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The impacts of the COVID-19 pandemic on the food security of Mississippians

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Mississippi leads the United States in food insecurity, with 15.3% of Mississippians experiencing food insecurity in a given year. To determine the impacts of the COVID-19 pandemic on the food insecurity of Mississippians, a survey containing the USDA Household Food Security Questionnaire was distributed to adult Mississippi residents. By employing the USDA Household Food Security Scale and the Foster-Greer-Thorbecke Methodology, this study finds that the food insecurity rate, food insecurity gap, and squared food insecurity gap have worsened in Mississippi since the beginning of the COVID-19 pandemic. Additionally, this study finds that households which were food insecure prior to March 2020 are more likely to be food insecure after March 2020, as well as households that experienced job loss after March 2020, households that do not purchase groceries online, and households where the survey respondent identifies as a minority besides Black or African American.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER I

INTRODUCTION

Mississippi has the highest food insecurity prevalence in the United States (United States Department of Agriculture Economic Research Service [USDA ERS], 2022). Food insecurity is defined by the USDA as "a household level economic and social condition of limited or uncertain access to adequate food" (USDA ERS, 2022). Mississippi has historically experienced heightened levels of food insecurity and poverty, with 15.3% of Mississippians experiencing food insecurity in a given year and 19.5% of Mississippians living in poverty in 2019, representing the highest rates of both food insecurity and poverty in the U.S. (Coleman-Jensen et al., 2020; USDA ERS, 2022). Additionally, Mississippians are at the highest risk of developing diabetes, a preventable illness that killed 1,083 Mississippians in 2016 (Mississippi Department