen et al., 2009; Seligman and Berkowitz, 2019).

Categorizing Food Insecurity Coping Strategies

The Social Ecological Model (SEM) is a useful framework for understanding how health outcomes, such as mental health, are affected by influences located at many different levels of

influence (Glanz et al., 2015). The models commonly used are largely based on groundwork laid by Urie Bronfenbrenner (1979) and his development of the Ecological Systems Theory. This theory was put forth as a way of understanding human development and categorized influences on the person into their microsystem, mesosystem, and the exosystem (Bronfenbrenner, 1979). In 1988, McLeroy and colleagues developed an ecological model to be applied to health promotion programs. Their model introduced the levels that are generally seen in most SEM used in health promotion today: intrapersonal factors, interpersonal factors, institutional factors, community factors, and public policy (McLeroy et al., 1988). Although the levels of influence included can vary based on the field and application, ecological models are based on the same principle—individuals' behaviors are impacted by multiple interrelated influences across multiple levels (Glanz et al., 2015).

The SEM has been widely used in health promotion. It has been used to provide understanding of a broad spectrum of health topics such as firearm safety (Durkin et al., 2020), violence prevention (Centers for Disease Control and Prevention, 2022), screen time and sedentary behavior (Kaur et al., 2019; Saquib,2018) physical activity (Fleury & Lee, 2006; Hu et al., 2021; Lee & Park 2021; Nelson et al., 2010; Soderlund, 2017), child obesity and obesity prevention (Jernigan et al., 2018; Naja-Riese et al., 2019; Ohri-Vachaspati et al., 2015). It has also been used to guide discussions of food insecurity (Goldberg & Mawn, 2015; Schroeder & Smaldone, 2015). Based on their literature review, Schroeder & Smaldone (2015) make recommendations for how nurses can address food insecurity among patients at societal, community, and individual levels, while Goldberg and Mawn (2015) use the ecological model to organize and analyze factors that influence food insecurity.

Not only has the SEM been applied to a variety of topics, but the way it has been used has varied. Studies have used it to structure and conceptualize planning for interventions (Centers for Disease Control and Prevention, 2022; Saquib, 2018), to discuss the effectiveness of interventions (Brothers et al., 2020; Jernigan et al., 2018; Naja-Riese et al., 2019), to provide structure for data analysis (Lee & Park, 2021), and retrospectively in review articles to organize discussions of the various levels of influence on a behavior (Fleury & Lee, 2006; Hu et al., 2021; Nelson et al., 2010).

Given the purpose of its development and prior uses, the SEM is a plausible means of conceptualizing the various coping strategies used by food insecure families. It can provide insight into the ways that these households navigate their environments to cope with or avoid food insecurity. Providing structure for the discussion of food insecurity coping strategies using the SEM or a similar type of framework is not uncommon in the literature (Hanson et al., 2016; Mammen et al., 2009; Seligman and Berkowitz, 2019).

Although the SEM is most typically applied to thinking about influences on behavior from multiple different levels, this study applies it to the *utilization* of resources by individuals at multiple different levels. Another deviation of this study from a traditional conceptualization of the SEM was the exclusion of an institutional level. This is not unprecedented, as the CDC utilizes a four-level model (societal, community, relationship, and individual) in their discussion of violence prevention (Centers for Disease Control and Prevention, 2022). Four levels (household, social network, community, and government) were also used by Hanson and colleagues in their coding of the food insecurity coping strategies used by their sample (2016). It seemed that the use of four levels for this study (intrapersonal, interpersonal, community, and policy) more accurately reflected the frequency and consistency with which various coping

strategies were discussed and assessed in the literature (Crespo-Bellido et al., 2021; Edin et al., 2013; Kempson et al., 2003; Pinard et al., 2016; Wood et al., 2009).

Policy Level Food Insecurity Coping Strategies

There are a variety of policy level coping strategies available for the use of those who meet the eligibility criteria, often based on income and other demographic factors. Those using these strategies may access federally funded nutrition assistance programs, which provide food resources that many US households rely upon (Economic Research Service, 2021a). Two of the largest programs are the Supplemental Nutrition Assistance Program (SNAP) and the Special Supplemental Nutrition Assistance Program for Women, Infants, and Children (WIC; Economic Research Service, 2021a). Twenty-five percent of SNAP households are those with children and headed by a single adult. This accounts for 61 percent of US households with children that participate in SNAP (Cronquist, 2019). The WIC program is designed for low-income women at nutritional risk who are pregnant, breastfeeding, or postpartum (Food and Nutrition Service, n.d.). Another program, the National School Lunch Program, offers free and reduced-price meals for children meeting certain eligibility criteria (Food and Nutrition Service, 2017). Children in households with incomes at or below 130% of the poverty threshold are eligible for free lunches and those in households at or below 185% are eligible for reduced price lunches. Some children may be "categorically" eligible, such as children whose families participate in SNAP, homeless children, and foster children (Food and Nutrition Service, 2017).

Another federal program that households may have utilized to provide food was Advance Child Tax Credits. As part of the American Rescue Plan, these payments were early installments adding up to about half of the amount of the Child Tax Credit that a household could claim on their 2021 tax return (Internal Revenue Service, 2021). The payments were received monthly

from July through December of 2021 (Internal Revenue Service, 2022). In their analysis of data from the US Census Bureau Pulse Survey, the Center on Budget and Policy Priorities (n.d.) reported that 59% of low-income households reported spending their Child Tax Credit Payment from the past 30 days on food.

In addition to providing financial support and needed food resources to households, participation in federal assistance programs may provide health and mental health benefits to their participants. For example, the use of SNAP has been associated with greater probability of very good or excellent self-assessed health ratings, better disease control among food insecure diabetics, and mental health benefits such as decreased psychological distress (Gregory & Deb, 2015; Mayer et al., 2016; Oddo & Mabli, 2015).Yet, participation in these federal programs does not always alleviate food insecurity (Bezuneh & Yiheyis, 2020; Mathews et al., 2010; Quintaliani et al., 2021; Swanson et al., 2008). Kinsey et al. (2019) reported that among their sample of mothers receiving SNAP benefits, many of them ran out before the end of the month and had to rely on other coping strategies to get through. This pattern of variation in food availability throughout the month, with food scarcity being the most severe at the end of the month, has been noted as a common problem for those participating in monthly allotment programs such as SNAP (Calloway et al., 2015; Hamrick & Andrews, 2016; Kinsey et al., 2019). In fact, due to results from a re-evaluation, the USDA recently made changes to the Thrifty Food Plan, which is used to calculate SNAP benefit allotments. This change resulted in an additional $36.24 per person, per month, beginning October 1, 2021 (United States Department of Agriculture, 2021). It is unknown what impact these changes will have on the use and need for other coping strategies employed within the household.

While these programs are available for a variety of households, not everyone is eligible, and eligibility criteria vary from program to program. It is important to note that the measurement of policy coping strategies captured those who reported *using* these programs, with the reference group of non-users not distinguishing between those who were ineligible and those were eligible but not enrolled.

Community Level Food Insecurity Coping Strategies

In addition to the policy level coping strategies of participation in federal assistance programs, households may cope by accessing community level resources such as food banks, food pantries, soup kitchens, or meals/foods from faith-based institutions. These community resources vary in the ways that they operate and what they provide to their clients. Food banks are typically distribution centers that take in donations, recovered retail products, or government commodities, and then distribute them to other programs in the community where the items can be accessed by those who need them (An et al., 2019; Ohls et al., 2002; Regional Food Bank of Oklahoma, 2021). For example, the Regional Food Bank of Oklahoma distributes food to a network of associated programs ranging from senior mobile markets to summer feeding programs for children to food pantries (Regional Food Bank of Oklahoma, 2021). Food pantries provide groceries to their clients and typically operate in one of two ways: a "traditional" system which offers a pre-arranged allotment of groceries, or a choice food pantry, which allows clients to select what they want from the pantry offerings (Remley et al., 2013). About two-thirds of pantries place some limitation on how often they can be visited (commonly one visit per month), and some pantries may monitor who may use the pantry, often based on income eligibility or residing within a specified service area (Ohls et al., 2002). Soup kitchens offer prepared meals to community members; they are commonly associated with religious organizations and tend to

exist in metropolitan areas (Ohls et al., 2002). The number of meals per week varies from kitchen to kitchen, but approximately one-third serve one meal a week, while more than 50 percent of emergency kitchens report serving 4 or more meals per week (Ohls et al., 2002).

Feeding America, one of the largest networks providing community level assistance, estimated that their network of partner agencies provided meals or groceries to 1 in 7 people in the US (Weinfield et al., 2014), highlighting the importance of these programs in providing support to food insecure or at-risk families. Increasing attention has been given to food banks and food pantries as important intervention points for improving the quality of life, nutrition, and food security of their clients (An et al., 2019; Barone et al., 2020; Long et al., 2019; K.S. Martin et al., 2013). A common concern is that food pantries do not provide foods that are nutritionally adequate for their clients (Simmet et al., 2017). In contrast to this, one recent study found that more frequent accessing of food pantries was associated with higher Healthy Eating Index scores (Liu et al., 2019). Although utilizing community food programs may be a useful and even beneficial strategy for coping with food insecurity, many households continue to report needing to supplement this with other food insecurity coping strategies to provide for their households (Weinfield et al., 2014; Wood et al., 2007).

Interpersonal Level Food Insecurity Coping Strategies

Another common means of coping is through reliance on social networks and relationships with friends or relatives outside of the home to provide help in some way (Crespo-Bellido et al., 2021; DeMarco et al., 2009; Edin et al, 2013; Kinsey et al., 2019; Weinfield et al., 2014). For example, some households may participate in food sharing, borrowing money for food, or eating at friend or family member's house when resources are scarce (Edin et al., 2013; Kempson et al., 2003). DeMarco and colleagues (2009) emphasized the importance of these

social resources among low income and food insecure families in Oregon, reporting that social isolation was likely a contributor to food insecurity among their sample.

King (2017) also emphasized how important social support can be for food security, reporting that social capital reduced the risk of becoming and remaining food insecure as well as being important for escaping food insecurity. This protective effect of social support and social contact was also described by Wu & Schimmele (2005). They found that social resources not only reduced the likelihood of being food insecure, but that social resources seemed to decrease the negative impact that food insecurity had on depression among those in their sample (Wu & Schimmele, 2006). Unfortunately, reported levels of social support tend to be lower both among single female caregivers and those who are food insecure (Cairney et al., 2003; Rousou et al., 2013). When compared to married peers, single mothers more commonly reported that they lacked social support, which was linked to higher reports of stress, anxiety, and depression (Liang et al., 2019). Social support has also been found to be lower among food insecure women, with one study reporting that, compared to food secure women, food insecure women were 80% less likely to report having strong social support (Ashe & Lapane, 2018). K.S. Martin and colleagues (2004) reported that among their sample of low-income households, greater social capital reduced the odds of being severely food insecure.

Intrapersonal Level Food Insecurity Coping Strategies

Intrapersonal coping strategies are those related to the caregiver's management of factors within their own lives and households. Some common examples of these strategies include pawning items for money, gardening, buying bulk or inexpensive foods, budgeting, making trade-offs between various bill and expenses to have money for food, or stretching food by meal skipping or limiting intake (Kempson et al., 2003; Pinard et al., 2016; Weinfield et al., 2014). A

few studies have suggested that some of these individual level strategies such as budgeting and planning meals, gardening, or stretching meals may be effective in protecting the family from food insecurity (Edin et al, 2013; Olson et al., 2004), yet concerns about the vigilance required and strain that may result from balancing all of these strategies remain (Kinsey et al., 2019; Seligman & Berkowitz, 2019). A variety of these intrapersonal level strategies may also pose nutritional, financial, or other kinds of risk to the household, such as eating low-cost foods or postponing a bill payment to buy food (Anater et al., 2011).

Summary

Food insecurity in the United States is an important public health issue to address (Holben & Marshall, 2017; Seligman & Berkowitz, 2019) both due to its continued high prevalence (Coleman-Jensen et al., 2022) and association with various health problems (Holben & Marshall, 2017). Women, and especially single female caregivers, have a unique set of challenges related to food insecurity that require consideration (Ivers & Cullen, 2011). Single female caregivers experience food insecurity at disproportionately high rates (Coleman-Jensen et al., 2022), which may put them at increased risk for poor mental wellbeing and other adverse outcomes linked with food insecurity.

Understanding how food insecurity coping strategies are utilized provides important insight into the behavioral aspects of coping with food insecurity that may contribute to or protect against adverse outcomes associated with food insecurity (Pinard et al., 2016; Seligman & Berkowitz, 2019). Very few studies have examined these coping strategies among single female caregivers in the US (Stevens, 2010; Zekeri, 2007) or how they relate to mental wellbeing (Liebe et al., 2020). This study seeks to address these gaps in the literature by examining food

insecurity coping strategies from a SEM perspective among single female caregivers, how they vary by food security status, and how they relate to depression among this population.

CHAPTER 3: METHODOLOGY

The purpose of this study was to investigate food insecurity coping strategies utilized by single female caregivers and to further understand the relationships between food security status, food insecurity coping strategies spanning multiple levels (i.e., policy, community, interpersonal, intrapersonal), and depression among this population. The following section of this paper describes the research design, sampling, measures, and statistical methods used to answer the research questions.

Research Design

This cross-sectional study consisted of a self-administered written survey. The survey was administered both online using Qualtrics or as a paper copy. It consisted of questions about relevant sociodemographic information in addition to a combination of questions and psychometrically sound scales to measure food security status, food insecurity coping strategies, and depression. The survey was 81 questions long and took approximately 15 to 20 minutes to complete. Incentives of a 5-dollar Walmart gift card were offered to all participants once they completed the survey.

Sample and Recruitment

The study sample was a convenience sample of single (i.e., unmarried, divorced, separated, or widowed) female caregivers. Eligibility criteria included being between the ages of 18 and 65 and the primary caregiver for one or more child under the age 18 who lived with them at least 50% of the time. Participants were English speaking and able to read and write in English. It is worth noting that participation was not restricted to biological mothers so that legal guardians such as aunts or grandmothers were included.

An a priori power analysis was run to estimate the required sample size before the study began. Although there were limited quantitative studies utilizing validated scales to examine a

breadth of coping strategies and their relationship to other relevant variables in this study, we identified a study that had bivariate correlations between food security status and two food insecurity coping scales used in the current study (Pinard et al., 2016). We ran an a priori power analysis with their provided effect sizes (.627 for rationing scale and .518 for tradeoffs scale) and using a .05 Type I error and 80 percent power. These analyses provided a needed sample size of 17 and 26, respectively. Since the effect sizes initially used were for a bivariate correlation that did not account for covariates, another power analysis was run using a more conservative estimate of the medium effect size (.3). The sample size estimates for this a priori power analysis indicated the need for completed surveys from 84 participants.

Participants were recruited using a variety of strategies, with a regional focus on Oklahoma and Indiana. We reached out to over 75 organizations, businesses or social media groups in order to make connections and inquire about the possibility of recruiting through them. Some organizations did not respond while others responded that they were unable to assist. For those able and willing to help, strategies varied based on how the organization or business ran and what they felt comfortable doing. Some organizations such as WIC offices, community or social service centers, libraries, and food pantries agreed to post flyers or pass out flyers to their clients. Digital flyers were also posted on social media sites, especially Facebook groups for mothers. Other organizations allowed us to attend local events for in-person recruitment such as farmer's markets, food pantries, health fairs, community nights, and church recreational events (approx. 25 or more events attended). At these events, we spread the word about the study and administered the survey for those interested in taking it at that time. We also received contact information for those interested who wanted to take the survey later online. Pre-existing

organizations were key contacts to spread the word about the study among their clients, and to provide ideas or connections for further recruitment opportunities.

Data Collection

Data collection began May of 2022 and continued until April of 2023, after undergoing review from the University of Oklahoma's IRB. Interested participants were directed by flyers to reach out by phone or email to the study director who then provided the link to an online Qualtrics survey. The survey was password protected and included reCAPTCHA to ensure that bots were unable to take the survey and therefore protect the quality of the data. Informed consent was completed by each participant after screening and before accessing the full survey. In-person survey delivery was also available to participants at various community locations and events such as food pantries, farmers markets, and women's when invited by the staff at these locations. The researcher provided the survey using a QR code or as paper copies for the participants to take the survey. Pens used to take the survey were sanitized between uses. Of the 94 surveys for enrolled participants, 43 were taken on paper (1 over the phone, 2 reading assisted) and the remaining 51 were taken online on Qualtrics. The number of completed surveys (not including those with sizable missing data) was regularly assessed to ensure the power analysis requirements were achieved.

Measures

Food Security Status. The 10-item US Adult Food Security Survey Module (AFSSM) was used to assess the food security status of caregivers (Economic Research Service, 2012). All questions were asked in reference to the past 12 months. The measure consisted of 10 questions. Three questions provided response options often true, sometimes true, never true or don't know as answers to questions like "I worried whether our food would run out before I got money to buy

more". Another three questions are answered with a yes, no, or don't know, asking, for example, "Did you lose weight because there wasn't enough money for food?". The format of the last questions and their responses were slightly altered for survey flow based on the work of Bartfeld & Collins (2017). One of them asked "In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food", with response options yes, almost every month, yes, some months but not every month, yes, only 1 or 2 months, no, and don't know. Responses of "yes," "often," "sometimes," "almost every month," and "some months but not every month" are considered affirmative responses (Economic Research Service, 2012). Responses of "don't know" were coded as missing (Bickel et al., 2000). The affirmative responses to the 10 items were then summed, with no affirmative answers indicating high food security, 1–2 affirmative answers indicating marginal food security, 3–5 affirmative answers indicating low food security, and 6–10 affirmative answers indicating very low food security (Economic Research Service, 2012). Food security status was categorized into these four levels based on responses to the AFSSM. For the missing values within this scale, we used the complex direct imputation model as recommend by Bickel and colleagues (2000) in the USDA Guide to Measuring Household Food Security.

Food Insecurity Coping Strategies.

The use of **policy level food insecurity coping strategies** were assessed by asking binary response questions about caregiver's use of various federal programs in the last 12 months. The questions about SNAP and WIC receipt were drawn from the Food Security Supplement (Economic Research Service, 2020). A follow-up question to affirmative responses to use of SNAP asked about the number of weeks into the month the benefits lasted. This item was used in the Hunger in America survey (Weinfield et al., 2014) and later by Calloway et al., (2015) to

assess monthly SNAP benefit duration. Questions about children's eligibility for and receipt of free or reduced-cost meals at school or Head Start programs was also asked, using a slightly altered version of questions asked by the Food Security Supplement (Economic Research Service, 2020). Use of Advance Child Tax Credit for food was assessed by asking "In the past 12 months, did you or anyone in your household receive a 'Child Tax Credit' payment, that is an advance payment from the expansion of the child tax credit as part of the Federal Government's 2021 American Rescue Plan?" (United States Census Bureau, 2021). A modified follow up question was asked "Thinking about your use of the payments from the "Child Tax Credit" did you…" with response options "used most of it to purchase food for the household", "used some of it purchase food for the household", "used a little of it to purchase food for the household", or "used none of it to purchase food for the household". For this question, an indication of using any of the Child Tax Credit on food was considered utilizing this policy level strategy. For analysis, responses to questions for each strategy were coded as yes (1) and no (0) and summed to produce and index of the number of policy level strategies used (0-4).

The use of **community level food insecurity coping strategies** were assessed by asking a variety of binary response questions. A question drawn from the work of Bartfeld and Collins (2017) asked, "Did you receive food from a food pantry, church, or other place that provides food at no cost to families in need?" One question asked about growing fruits and vegetables in a community garden (Bartfeld & Collins, 2017; Pinard et al., 2016), and another about whether the respondent had attended community events just to eat food (Pinard et al., 2016). Lastly, we used a question drawn from the Food Security Supplement - "In the last 12 months, did you ever eat any meals at a soup kitchen or shelter?" (Economic Research Service, 2020). For analysis,

responses to each question were coded as yes (1) and no (0) and summed to produce and index of the number of community level strategies used (0-4).

To assess **interpersonal strategies of food insecurity coping**, binary response questions were asked. The questions, which were slightly modified versions of questions asked in the 1995 Food Security Supplement, were "In the last 12 months, did you ever get food from friends or family", "In the last 12 months, did you ever borrow money for food from friends or family?" and "In the last 12 months, did you ever send or take your children to the homes of friends or relatives for a meal because you were running out of food?" (Economic Research Service, 1995; Niles et al., 2020). An additional question was asked, "In the last 12 months, did you receive information from friends or family about where to access free or reduced-price food?", based on the work of Kempson and colleagues (2003) and Wood and colleagues (2009). For analysis, responses to each question will be coded as yes (1) and no (0) and summed to produce and index of the number of interpersonal level strategies used (0-4).

Three scales were used to assess **intrapersonal food insecurity coping behaviors** in order to capture a broad range of the strategies commonly described in the literature. We utilized a shopping practices scale developed by McCurdy and colleagues (2015) and the trade-offs and rationing coping scales developed by Pinard and colleagues (2016).

The 8-item Food Shopping Practices scale was created by McCurdy and colleagues (2015) and focused on the food shopping practices used by a household to stretch money for food. They developed the scale through pilot surveys and focus groups with low-income mothers and it demonstrated acceptable internal reliability (Cronbach's alpha = .71). The reliability was also adequate in this study's sample (Chrobach's alpha = .824).

Likert type response options for the Food Shopping Practices scale ranged from 1 (never) to 4 (often), for items like "in the last 30 days, how often have you gone to 2 or more stores to find cheaper food". Responses were summed, with scores ranging from 8–32, and then averaged, producing a final scale score of 1-4, with a higher score indicating frequent use of many of the shopping strategies. Since missing data for this scale was minimal, using the scale mean for each participant was determined to be an appropriate way of dealing with missing values (McCurdy et al., 2015). Due to the abnormal distribution of scores for this scale, we recoded it as a binary variable of above and below the sample mean (3.3375; below= ref)

The tradeoffs and rationing coping scales were developed by Pinard et al. (2016) based on preexisting literature on food insecurity coping strategies (Anater et al., 2011; Kempson et al., 2003; Wood et al., 2007; Weinfield et al., 2014) and were tested among a low-income sample of caregivers. The trade-offs scale consists of 5 Likert type response questions with response options ranging from (1) "never" to (5) "always". Answers indicate how frequently the respondent faced having to choose between paying for food or another household expense throughout the month. For example, one question asks, "how often during the past month did you have to choose between paying for food or paying for medicine or medical care?". Responses were summed and then averaged, with a higher score indicating greater use of tradeoff strategies (scores ranging 1-5).

The rationing coping scale asks 5 yes/no questions that are summed to produce a continuous variable from 0–5. The scale consists of questions like "have you locked up or hidden food to save it?" and "have you avoided inviting guests to your home when you would be expected to serve them food?". Higher scores for this scale indicated use of more of these coping strategies.

The tradeoffs scale was shown to have good internal consistency, with a Cronbach's alpha value of .85 (Pinard et al., 2016); the Cronbach's alpha for this study's.sample was .902. Pinard and colleagues reported that the rationing coping scale indicated adequate internal consistency using the Kuder-Richardson method, with a value of .74. Construct validity was confirmed by running Spearman's correlations between the two scales, with significant correlations between them (Pinard et al., 2016). Content validity was also confirmed by a significant correlation between the each of the scales and the USDA's 6-item short form food security measure (Pinard et al., 2016).

Depression (CES-D-10)

Mental health of the single female caregivers was assessed using a 10-item short version of the Center for Epidemiologic Studies Depression Scale (Radloff, 1977). The CES-D differs from other depression scales because it was not meant to be a diagnostic tool but to "measure current level of depressive symptomatology, with emphasis on the affective component, depressed mood." (Radloff, 1977, p.385). The CES-D has commonly been used in studies examining mental health and food security among female populations (Huddleston-Casas et al., 2009; Laraia et al., 2006; McCurdy, et al., 2015; Zekeri, 2010), and therefore was a strong candidate for this study.

The CES-D-10 short form was developed by Andresen et al. (1994) and demonstrated predictive accuracy for the CES-D (α =.97, $p<.001$) among sample of older adults. The CESD-10 was used by Sharpe and colleagues (2016) in their study examining food security and dietary intake among a sample of US women. The CESD-10 has also been used in the Australia Longitudinal Study on Women's Health (Mishra et al., 2022). The CESD-10 was selected as a

viable alternative to the long form in order to reduce participant burden, and among this study sample had a Cronbach's alpha of .859 (after reverse coding for positive questions).

The CESD-10 consists of ten questions inquiring about the past week with response options “rarely or none of the time (less than 1 day)”, “some or a little of the time (1-2 days)”, “occasionally or a moderate amount of the time (3-4 days)”, and “most or all of the time (5-7 days)”. Items 5 & 8 were reverse coded, and then items were summed to produce a continuous score, ranging from 0-30. A score of 10 or more was used as the cutoff value for determining the presence of depressive symptoms (Andresen et al., 1994). Missing data was treated in accordance with protocols in the study describing the formation of the CESD-10. When only 1 missing response was present, the data was usable, and the average value was imputed for that missing value (Andresen et al., 1994)

COVID-19

Due to the timing of data collection, it is possible that some of the variables of interest in this study were impacted by the COVID-19 pandemic. Because of this, three questions wereasked to assess whether participants may have experienced changes in their mental health and food security due to the pandemic. To assess whether there was a change in food security status, the screener question for the USDA Food Security Survey Module was asked twice (Economic Research Service, 2012). The first time, the prompt waschanged to “Which of these statements best describes the food eaten in your household *before* the COVID-19 pandemic?”, with response options “enough of the kinds of food we want to eat”, “enough but not always the *kinds* of food we want”, “sometimes *not enough* to eat”, and “*often* not enough to eat”. Then, the question was asked again in reference to the past 12 months. To assess if mothers experienced a change in mental health as a result of the pandemic, a single question was be asked – “Have you

experienced any change in your overall emotional/psychological well-being during the COVID-19 pandemic?" with response options "mostly negative", "somewhat negative", "neutral", somewhat positive", and "mostly positive". This question is a slightly altered version of a question asked by (Randall et al., 2021) in their study of the impact of COVID on the wellbeing of early childhood educators.

Sociodemographic Controls

Demographic questions also gathered pertinent information about participants' age (in years), race and ethnicity, employment status, marital status, education, income (ranges every $5,000 after $10,000 up to $70,000), and household characteristics (number and age of children). In addition to income, a novel question was created that asked about whether participants would have a way to get $200 dollars in an emergency (Bumpass et al., 2017; Nilsson & Estrada, 2006).

The sociodemographic control variables selected to be entered into regression models were: age, race (binary), income, and number of children in household. The median income was imputed for participants missing a response to this question who could otherwise be entered into the model (N=2). For those missing data about the number of children (who otherwise could be included in regression models), we imputed a conservative estimate of the number of children based on answers to questions about household size and age ranges of children (N=3).

Data Analysis

Before data were analyzed, all paper surveys were entered into SPSS to be cleaned. After also cleaning the data downloaded from online surveys completed on Qualtrics, both sets were merged to form the IBM SPSS statistics, version 28, data set used for all subsequent analyses. 45.7% of surveys were completed on paper and the remaining 54.3% were online. Measures were calculated following the procedures outlined above.

Exploratory analyses assess the normality and skew of the variables of interest using histograms, q-q plots, and kurtosis measurements. Based on these tests, all outcome variables were determined to be sufficiently normal to meet the requirements for linear regression except for the Shopping Strategies Scale. This scale was recoded into a binary variable and examined with logistic regression models when it was used as an outcome variable (for RQ2). Missing data were examined and found to be less than 1.51% for variables of interest for the analytic sample included in one or more regression analyses (Research Questions 1-3). For more details about missing data, see Appendix A. Scales were assessed for internal consistency reliability using Cronbach's alpha. Bivariate correlation matrices were used to examine the relationships between variables and identity potential confounding factors and potential for collinearity. To answer the study's research questions, a series of regression models (ordinary least square linear regression and logistical regression, as appropriate for the outcome of interest) was calculated both before and after adjusting for sociodemographic characteristics. All statistical tests were two sided with the alpha level for significance set at <.05.

For research question 1 (refer back to conceptual model in Chapter 1), depression was regressed on food security status. For research question 2 (see conceptual model), policy level, community level, interpersonal level, and intrapersonal level food insecurity coping strategies were regressed on food security status in separate regression models. Intrapersonal coping strategies and food security status associations were examined in three separate models, one for each of the three relevant scales. For question 3 (see conceptual model), depression was regressed on policy level, community level, interpersonal level, and intrapersonal level food insecurity coping strategies, each in separate models. Again, the intrapersonal coping strategies and depression relationships were examined in three separate models.

CHAPTER 4: RESULTS

Participant Sociodemographic Information

There were 94 participants who enrolled in study, 86 of whom answered the majority of the survey questions and progressed far enough to receive a gift card. The age of participants ranged from 18 to 63 years old with a mean age of 37.6 years old. A majority of the sample identified as Non-Hispanic White (62.2%). While 25.5% of the sample identified as Black or African American, we decided that due to our small sample size and few participants identifying with other racial or ethnic groups, it would be best to collapse this variable into two categories for the purpose of analysis: "Non-Hispanic White" and "Racial or Ethnic Minority". For this binary variable, 61.2% of the sample were non-Hispanic white and 38.8 % were a racial or ethnic minority (see Table1 for more detail). Over half of the sample had never been married (57.6%), and 41.8% of women had one child in their household (see Figure 1). A majority of the sample came from Indiana (74.2%), while the rest were Oklahoma residents (25.8%).

The mothers in this study reported an annual income ranging from less than $10,000 to greater than $70,000. The median annual household income range was $10,000 to $15,000. When asked whether they had a way of obtaining $200 in an emergency, half of women said "yes", while the other half "no (see Figure 2). Figure 3 illustrates the employment breakdown of the sample, with 40.5% of women reporting full time employment, 16.7% reporting part time employment, and the remaining 42.9% reporting that they were currently unemployed. When asked about highest degree of educational attainment, 6% of the sample reported attaining a graduate degree and 13.1% had received a bachelor's degree(see Figure 4). A large portion of the sample reported some college, with degree not received or an associate's degree (45.2%). A quarter of the sample (25%) reported that they had a high school degree or equivalent, while 10.7% of women had not received high school diplomas.

Table 1: Participant Sociodemographic Characteristics (N=94)

	Mean (SD) or %
Age (years)	37.6 (9.3) Range: 18-63
Race	
American Indian or Alaska Native	3.1
Asian	1
Black or African American	25.5
Native Hawaiian or Pacific Islander	1
White	62.2
Other	1
Multiracial	5.1
Hispanic, Latino, or Spanish in Origin	
Yes	5.9
No	94.1
Marital Status	
Widowed	2.4
Divorced	27.1
Separated	12.9
Never Married	57.6
Number of Children in Household	
1	41.8
2	22.0
3	22.0
4	9.9
5	4.4
State of Residence	
Indiana	74.2
Oklahoma	25.8
Annual Income	
Less than $10,000	40.7
$10,000 to $40,000	40.7
$40,001 to $70,000	15.3
Greater than $70,001	3.5
200 Dollars in Emergency	
Yes	50
No	50
Employment	
Employed, full time	40.5
	16.7

Employed, part time	42.9
Not currently employed	
Education	
No high school diploma	10.7
High school grad or equivalent	25.00
Some college but no degree or associates degree	45.2
Bachelor's degree	13.1
Graduate or professional degree	6

Figure 1: Number of Children in Household

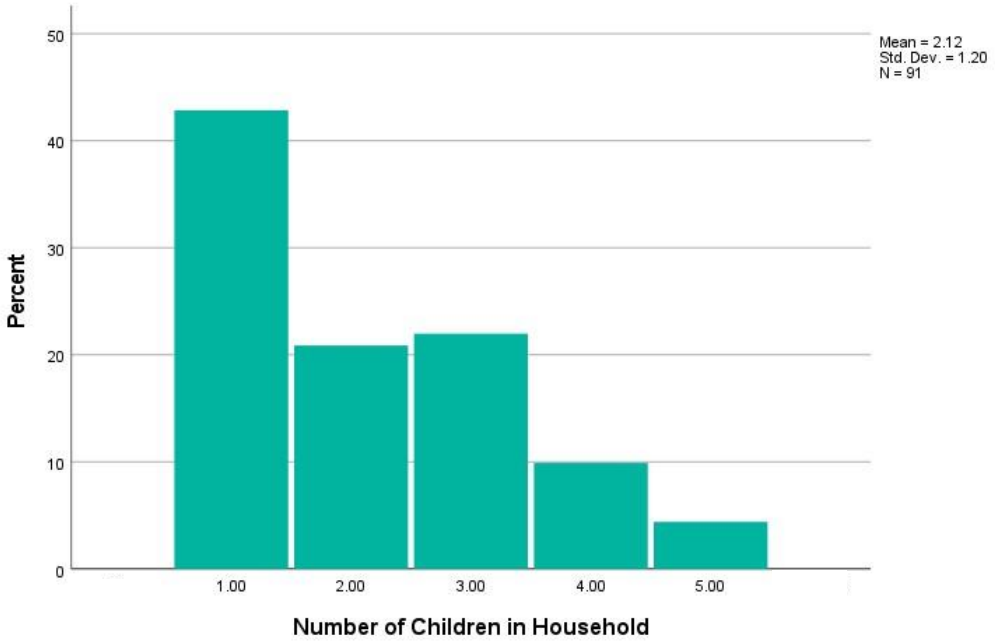


Figure 2: Dealing with an unexpected emergency

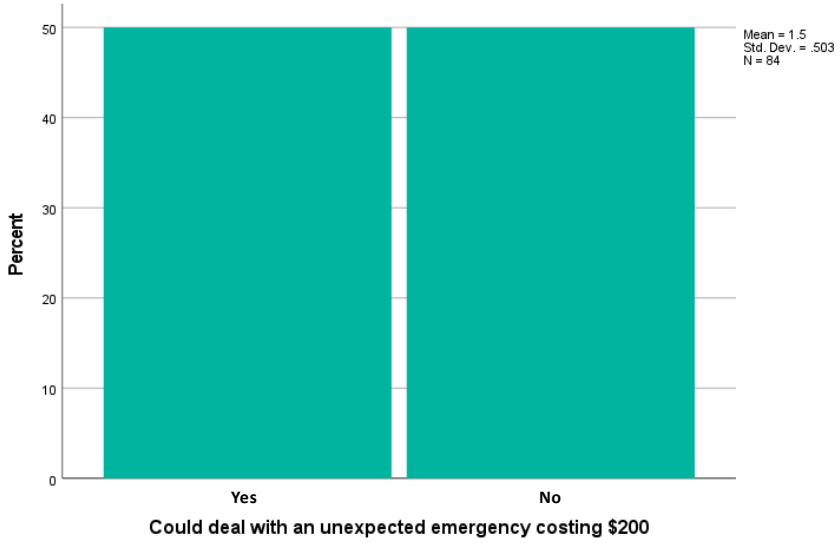


Figure 3: Employment

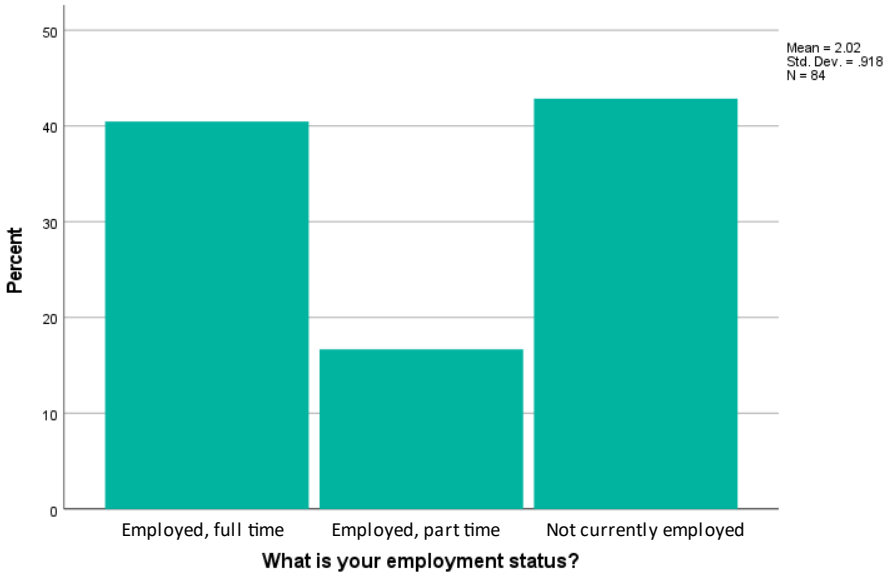
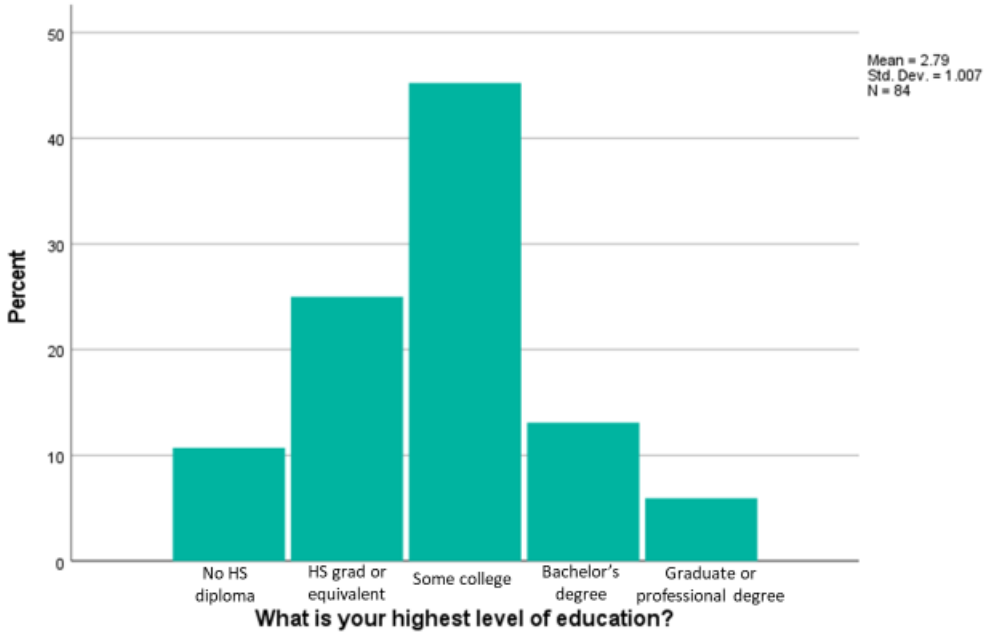


Figure 4: Education

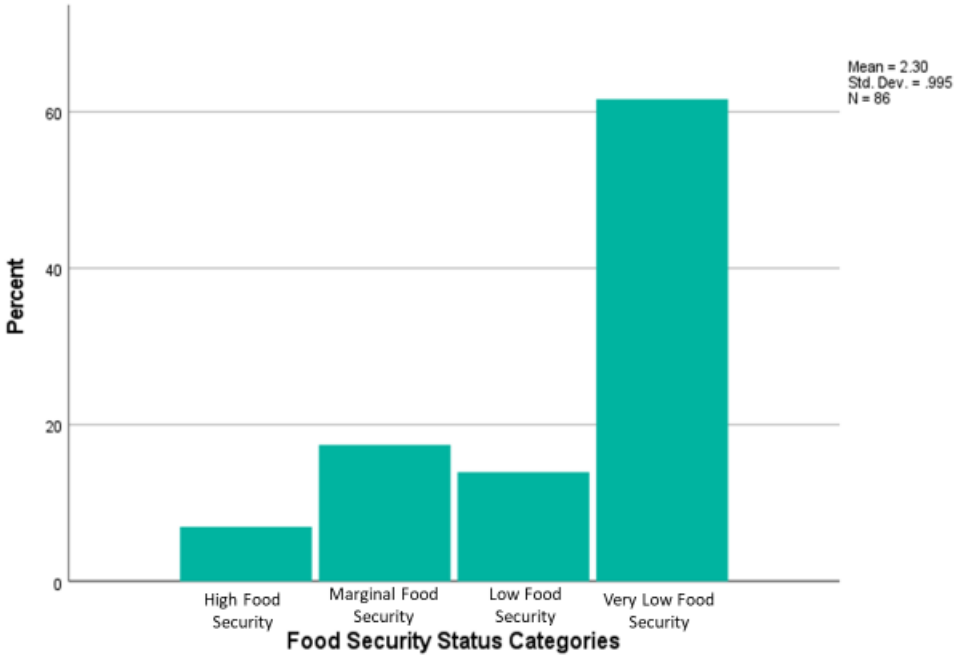


Key Study Variables

Food Security Status

The majority (61.6%) of the study sample fell into the most severe category of food insecurity: “Very Low Food Secure”. 14% of the sample was low food secure. Another 17.4% of the sample was marginally food secure. Only 7% of single female caregivers in this sample were considered fully food secure (see Figure 5). For food security questions see the sample survey provided in Appendix F.

Figure 5: Adult Food Security Status

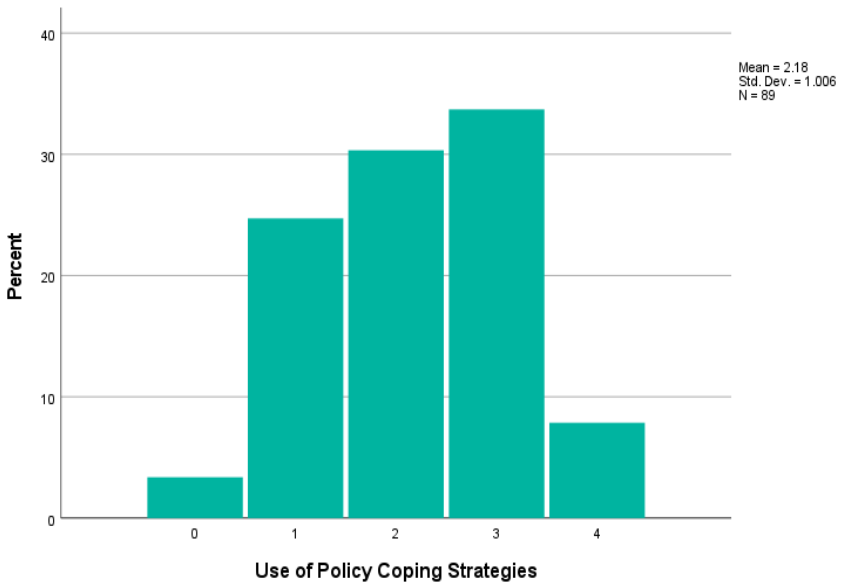


Coping Strategies

The mean score for Policy Coping Strategies Index, representing the number of policy-related food insecurity coping strategies women reported using out of 4 assessed, was 2.18(1).

As seen in Figure 6, it was most common for women to report utilizing 3 policy coping strategies (33.7%). The items and frequency of responses for each item can be found in Appendix B. We estimated that approximately 70% of the participants from our study had children that were eligible (based on sample income and household size to estimate households below 130% Federal Poverty Level) for *free* lunches through NSLP. Even more would be eligible for reduced-price lunch through this program, since the % Federal Poverty limit is higher (185%) (Child Nutrition Programs: Income Eligibility Guidelines, 2021). This estimate did not consider categorical eligibility, age of the children, or whether the children attended a school where NSLP was offered (Food and Nutrition Service, 2017). Even so, this is a conservative estimate demonstrating that much of our sample was eligible for at least one of these programs.

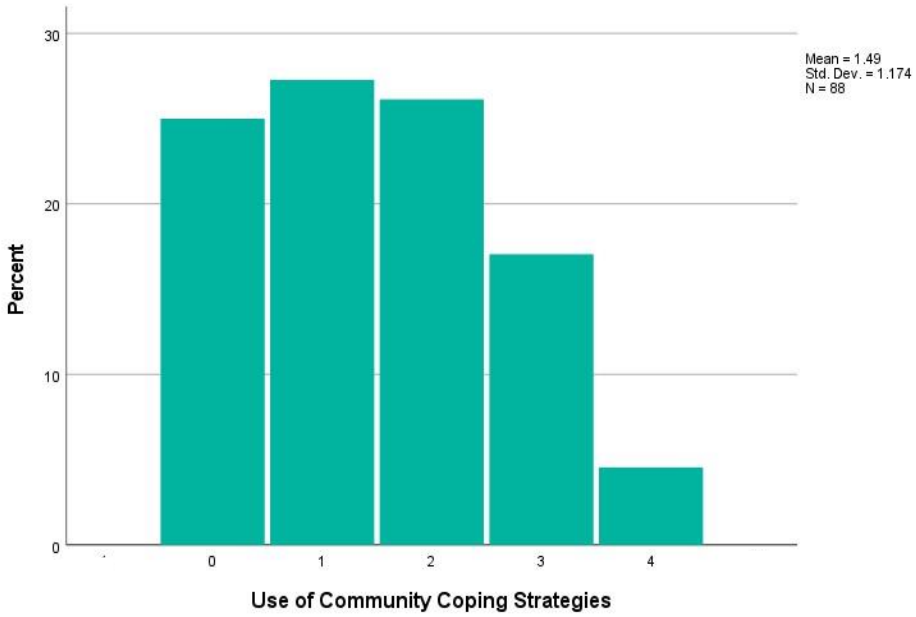
Figure 6: Number of Policy Coping Strategies Used



The mean score for the Community Coping Index, representing the number of community related food insecurity coping strategies women reported using out of 4 assessed,

was 1.49(1.17). As seen in figure 7, it was most common for women to use one or two of these strategies (27.3% and 26.1%, respectively; a quarter of mothers also reported that they did not use any community coping strategies (25%). The items and frequency of responses for each item can be found in Appendix B.

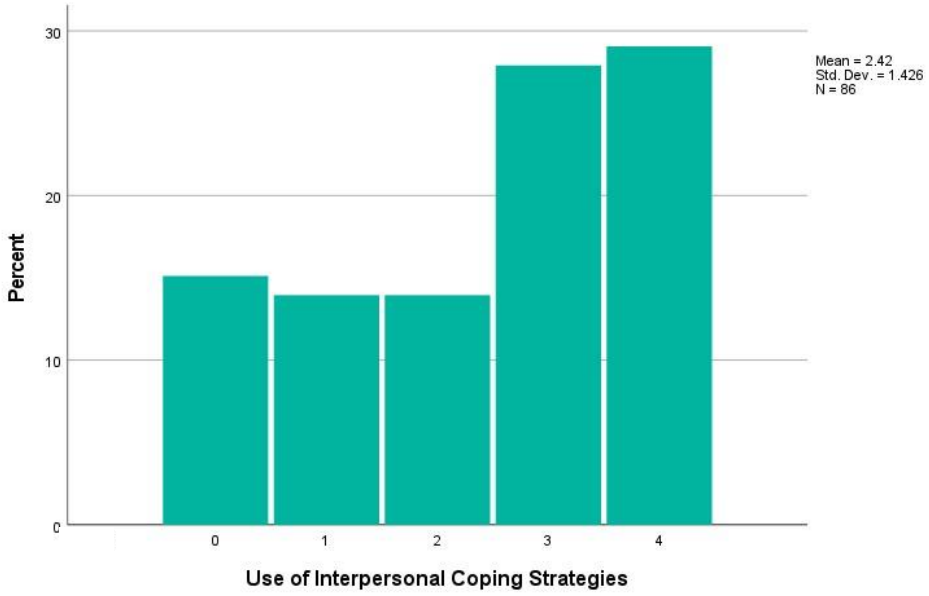
Figure 7: Number of Community Coping Strategies Used



The mean score for Interpersonal Coping Index, representing the number of interpersonal food insecurity coping strategies women reported using out of 4 assessed, was 2.42(1.4). The majority of mothers reported utilization of 3 or 4 of these strategies (27.9% and 29.1% respectively). An almost identical number of respondents reported use of none, one, or two of

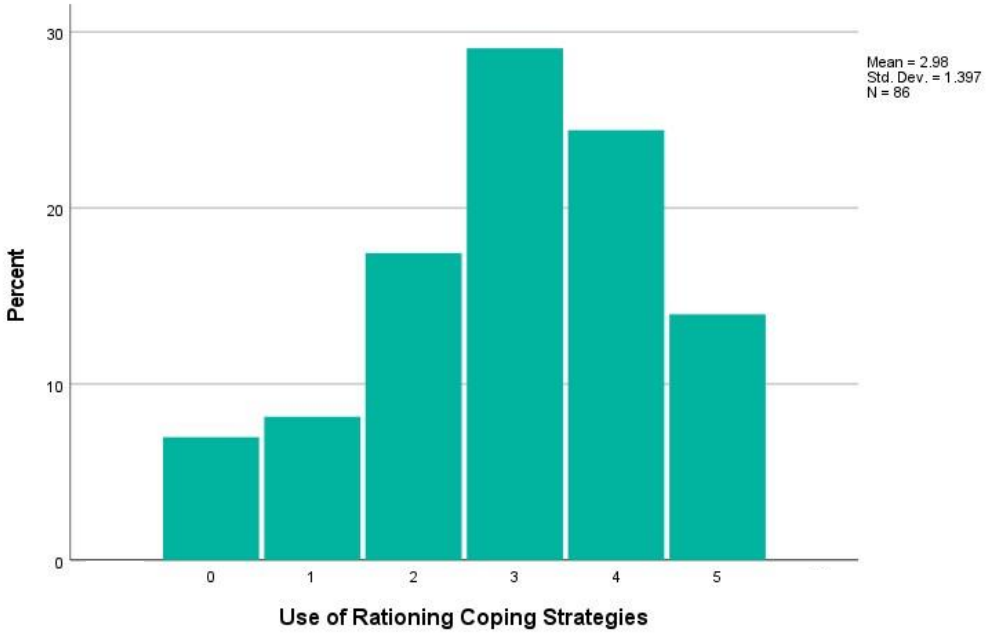
these strategies (see figure 8). The items and frequency of responses for each item can be found in Appendix B.

Figure 8: Number of Interpersonal Coping Strategies Used



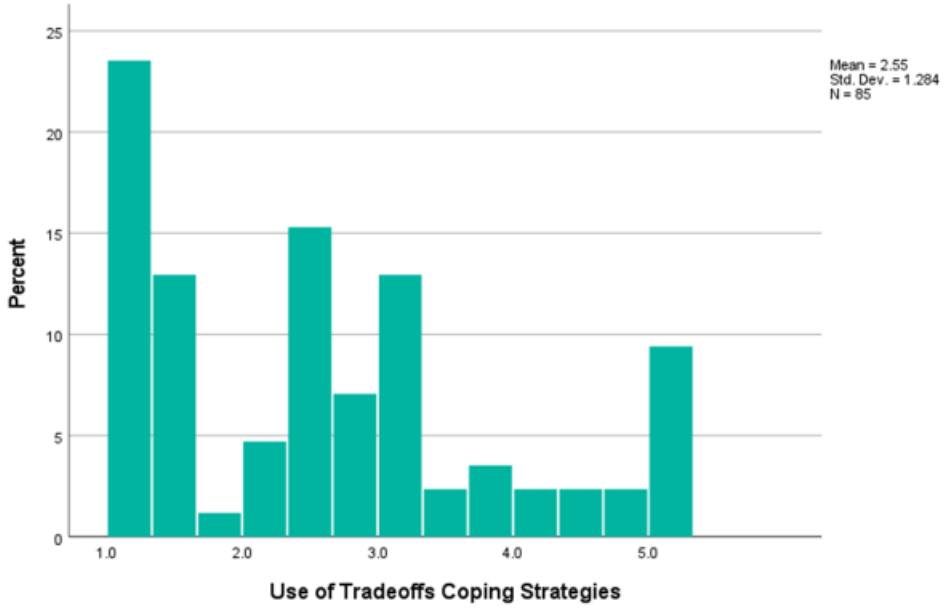
The mean score for the Rationing Coping Scale, representing the number of rationing coping strategies women reported using out of 5 assessed, was 2.98(1.4). It was most common for women to report utilizing 3 rationing coping strategies in their household (29.1%) (see Figure 9). Approximately 25% and 15% of respondents utilized 4 or 5 of the rationing strategies, respectively. The items and frequency of response for each item can be found in Appendix B.

Figure 9: Number of Rationing Coping Strategies Used (Intrapersonal)



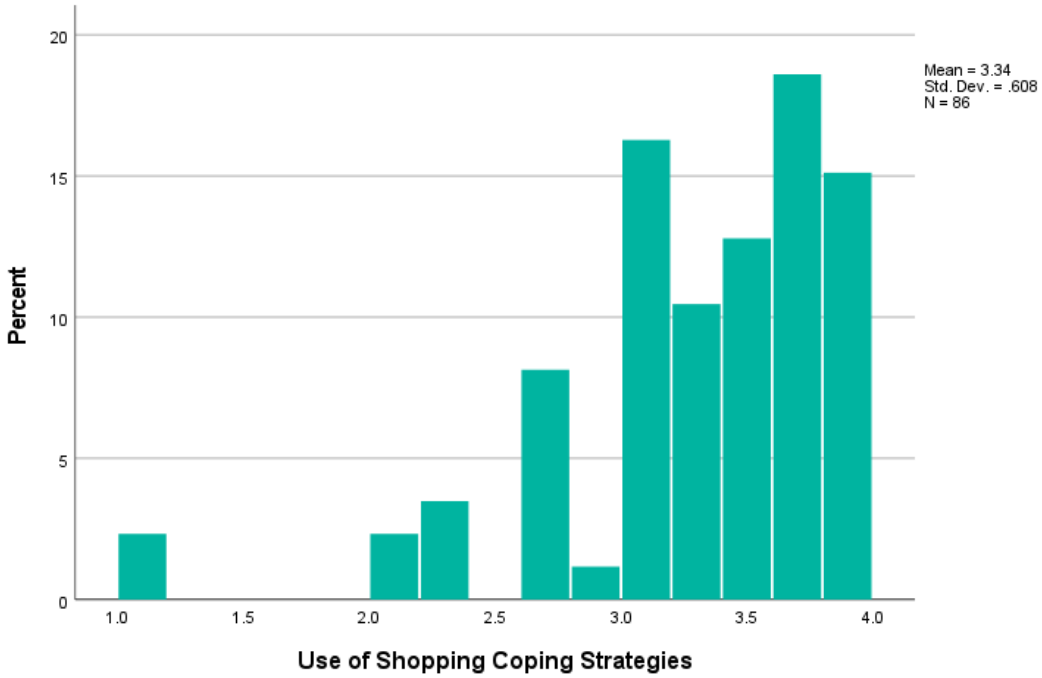
The mean score for the Tradeoffs Scale, representing the frequency that women reported using certain tradeoffs in their household, ranging 1-5, was 2.55(1.28). A large proportion of the sample (17.6%) received a score of "1", indicating that they never used any of these tradeoff strategies (see figure 10). Increasing scores indicated a more frequent use of more of the strategies, with almost 10% of mothers in this sample reporting always using all five of the tradeoff strategies (a "5" on the scale). The items and frequency of response for each item can be found in Appendix B.

Figure 10: Use of Tradeoff Strategies (Intrapersonal)



The mean score for the Shopping Strategies Scale, representing the frequency that women reported using certain shopping strategies in their household, ranging 1-4, was 3.34(.61). As evident in Figure 11, the frequency of response for this scale was significantly skewed, with approximately 56% of the sample receiving a score of 3.5 or higher. This indicates that a large proportion of mothers in this sample utilized most of these shopping strategies often. The items and frequency of response for each item can be found in Appendix B.

Figure 11: Use of Shopping Strategies (Intrapersonal)

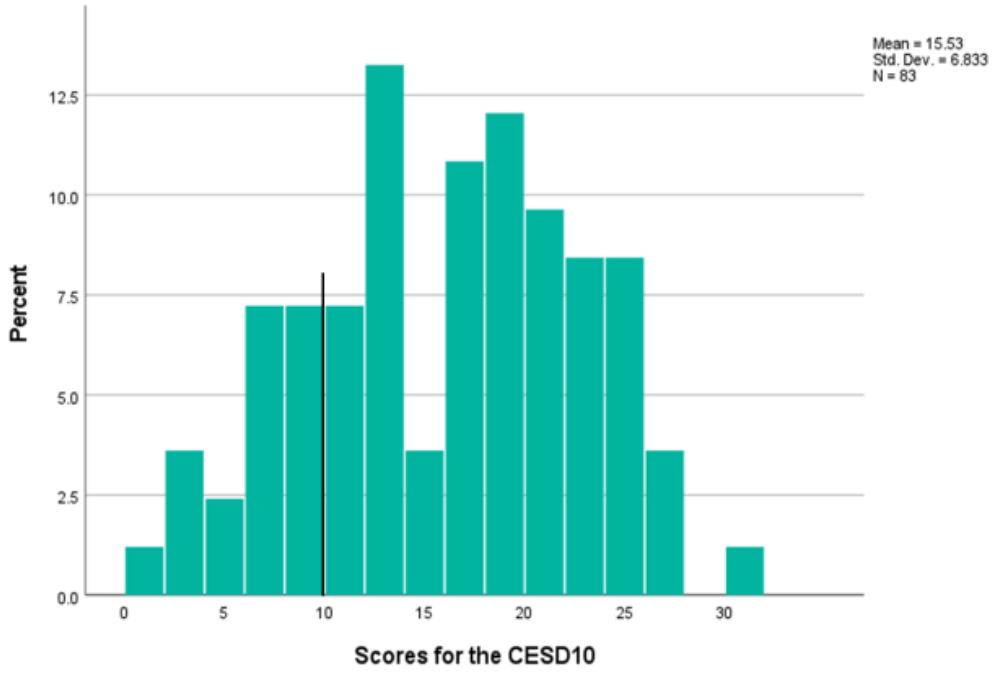


CESD-10

The sample mean for the CESD-10 was 15.53(6.83). Responses ranged from 1-30, with a possible range of 0-30. In Figure 12, the marking highlights the cutoff point of ≥10 for depressive symptoms, as suggested by Andresen and colleagues (1994). For this sample, approximately 22% of women were at or below the cutoff, while the remaining 78% surpassed it. As mentioned previously, for the purposes of this study, we chose to analyze the CESD-10 as a scaled variable instead of utilizing the cutoff value in order to better understand the broad range of depressive symptomology among single mothers and how they may relate to the other

variables of interest. To see all CESD-10 questions, refer to the sample survey provided in Appendix F.

Figure 12: CESD-10 Scores



Research Q1

Is there a relationship between level of food security and depression among single female caregivers?

Table 4 demonstrates that in Model 1, food security status was a significant predictor for depression (B= 2.696(692), p <.001), accounting for 15.8% of the variation in depression among this sample (F = 15.168, p<.001). Accounting for sociodemographic control variables in Model 2 did not improve the model (F=.623, p=.648). The association between food security status remained significant (B= 2.669(.907), p=.004). For every one category increase in food insecurity status (more severe food insecurity), there was an increase of 2.669 increase in CESD-

10 scores. For example, the average caregiver depression scores, after controlling for sociodemographic characteristics including income, ranged from 10.347 among those who were categorized at high food secure (reference group) and 12.741 among those who were marginally food secure to 15.134 among those low food secure, and 17.527 among those very low food secure. This supports Q1H1 that higher food insecurity would be associated with greater depressive symptomology.

Table 4: Association between Food Security Status and Depression **(N= 83)**

	Model 1			**Model 2**		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Food Security Status (food secure ref)	2.696	.692	<.001	2.669	.907	.004
Age				-.058	.082	.480
# of children in household				-.242	.609	.692
Income				-.075	.236	.751
Race (NonHispanic White ref)				-1.723	1.489	.251
Constant	9.360	1.730	<.001	13.027	4.430	.004
Model R^2		.158			.184	
Model *F* Change (*p*)		15.168(<.001)			.623 (.648)	

Research Q2

Using a social-ecological framework, is there an association between food security status and the use of food insecurity coping strategies among single female caregivers?

Policy Coping Strategies

Table 5 demonstrates that in Model 1, food security status was a significant predictor for the use of policy coping strategies (B= .335(.103), p =.002), accounting for 11.2% of the variation (F = 10.480, p=.002). The addition of sociodemographic controls improved the overall model (F = 6.777, p<.001) and attenuated the association between the food security status and policy coping strategies such that it no longer achieved statistical significance (B= .143, p=.227).

Table 5: Association between Food Security Status and Policy Coping Index **(N=85)**

	Model 1			Model 2		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Food Security Status (food secure ref)	.335	.103	.002	.143	.118	.227
Age				-.046	.011	<.001
# of children in household				.193	.079	.017
Income				-.052	.030	.094
Race (NonHispanic White ref)				.248	.192	.201
Constant	1.432	.258	<.001	3.264	.578	<.001
Model R^2		.112			.341	
Model *F* Change (*p*)		10.480(.002)			6.877 (<.001)	

Community Coping Strategies

As seen in Table 6, food security status was a significant predictor of the use of community coping strategies in Model 1 (B= .641 (.108), <.001, accounting for 29.9% of the variance in policy coping (*F*= 35.326, p<.001). Accounting for sociodemographic control variables in Model 2 did improve the model (*F*=2.873, p= .028), with Model 2 accounting for 38.8% of change in the dependent variable. Table 6 shows that adult food security status is a significant predictor in both Model 1 (B=.641 (.108), p<.001) and in Model 2 (B=.450 (.133), p=.001). According to Model 2, for every unit increase in food security, community coping strategies increased by .445 units.

Table 6: Association between Food Security Status and Community Coping Index **(N=85)**

	Model 1			Model 2		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Food Security Status (food secure ref)	.641	.108	<.001	.450	.133	.001
Age				.007	.012	.545
# of children in household				.039	.090	.666
Income				-.070	.035	.045
Race (NonHispanic White ref)				.471	.218	.033
Constant	.023	.270	.933	.207	.654	.752

Model R^2	.299	.388
Model *F* Change (*p*)	35.326(<.001)	2.873 (.028)

Interpersonal Coping Strategies

Table 7 demonstrates that in Model 1, adult food security status was a significant predictor for interpersonal coping (B= .937 (.115), p <.001), accounting for 44.6% of the change in interpersonal coping strategies among this sample (*F* = 65.927, p=<.001). Model 2 included sociodemographic control variables, but it appears that the addition of these variables did not improve the model (F= .262, p=.902). Food security status remained a significant predictor of interpersonal coping strategies in Model 2; for every unit increase in food security status (more severe food insecurity), there was an increase of .912 units of interpersonal coping (B= .912 (.152), p<.001).

Table 7: Association between Food Security Status and Interpersonal Coping Index**(N= 84)**

	Model 1			**Model 2**		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Food Security Status (food secure ref)	.937	.115	<.001	.912	.152	<.001
Age				.004	.014	.757
# of children in household				.078	.103	.451
Income				.003	.039	.936
Race (NonHispanic White ref)				.132	.249	.598
Constant	.276	.289	.342	-.059	.744	.937
Model R^2		.446			.453	
Model *F* Change (*p*)		65.927(<.001)			.262 (.902)	

Intrapersonal Coping Strategies

Rationing Coping

As seen in Table 8, food security status was a significant predictor of the use of rationing coping strategies in Model 1 (B= .935 (.113), p <.001), accounting for 45.2.% of the variance

(*F*= 68.331, p<.001). The addition of sociodemographic controls in Model 2 did not improve the model (*F*=1.046, p=.389) but food security status remained a significant predictor in this model (B= .845 (.146), p <.001). According to Model 2, for every unit increase in food security status (more severe food insecurity), there was an increase of .845 units of rationing coping.

Table 8: Association between Food Security Status and Rationing Coping Scale **(N= 85)**

		Model 1			**Model 2**	
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Food Security Status (food secure ref)	.935	.113	<.001	.845	.146	<.001
Age				-.007	.013	.585
# of children in household				.015	.098	.878
Income				-.030	.038	.435
Race (NonHispanic White ref)				.445	.238	.065
Constant	.809	.283	.005	1.194	.715	.099
Model R^2		.452			.479	
Model *F* Change (*p*)		68.331(<.001)			1.046(.389)	

Tradeoffs

Table 9 demonstrates that in Model 1, adult food security status was a significant predictor for tradeoffs coping (B=.730 (.116) p <.001), accounting for 32.7% of the change in tradeoffs coping strategies among this sample (*F* = 39.923 p=<.001). Model 2 included sociodemographic control variables, but it appears that the addition of these variables did not improve the model (F=1.880, p=.122). After the addition of sociodemographic controls, food security status was still a significant predictor of tradeoffs in Model 2, with every unit increase in Adult Food Security Status (more severe food insecurity) corresponding to a.497 unit increase of tradeoffs coping (B=.497 (.149), p =.001).

Table 9: Association between Food Security Status and Tradeoffs Scale **(N= 84)**

	Model 1			Model 2		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Food Security Status (food secure ref)	.730	.116	<.001	.497	.149	.001
Age				.000	.013	.996
# of children in household				.127	.098	.197
Income				-.078	.039	.048
Race (NonHispanic White ref)				.252	.236	.289
Constant	.834	.290	.005	1.307	.759	.089
Model R^2		.327			.387	
Model *F* Change (*p*)	39.923(<.001)			1.880(.122)		

Shopping **(Logistic Regression)**

For each higher risk category in food security status, odds of reporting an above-average score on the shopping food insecurity coping strategies scale increased 2.118-fold (95% CI: 1.310-3.425, *p*=.002) in unadjusted models and even more—2.822-fold (95% CI: 1.463-5.442, *p*=.002)—after adjusting for sociodemographic covariates.

Table 10: Association between Food Security Status and Shopping Food Insecurity Coping Strategy (N=85)

		Model 1			Model 2	
Variables	**OR**	**95% CI**	**p**	**OR**	**95% CI**	**p**
Food Security Status (food secure ref)	2.118	1.310-3.425	.002	2.822	1.463-5.442	.002
Age				1.008	.954-1.065	.767
# of children in household				.907	.604-1.361	.636
Income				1.117	.950-1.314	.182
Race (NonHispanic White ref)				1.018	.379-2.731	.972
Model R^2		.116 (C&S)			.135 (C&S)	
X^2 (*p*)	10.577 (.001)			12.306 (.031)		

To summarize the findings related to Research Question 2, single female caregiver food security status was associated with reported use of food insecurity coping strategies representing most, but not all, levels of the socioecological model. Higher levels of food insecurity were associated with greater use of community and interpersonal coping strategies, as well as all three of the intrapersonal coping strategies examined: rationing, tradeoffs, and shopping. The one exception was that use of policy-level coping strategies was not associated with food security status after accounting for sociodemographic covariates such as the caregivers' age, race, income, and number of children in the household.

Research Q3

Using a social-ecological framework, is there a relationship between the use of food insecurity coping strategies and depression among single female caregivers?

Policy Coping

As seen in Table 11, policy coping was not a significant predictor of depressive symptomology (B= -.178 (.755), *p*=.814) when entered as the only predictor in Model 1 (F=.055, p=.814). Policy coping remained insignificant in Model 2 (B= -1.454 (.886), p=.105) though the model as a whole was improved by the addition of sociodemographic variables (F= 2.687, p=.037).

Table 11: Policy coping index and depression **(N= 83)**

	Model 1			**Model 2**		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Policy Coping Index	-.178	.755	.814	-1.454	.886	.105
Age				-.148	.094	.120
# of children in household				.444	.646	.494
Income				-.597	.207	.005
Race (NonHispanic White ref)				-1.200	1.556	.443

Constant	15.922	1.819	<.001	26.052	4.949	<.001
Model R^2		.001			.123	
Model *F* Change (*p*)		.055 (.814)			2.687(.037)	

Community Coping

In Model 1, greater report of using community coping strategies was associated with more depressive symptomology (B=1.593(.623), p=.012) and accounted for 7.5% of the variation in depressive symptom scores (F= 6.545, p=.012) (see Table 12). The addition of sociodemographic controls did not improve the model (F= 1.491, p=.213); the Community Coping Index remained a significant predictor of depression in Model 2, with 1 unit increase in community coping corresponding to a 1.563 unit increase in CESD-10 scores (B= 1.563(.747), p=.040).

Table 12: Community Coping Index and Depression **(N= 83)**

	Model 1			**Model 2**		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Community Coping Index	1.593	.623	.012	1.563	.747	.040
Age				-.086	.083	.304
# of children in household				-.034	.616	.956
Income				-.274	.220	.217
Race (NonHispanic White ref)				-2.464	1.590	.125
Constant	13.113	1.192	<.001	18.431	3.832	<.001
Model R^2		.075			.141	
Model *F* Change (*p*)		6.545(.012)			1.491(.213)	

Interpersonal Coping

As seen in Table 13, interpersonal strategies were significantly predictive of depressive symptomology in Model 1 (B= 1.650(.504), p=.002), accounting for 11.7% of the change in depressive symptoms (F= 10.706, p=.002). The addition of sociodemographic controls did not

improve the model's ability to predict depressive symptomology in Model 2 (F=1.109, p=.358). Interpersonal coping strategies remained a significant predictor in Model 2, with a one unit increase in the Interpersonal Coping Index representing an increase of 1.453 units in the CESD-10 (B= 1.453, p=.012).

Table 13: Interpersonal Coping Index and depression **(N= 83)**

	Model 1			**Model 2**		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Interpersonal Coping Index	1.650	.504	.002	1.453	.562	.012
Age				-.075	.082	.367
# of children in household				-.169	.614	.784
Income				-.289	.207	.167
Race (NonHispanic White ref)				-1.831	1.510	.229
Constant	11.573	1.412	<.001	16.973	3.901	<.001
Model R^2		.117			.165	
Model *F* Change (*p*)		10.706 (.002)			1.109 (.358)	

Intrapersonal Coping

Rationing

In Model 1, rationing coping strategies were significant as a predictor of depressive symptomology (B= 1.386(.528), p=.010), accounting for 7.8% of the change in depressive symptoms (F= 6.894, p=.010) (see Table 14). The addition of sociodemographic controls did not improve the model's ability to predict depressive symptomology, seen in Model 2 (F=1.146, p=.342). Table 14 demonstrates that the addition of sociodemographic controls attenuated the association between the Rationing Coping Scale and depression so that it was no longer a statistically significant predictor of depression (B= 1.115(.609), p=.071).

Table 14: Rationing coping scale and depression **(N= 83)**

	Model 1	**Model 2**

Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Rationing Coping Scale	1.386	.528	.010	1.115	.609	.071
Age				-.060	.085	.479
# of children in household				-.040	.622	.948
Income				-.315	.218	.152
Race (NonHispanic White ref)				-2.031	1.560	.197
Constant	11.492	1.701	<.001	16.607	4.321	<.001
Model R^2		.078			.130	
Model *F* Change (*p*)		6.894 (.010)			1.146 (.342)	

Tradeoffs

Table 15 demonstrates that tradeoff strategies were a significant predictor of depressive symptomology (B= 1.940(.561), p<.001), accounting for 13% of the variation in the CESD-10 (F=11.934, p<.001). The addition of sociodemographic control variables did not improve the model's ability to predict the outcome variable, as seen in Model 2 of Table 27 (F=.978, p=.425). In Model 2 of Table 15, we see that the tradeoffs scale remained a significant predictor of depressive symptomology after the addition of sociodemographic controls; for every 1 unit increase in the Tradeoffs Scale, depressive symptoms increased by 1.85 units (B=1.850(.677), p=.008).

Table 15: Tradeoffs coping scale and depression **(N= 82)**

		Model 1			**Model 2**	
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Tradeoffs Coping Scale	1.940	.561	<.001	1.850	.677	.008
Age				-.073	.084	.389
# of children in household				-.194	.621	.755
Income				-.194	.223	.387
Race (NonHispanic White ref)				-2.126	1.524	.167
Constant	10.593	1.589	<.001	15.526	4.231	<.001
Model R^2		.130			.172	
Model *F* Change (*p*)		11.934(<.001)			.978(.425)	

Shopping

As demonstrated in Model 1 of Table 16, shopping strategies were a significant predictor of depressive symptomology for this sample (B=3.271(1.174), p=.007), accounting for 8.7% of the variation in the CESD-10 (F=7.757, p=.007). The addition of sociodemographic control variables in Model 2 did not significantly improve the model's ability to predict the outcome variable (F=1.392, p=.244). The Shopping Strategies Scale remained a significant predictor of depressive symptomology after the addition of sociodemographic controls in Model 2; for every 1 unit increase in the Shopping Strategies Scale, depressive symptoms increased by 2.7 units (B=2.700(1.193), p=.027).

Table 16: Shopping strategies scale and depression **(N= 83)**

	Model 1			**Model 2**		
Variables	**B**	**SE**	***p***	**B**	**SE**	***p***
Shopping Strategies Scale	3.271	1.174	.007	2.700	1.193	.027
Age				-.064	.083	.445
# of children in household				.176	.608	.773
Income				-.392	.198	.052
Race (NonHispanic White ref)				-1.473	1.520	.336
Constant	4.616	3.985	.250	10.617	5.763	.096
Model R^2		.087			.149	
Model *F* Change (*p*)		7.757(.007)			1.392(.244)	

To summarize findings related to Research Question 3, only a few types of food insecurity coping strategies examined in this study were *unrelated* to depressive symptomology among single female caregivers after the addition of sociodemographic covariates: the use of policy-level coping strategies and intrapersonal rationing coping strategies. Policy-level coping strategies were not associated with depressive symptomology in any models. Community and interpersonal food insecurity coping strategies were associated with depressive symptomology before and after adding the sociodemographic covariates to the models. Greater use of two

intrapersonal coping strategies—tradeoffs and shopping—were associated with higher levels of depressive symptomology in both models.

CHAPTER 5: DISCUSSION

The purpose of this study was to investigate food insecurity coping strategies utilized by single female caregivers and to further understand the relationships between food security status, food insecurity coping strategies spanning multiple levels (i.e. policy, community, interpersonal, intrapersonal), and depression among this population.

Discussion

For question 1, when examining the relationship between adult food security status and depression among this sample of single mothers, we found that food insecurity was a significant predictor of depressive symptomology. This held true even after controlling for associated variables such as income and race. This finding adds to the literature that overwhelmingly reports a connection between food insecurity and worse mental health outcomes among females (Mayard et al., 2018). It is important to note that the relationship between food insecurity and depressive symptomology among this sample persisted after controlling for associated sociodemographic covariates; this reinforces the conclusions drawn by others in the literature that food insecurity is itself a significant predictor of depression (Wu & Schimmele, 2005; Zekeri, 2010).

It was also noteworthy that among this sample of females, over 70% had scores surpassing the cutpoint for the CESD-10. This is higher than percentages reported by other studies using various forms of the CESD among samples of women in the US and abroad (Bronte-Tinkew et al, 2007; Gabriel et al., 2021; McCurdy et al., 2015; Mishra et al., 2022; Tuthill et al, 2019). For example, among their nationally representative sample of low-income families in the US, Garg and colleagues (2015) reported that 16.1% of mothers exceeded the

cutoff indicating possible depression for their sample (this study used a 12-item short form, not the CESD-10).

For RQ2, food security status was positively associated with greater use of food insecurity coping strategies at all levels of the SEM with the single exception of the policy level. Food security status was not significantly predictive of the use of policy coping strategies. The use of community coping strategies was significantly predicted by food security status, with more severe food insecurity predicting use of a greater number of community coping strategies. More severe food insecurity was also significantly associated with the greater use of interpersonal coping strategies, and all three intrapersonal strategies (tradeoffs, rationing, and shopping).

It is possible that food security status was not significantly related to policy coping strategies (unlike the other coping strategies) because policy coping represents ways of coping with food insecurity that are less risky and more predictable, potentially helping those utilizing them to attain a higher level of food security (Anater et al., 2011; Ratcliffe et al., 2011; Seligman & Berkowitz, 2019). In their study on various financial coping strategies and financial shocks as they relate to food insecurity, Bartfield and colleagues (2017) concluded that SNAP use among their sample was a more stable coping strategy that was used consistently across food security statuses. Another study suggested that participation in WIC and SNAP had a positive influence on their sample's satisfaction with their household food situation (Bezuneh et al., 2019). In fact, for these reasons, the study hypothesis was that the report of using these strategies might have a significant *negative* relationship among the sample. Although this was not the case, the lack of a significant relationship in contrast to all the other levels of coping strategies in this study may still support this reasoning.

The significant association between more severe food insecurity and the use of community, interpersonal, and intrapersonal (rationing, tradeoff, and shopping) was not entirely surprising. These associations fit with and bolster the existing literature for use of community (Crespo-Bellido et al., 2020), shopping (Gorman et al., 2016; McCurdy et al., 2015), and rationing and tradeoffs strategies (Liebe et al, 2022; Pinard et al, 2016). It was expected that interpersonal strategies might be *negatively* associated with food insecurity due to their connection to social support (DeMarco et al., 2009; King, 2017; Martin et al., 2016). Edin and colleagues (2013) noted that many of the food secure households in their sample reported relying on food, cash, and invitations to meals from friends and family. Yet among this study sample, higher food insecurity was associated with more use of interpersonal strategies. This could reflect the material stability of the networks surrounding the participants; it is possible that while some households within this sample could rely upon those around them consistently, others may live in communities where they are called upon to help friends and family as well, which can then impact their ability to provide and plan for their own household (Edin et al., 2013). Another possible explanation is that the mothers in this sample used interpersonal strategies reactively, after their food situation was already difficult, instead of a more consistent, proactive reliance on their supports (Edin et al., 2013).

For RQ3, when looking at the relationship between coping strategies and depressive symptomology, the results were mixed. Policy level and intrapersonal rationing coping did not have a significant relationship with depression when examined in models with sociodemographic covariates included. However, community, interpersonal, and the other two intrapersonal strategies (tradeoffs and shopping) coping *were* significantly predictive ($p<.05$) of depressive

symptomology in all models; this indicates that more frequent use of a greater number of these strategies is predictive of higher depressive symptomology.

It was unexpected that greater reported use of policy level coping and interpersonal level coping did not have significant *negative* associations with depressive symptomology among our sample based on the literature about the positive impacts of SNAP on mental health (Munger et al., 2016; Oddo & Mabli, 2015) and the importance of social support on the mental wellbeing of mothers (Cairney et al., 2003; Liang et al., 2019). It is possible that there is, indeed, a negative relationship between policy coping strategies and depression that was not detected in this sample due to the way that policy coping was measured or due to the limited sample size. Our policy coping measure did not take into account whether households were eligible or not for the policy programs, which may be an important distinction when interpreting these results. There was also some confusion among participants about the Advance Child Tax Credit question, which may have impacted the accuracy of this measurement. The surprising result that interpersonal coping strategies had a significant *positive* relationship with depression may, as mentioned above, be reflective of the networks that participants are a part of (Edin et al., 2013).

Community coping strategies and intrapersonal tradeoffs and shopping strategies were also significant predictors of depression among this sample. One possible explanation is that these scales (especially tradeoffs and shopping) represent an increase in the mental load and stress that single mother must bear (Anater et al., 2011; Edin et al., 2013; Kinsey et al., 2019; Seligman & Berkowitz, 2019). Based on the existing literature, the association between tradeoffs strategies and depression was largely expected, while the absence of a significant relationship between rationing coping and depression was surprising (Liebe et al., 2022). Although it was not

feasible for this study, future studies with a larger sample size may be able to confirm the presence (or absence) of this relationship more definitively.

It is important to note that data for this study were collected on the heels of the COVID-19 pandemic. This may have influenced some or all of the variables measured in our study.

One study in Vermont reported a 32.3% increase in food insecurity from the beginning of COVID-19 among their sample (Niles et al., 2020). This study also suggests that households that had recently become food insecure also had some difference in coping strategies from households with more consistent food insecurity (Niles, 2020). In contrast, the USDA reports suggest that national household rates of food insecurity remained fairly stable, with a rate of 10.5% for both 2019 and 2020, and a rate of 10.2% for 2021 (Coleman-Jensen et al., 2020; Coleman-Jensen et al., 2021; Coleman-Jensen et al., 2022). It is possible that this stability is due to the attention given to resource and food assistance in various sectors. The Advance Child Tax credit is one such example. The Thrifty Food Plan was also updated, leading to an increase in SNAP benefits in Oct of 2021 (United States Department of Agriculture, 2021). COVID-19 also likely had a significant impact on mental health. A study conducted by Ettman and colleagues reported that the prevalence of depression among their sample collected during 2020 was three times higher than among the comparison sample (from the NHANES before COVID) (2020). They also discussed how depression rates in their sample were higher among women, those of low SES, and unmarried respondents (Ettman et al.,2020). It is possible that COVID-19 is an important factor in understanding the elevated rates of depression among our study sample.

Implications

The results of this study have important insights for food assistance programs and organizations. There was a staggering number of single female caregivers in this sample who

surpassed the CESD-10 cutoff for depressive symptoms. This highlights the need for programs that can support single mothers both with food and resources to improve their mental wellbeing, as the relationship between food insecurity and depression can be cyclical (Huddleston-Casas et al., 2009). In their study examining food insecurity and maternal depression, Reesor-Oyer and colleagues (2021) conclude that "a holistic approach that combines food assistance and mental health services may be an efficacious approach to reducing both depressive symptoms and food insecurity among low-income mothers" (p 5506). This study also reiterates the need for a continued presence and strengthening of policies that support mothers and provide necessary resources. Education about what resources are available and clear processes for enrollment (and re-enrollment) are important to ensure that single mothers are able to access them.

Future research

There are many avenues for future research based on the findings of this study. Further investigation into the use policy coping strategies and the possible benefits of utilizing these programs is warranted. Based on the surprising relationship between use of interpersonal coping strategies and depression, future studies may examine the relationships between kinds and qualities of social connections, mental health, and food insecurity. There is need for continued research surrounding food insecurity and its impact on the mental wellbeing of women, particularly single mothers. This study suggests that certain kinds of coping behaviors common to food insecurity may clarify this relationship, but more studies greater sample sizes are needed.

Limitations

This study was limited by its cross-sectional design; it could only examine whether relationships exist between the variables studied and cannot be used to establish causal relationships. Also, because the data were cross sectional, we could not examine the direction of

relationships between variables, but it is possible that some variables in this study have a bi-directional relationship. Self-report data is susceptible to self-report and recall bias, and the multimodal administration of the surveys (online and paper) could have introduced differences in the ways that participants responded to the survey. Due to a modest sample size, this study only had the capacity to detect medium effect sizes. Because the sample for this study was a convenience sample, there is also no certainty that this sample was representative of single mothers, therefore conclusions cannot necessarily apply for all single mothers in the US. Another possible limitation of the study is the that the food insecurity coping measures asked about the *use* of these strategies without assessing the eligibility for or availability of the strategies. This may be particularly important to keep in mind when considering the null results related to policy coping strategies. Yet, given the socioeconomic demographics in this sample, it is likely that a majority of them were eligible for one or more of these programs (as noted previously, an estimated 70% were eligible based on income and household size for free lunches through NSLP).

Conclusions

The current study provides important insights into the experiences of single female caregivers and how they provide food for themselves and their households. Elevated scores for the depression measure highlight a need for comprehensive care and a greater awareness of the needs of single mothers among policymakers and community programs. This study also suggests that examining food insecurity coping strategies may provide deeper insight into understanding food insecurity as well as help to clarify the relationship between food insecurity and depression.

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Appendix A: Missing Data for Key Variables

	Number Missing (for those answering at least 1 question in the scale)	How it was addressed
Food Security Status	19 participants missing 1 or more answers	Data imputed based on the recommendations in the USDA guide (Bickel et al, 2000)
Policy Coping Index	5 participants missing 1 or more answers	Participants providing at least half of the relevant information (2 items or more) were included. Only 1 participant was missing 3 values and therefore did **not** receive an index score
Community Coping Index	2 participants missing 1 or more answers	Participants providing at least half of the relevant information (2 items or more) were included. Based on this, both of these participants received in index score
Interpersonal Coping Index	1 participant missing 1 or more answers	Participants providing at least half of the relevant information (2 items or more) were included. Based on this 1 participant did **not** receive an index score
Rationing Coping Scale	1 participant missing 1 or more answers	A judgement was made about the best interpretation of this participant's answers and a value of 3 was imputed
Tradeoffs Scale	5 participants missing 1 or more answers	A missing item value was imputed for 1 participant based on answer patterns. For other 4 participants, the scale mean was used for anyone answering at least 3 questions. Based on this, only 1 participant did not receive a scale score
Shopping Strategies Scale	4 participants missing 1 or more answers	Score was a mean value for any participant answering at least 1 question in the scale. Based on this, all participants received a scale score.
CESD-10 Scale	5 participants missing 1 or more answers	As recommended by Andreson et al. (1994), scale scores were given to those who answered at least 9 out of 10 questions. Scale means were imputed for missing values. Based on this, 3 participants did **not** receive a scale score.

Appendix B: Food Insecurity Coping Questions and Answer Frequencies

Policy Coping Index

Question:	**Yes (%)**	**No (%)**
In the past 12 months, did you get SNAP or food stamp benefits?	60.4	39.6
In the past 12 months, did you or anyone in your household receive a 'Child Tax Credit' payment. These were an advance payment from the expansion of the child tax credit as part of the Federal Government's 2021 American Rescue Plan? *Please report yes if you received the payment as a paper check or direct deposit.* ****A follow up question asked about whether the household used any of the money on food. If they responded that they used most or some of it on food, they were considered a "yes". If they reported using none on food, there were considered a "no" for the purposes of the policy coping index.*	53.9	46.1
During the past 12 months, did you or children in your household get food through the WIC program?	33.3	66.7
During the past 12 months, did any children in the household meet eligibility criteria for and receive free or reduced-cost meals at a day-care or Head Start program? During the past 12 months, did any children in the household (between 5 and 18 years old) meet eligibility criteria for and receive free or reduced-cost meals at school?	72.7	27.3

Community Coping Index

Question:	**Yes (%)**	**No (%)**
During the past 12 months: - Did you receive food from a food pantry, church or other place that provides food at no cost to families in need?	63.6	36.4
During the past 12 months: - Have you grown vegetables or fruits in a community garden?	11.5	88.5
In the last 12 months: - Have you visited a social or community event just to eat food?	42.5	57.5
In the last 12 months: - Did you ever eat any meals at a soup kitchen or shelter?	33.3	66.7

Interpersonal Coping Index

Question:	Yes (%)	No (%)
In the last 12 months: - Did you ever send or take your children to the homes of friends or relatives for a meal because you were running out of food?	48.8	51.2
In the last 12 months: - Did you receive information from friends or family about where to access free or reduced-price food?	55.2	44.8
In the last 12 months: - Did you ever borrow money for food from friends or family?	57.0	43.0
In the last 12 months: - Did you ever get food from friends or family?	80.2	19.8

Rationing Scale (Intrapersonal)

Question:	Yes (%)	No (%)
In the last 30 days: - Have you avoided inviting guests to your home when you would be expected to serve them food?	68.6	31.4
In the last 30 days: - Have you eaten as much as possible when food is available?	61.6	38.4
In the last 30 days: - Have you locked up or hidden food to save it?	38.8	61.2
In the last 30 days: - Have you stretched the amount of food in your home by limiting the amount of food people in your home could eat?	50.6	49.4
In the last 30 days: - Have you eaten meals or snacks after your children finished to ensure they had enough?	77.9	22.1

Tradeoffs Scale (Intrapersonal):

Question:	Never	Rarely	Sometimes	Often	Always
How often during the past 30 days did you have to choose between: - Paying for food and paying for medicine or medical care	41.5	15.9	23.2	6.1	13.4
How often during the past 30 days did you have to choose between: - Paying for food and paying for utilities	33.3	11.9	29.8	8.3	16.7
How often during the past 30 days did you have to choose between: - Paying for food and paying for rent or mortgage	43.5	8.2	16.5	11.8	20.0
How often during the past 30 days did you have to choose between: - Paying for food and paying for transportation or gas for a car	24.7	15.3	18.8	17.6	23.5
How often during the past 30 days did you have to choose between: - Paying for food an paying for school loans, tuition, or other education expense	54.8	9.5	14.3	6.0	15.5

Shopping Strategies Scale (Intrapersonal)

Question:	**Never**	**Rarely**	**Sometimes**	**Often**
In the last 30 days, how often have you used these shopping tools? - Used food coupons	20	7.1	36.5	36.5
In the last 30 days, how often have you used these shopping tools? - Bought food in bulk (buying 3 items for the price of 2)	9.3	8.1	39.5	43
In the last 30 days, how often have you used these shopping tools? - Shopped for food at a certain store because of a sale	3.5	5.8	22.1	68.6
In the last 30 days, how often have you used these shopping tools? - Bought lower cost food to save money	3.6	1.2	17.9	77.4
In the last 30 days, how often have you used these shopping tools? - Bought fewer fruits and vegetables to save money	12.8	7	26.7 (1 part. answered between sometimes and often- 1.2%)	52.3
In the last 30 days, how often have you used these shopping tools? - Bought less junk food to save money	4.7	5.9	27.1	62.4
In the last 30 days, how often have you used these shopping tools? - Gone to 2 or more food stores to find cheaper food	10.6	9.4	24.7	55.3
In the last 30 days, how often have you used these shopping tools? - Used a shopping list	7	3.5	24.4	65.1

Appendix C: Bivariate Correlations

Table 1C: All Key Study Variables & Sociodemographic Controls

Correlations

		Depression	Shopping	Tradeoffs	Rationing	Policy	Community	Interpersonal	Food Security Status	Age	# Children	Income	Race/ethnicity
Depression	Pearson Correlation	1	.296**	.360**	.280*	-.026	.273*	.342**	.397**	-.093	.072	-.254*	-.108
	Sig. (2-tailed)		.007	<.001	.010	.814	.012	.002	<.001	.402	.518	.021	.329
	N	83	83	82	83	83	83	83	83	83	83	83	83
Shopping	Pearson Correlation	.296**	1	.266*	.397**	.136	.294**	.269*	.455**	-.043	.000	-.207	-.026
	Sig. (2-tailed)	.007		.014	<.001	.212	.006	.013	<.001	.692	.997	.056	.816
	N	83	86	85	86	86	86	85	86	86	86	86	85
Tradeoffs	Pearson Correlation	.360**	.266*	1	.562**	.073	.347**	.414**	.574**	.079	.241*	-.504**	.150
	Sig. (2-tailed)	<.001	.014		<.001	.509	.001	<.001	<.001	.474	.026	<.001	.172
	N	82	85	85	85	85	85	84	85	85	85	85	84
Rationing	Pearson Correlation	.280*	.397**	.562**	1	.165	.444**	.558**	.674**	.035	.191	-.456**	.202
	Sig. (2-tailed)	.010	<.001	<.001		.130	<.001	<.001	<.001	.747	.079	<.001	.064
	N	83	86	85	86	86	86	85	86	86	86	86	85
Policy	Pearson Correlation	-.026	.136	.073	.165	1	.121	.140	.332**	-.411**	.315**	-.267*	.058
	Sig. (2-tailed)	.814	.212	.509	.130		.260	.197	.002	<.001	.003	.013	.595
	N	83	86	85	86	89	88	86	86	89	88	86	85
Community	Pearson Correlation	.273*	.294**	.347**	.444**	.121	1	.452**	.550**	.148	.196	-.491**	.263*
	Sig. (2-tailed)	.012	.006	.001	<.001	.260		<.001	<.001	.168	.067	<.001	.015
	N	83	86	85	86	88	88	86	86	88	88	86	85
Interpersonal	Pearson Correlation	.342**	.269*	.414**	.558**	.140	.452**	1	.670**	.043	.254*	.**	.110
	Sig. (2-tailed)	.002	.013	<.001	<.001	.197	<.001		<.001	.697	.018	<.001	.319
	N	83	85	84	85	86	86	86	85	86	86	85	84
Food Security Status	Pearson Correlation	.397**	.455**	.574**	.674**	.332**	.550**	.670**	1	.018	.262*	-.599**	.080
	Sig. (2-tailed)	<.001	<.001	<.001	<.001	.002	<.001	<.001		.872	.015	<.001	.466
	N	83	86	85	86	86	86	85	86	86	86	86	85
Age	Pearson Correlation	-.093	-.043	.079	.035	-.411**	.148	.043	.018	1	-.089	-.153	.242*
	Sig. (2-tailed)	.402	.692	.474	.747	<.001	.168	.697	.872		.401	.159	.026
	N	83	86	85	86	89	88	86	86	98	91	86	85
# Children	Pearson Correlation	.072	.000	.241*	.191	.315**	.196	.254*	.262*	-.089	1	-.142	.044
	Sig. (2-tailed)	.518	.997	.026	.079	.003	.067	.018	.015	.401		.191	.691
	N	83	86	85	86	88	88	86	86	91	91	86	85
Income	Pearson Correlation	-.254*	-.207	-.504**	-.456**	-.267*	-.491**	-.405**	-.599**	-.153	-.142	1	-.088
	Sig. (2-tailed)	.021	.056	<.001	<.001	.013	<.001	<.001	<.001	.159	.191		.421
	N	83	86	85	86	86	86	85	86	86	86	86	85
Race/ethnicity	Pearson Correlation	-.108	-.026	.150	.202	.058	.263*	.110	.080	.242*	.044	-.088	1
	Sig. (2-tailed)	.329	.816	.172	.064	.595	.015	.319	.466	.026	.691	.421	
	N	83	85	84	85	85	85	84	85	85	85	85	85

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Table 2C: Food Security Coping Strategies

Correlations

		Shopping	Tradeoffs	Rationing	Policy	Community	Interpersonal
Shopping	Pearson Correlation	1	.266*	.397**	.136	.294**	.269*
	Sig. (2-tailed)		.014	<.001	.212	.006	.013
	N	86	85	86	86	86	85
Tradeoffs	Pearson Correlation	.266*	1	.562**	.073	.347**	.414**
	Sig. (2-tailed)	.014		<.001	.509	.001	<.001
	N	85	85	85	85	85	84
Rationing	Pearson Correlation	.397**	.562**	1	.165	.444**	.558**
	Sig. (2-tailed)	<.001	<.001		.130	<.001	<.001
	N	86	85	86	86	86	85
Policy	Pearson Correlation	.136	.073	.165	1	.121	.140
	Sig. (2-tailed)	.212	.509	.130		.260	.197
	N	86	85	86	89	88	86
Community	Pearson Correlation	.294**	.347**	.444**	.121	1	.452**
	Sig. (2-tailed)	.006	.001	<.001	.260		<.001
	N	86	85	86	88	88	86
Interpersonal	Pearson Correlation	.269*	.414**	.558**	.140	.452**	1
	Sig. (2-tailed)	.013	<.001	<.001	.197	<.001	
	N	85	84	85	86	86	86

*. Correlation is significant at the 0.05 level (2-tailed).

**. Correlation is significant at the 0.01 level (2-tailed).

Appendix D: RQ3 Linear Regression with All Variables

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.481[a]	.231	.170	6.25887	.231	3.762	6	75	.003
2	.531[b]	.281	.180	6.21938	.050	1.239	4	71	.302

a. Predictors: (Constant), ALL coping strategies scales

b. Predictors: (Constant), ALL coping strategies scales, Sociodemographic Control Variables

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	95.0% Confidence Interval for B		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	4.075	3.997		1.020	.311	-3.886	12.037		
	Shopping	2.150	1.239	.194	1.736	.087	-.317	4.618	.817	1.225
	Tradeoffs	1.346	.673	.250	1.999	.049	.005	2.688	.655	1.527
	Rationing	-.524	.730	-.106	-.718	.475	-1.978	.930	.470	2.126
	Interpersonal	1.120	.619	.228	1.810	.074	-.113	2.353	.646	1.548
	Community	.629	.698	.107	.901	.370	-.762	2.020	.728	1.373
	Policy	-.609	.707	-.089	-.861	.392	-2.018	.800	.961	1.040
2	(Constant)	11.052	6.781		1.630	.108	-2.468	24.572		
	Shopping	1.802	1.263	.163	1.426	.158	-.717	4.321	.775	1.290
	Tradeoffs	1.446	.739	.269	1.958	.054	-.027	2.919	.538	1.860
	Rationing	-.493	.729	-.100	-.677	.501	-1.947	.960	.465	2.148
	Interpersonal	1.033	.629	.210	1.643	.105	-.221	2.287	.618	1.618
	Community	1.042	.777	.177	1.341	.184	-.507	2.590	.581	1.721
	Policy	-1.047	.891	-.153	-1.175	.244	-2.825	.730	.597	1.674
	Age	-.117	.094	-.152	-1.248	.216	-.305	.070	.683	1.463
	# Children	-.092	.642	-.016	-.143	.886	-1.371	1.187	.791	1.265
	Income	-.051	.264	-.028	-.192	.848	-.577	.475	.470	2.126
	Race/ethnicity	-2.289	1.566	-.163	-1.461	.148	-5.413	.834	.818	1.223

a. Dependent Variable: CESD10_v1

Appendix F: Sample Survey

Stretching It Survey

What is your gender?

- ○ Male
- ○ Female
- ○ Non-binary
- ○ Transgender
- ○ None of these

How old are you?

_____ years

Are you currently single? (this includes people who are not married, married but separated, widowed, or divorced)

- ○ Yes
- ○ No

How many children under the age of 18, for whom you are the primary caregiver, live in your household at least half of the time?

- ○ none
- ○ 1
- ○ 2 or more

Are you a US citizen?

- ○ Yes
- ○ No

Are you comfortable taking a survey in English?

- ○ Yes
- ○ No

This survey is estimated to take about 30 minutes to complete. Do you have this time available now? Note: you will not be able to pause and finish this survey later

- ○ Yes
- ○ No



IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

Stretching It Survey

Including yourself, how many people typically live in your household?

_____

How many children, under the age of 18, live in your household?

_____

In your household are there... (select all that apply)

- ☐ Children under 5 years old?
- ☐ Children 5 through 11 years old?
- ☐ Children 12 through 17 years old?

What state do you live in?

_____

What city do you live in?



IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

In this section, you will be asked about ways you may get food for yourself and your household. Questions will ask about your use of various federal and community programs and informal help you may have gotten to obtain food.

In the past 12 months, did you get SNAP or food stamp benefits?

- ○ Yes
- ○ No (if no, skip to the next page)

Before the increase in SNAP benefits beginning October 1, 2021, how many weeks into the month did your food stamps or SNAP benefits usually last?

- ○ 1 week or less
- ○ 2 weeks
- ○ 3 weeks
- ○ 4 weeks or more
- ○ I was not receiving SNAP benefits before October 1, 2021

Since the increase in SNAP benefits beginning Oct 1, 2021, how many weeks into the month do your food stamps or SNAP benefits usually last?

- ○ 1 week or less
- ○ 2 weeks
- ○ 3 weeks
- ○ 4 weeks or more
- ○ I have not received SNAP benefits since October 1, 2021

IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

In the past 12 months, did you or anyone in your household receive a “Child Tax Credit” payment. These were an advance payment from the expansion of the child tax credit as part of the Federal Government's 2021 American Rescue Plan? *Please report yes if you received the payment as a paper check or direct deposit*

- ○ Yes
- ○ No (if no, move to next page)

Thinking about your use of the payments from the "Child Tax Credit" did you...

- ○ Use most of it to purchase food for the household
- ○ Use some of it to purchase food for the household
- ○ Use none of it to purchase food for the household

Please continue to next page now

IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

During the past 12 months…

	Yes	No
Did you or children in your household get food through the WIC program?	○	○
Did any children in the household meet eligibility criteria for and receive free or reduced-cost meals at a day-care or Head Start program?	○	○
Did any children in the household (between 5 and 18 years old) meet eligibility criteria for and receive free or reduced-cost meals at school?	○	○
Did you receive food from a food pantry, church or other place that provides food at no cost to families in need?	○	○
Have you grown vegetables or fruits in a community garden?	○	○
Have you grown vegetables or fruits in a home garden?	○	○

IRB APPROVED
IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

In the last 12 months…	Yes	No
Have you visited a social or community event just to eat food?	○	○
Did you ever eat any meals at a soup kitchen or shelter?	○	○
Did you ever send or take your children to the homes of friends or relatives for a meal because you were running out of food?	○	○
Did you receive information from friends or family about where to access free or reduced-price food?	○	○
Did you ever borrow money for food from friends or family?	○	○
Did you ever get food from friends or family?	○	○

These next questions are about the food eaten in your household in the last 12 months, and whether you were able to afford the food you need.

Below are several statements that people have made about their food situation. For these statements, please indicate whether the statement was often true, sometimes true, or never true for you in the last 12 months

	Often True	Sometimes True	Never True	Don't Know
I worried whether our food would run out before I got money to buy more	○	○	○	○
The food that I bought just didn't last and I didn't have money to get more	○	○	○	○
I couldn't afford to eat balanced meals	○	○	○	○

IRB APPROVED
IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

In the last 12 months…

	Yes	No	Don't know
Did you ever eat less than you felt you should because there wasn't enough money for food?	○	○	○
Were you ever hungry but didn't eat because there wasn't enough money for food?	○	○	○
Did you lose weight because there wasn't enough money for food?	○	○	○

In the last 12 months, did you ever cut the size of your meals or skip meals because there wasn't enough money for food?

- ○ Yes, almost every month
- ○ Yes, some months but not every month
- ○ Yes, only 1 or 2 months
- ○ No
- ○ Don't know

In the last 12 months did you ever not eat for a whole day because there wasn't enough money for food?

- ○ Yes, almost every month
- ○ Yes, some months but not every month
- ○ Yes, only 1 or 2 months
- ○ No
- ○ Don't know

IRB APPROVED
IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

The following items are about potential situations over the last 30 days.

In the last 30 days…

	Yes	No
Have you avoided inviting guests to your home when you would be expected to serve them food?	○	○
Have you eaten as much as possible when food is available?	○	○
Have you locked up or hidden food to save it?	○	○
Have you stretched the amount of food in your home by limiting the amount of food people in your home could eat?	○	○
Have you eaten meals or snacks after your children finished to ensure they had enough?	○	○
Have you eaten food after the expiration date?	○	○

How often during the last 30 days did you have to choose between:

	Never	Rarely	Sometimes	Often	Always
Paying for food and paying for medicine or medical care	○	○	○	○	○
Paying for food and paying for utilities	○	○	○	○	○
Paying for food and paying for rent or mortgage	○	○	○	○	○
Paying for food and paying for transportation or gas for a car	○	○	○	○	○
Paying for food an paying for school loans, tuition, or other education expense	○	○	○	○	○

IRB APPROVED
IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

In the last 30 days, how often have you used these shopping tools?

	Never	Rarely	Sometimes	Often
Used food coupons	○	○	○	○
Bought food in bulk (buying 3 items for the price of 2)	○	○	○	○
Shopped for food at a certain store because of a sale	○	○	○	○
Bought lower cost food to save money	○	○	○	○
Bought fewer fruits and vegetables to save money	○	○	○	○
Bought less junk food to save money	○	○	○	○
Gone to 2 or more food stores to find cheaper food	○	○	○	○
Used a shopping list	○	○	○	○

Are there any other strategies you used to help feed your family and save money on food? If yes, please describe below

_____

_____

_____



IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way **during the past week**.

	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of the time (3-4 days)	Most or all of the time (5-7 days)
I was bothered by things that usually don't bother me	○	○	○	○
I had trouble keeping my mind on what I was doing	○	○	○	○
I felt depressed	○	○	○	○
I felt that everything I did was an effort	○	○	○	○
I felt hopeful about the future	○	○	○	○
I felt fearful	○	○	○	○
My sleep was restless	○	○	○	○
I was happy	○	○	○	○
I felt lonely	○	○	○	○
I could not get "going"	○	○	○	○

IRB APPROVED
IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

In this section, a few questions about characteristics of you and your household:

What is your highest level of education?

- ○ No high school diploma
- ○ High school graduate or equivalent (GED)
- ○ Some college but degree not received or associates degree
- ○ Bachelor's degree (for example, BS, BA)
- ○ Graduate degree or professional degree

What is your employment status?

- ○ Employed, full time
- ○ Employed, part time
- ○ Not currently employed

What is your race? (select all that apply)

- ○ American Indian or Alaska Native
- ○ Asian
- ○ Black or African American
- ○ Native Hawaiian or Pacific Islander
- ○ White
- ○ Other

Are you Hispanic, Latino, or Spanish in origin?

- ○ Yes
- ○ No



IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

What is your marital status?

- ○ Widowed
- ○ Divorced
- ○ Separated
- ○ Never married

Are you currently living with a significant other?

- ○ Yes
- ○ No

What is your household's total annual income before taxes?

- ○ Less than $10,000
- ○ $10,000-$15,000
- ○ $15,001- $20,000
- ○ $20,001- $25,000
- ○ $25,001- $30,000
- ○ $30,001- $35,000
- ○ $35,001- $40,000
- ○ $40,001- $45,000
- ○ $45, 001- $50,000
- ○ $50,001- $55,000
- ○ $55,001- $60,000
- ○ $60,001-$65,000
- ○ $65,001- $70,000
- ○ Greater than $70,001

If you had an unexpected emergency costing $200, do you have a way of getting that money (either from your own savings, borrowing money from a friend or family member, etc)?

- ○ Yes
- ○ No

IRB APPROVED
IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

In this last section, a few questions about how things may have been different before and since the COVID-19 pandemic and information we need in order to send you a gift card

Which of these statements best describes the food eaten in your household **before** the COVID-19 pandemic?

- ○ Enough of the kinds of food we want to eat
- ○ Enough but not always the *kinds* of food we want
- ○ Sometimes *not enough* to eat
- ○ *Often* not enough to eat

Which of these statements best describes the food eaten in your household **in the last 12 months**?

- ○ Enough of the kinds of food we want to eat
- ○ Enough but not always the *kinds* of food we want
- ○ Sometimes *not enough* to eat
- ○ *Often* not enough to eat

Have you experienced any change in your overall emotional/psychological well-being during the COVID-19 pandemic?

	Mostly negative	Somewhat negative	No change	Somewhat positive	Mostly Positive
Change in overall emotional/psychological well-being during the outbreak	○	○	○	○	○



IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022

You have the opportunity to receive a gift card for participating in this survey. What is your preferred way to receive the gift card – an electronic gift card or a physical gift card?

- ○ Electronic
- ○ Physical
- ○ I don't want a gift card

Based on your preference, please provide your **name** and either **email** (for electronic card) **or home address** (for physical card) below.

Name:

_____

Email:

_____

Address:

_____

IRB NUMBER: 14527
IRB APPROVAL DATE: 04/28/2022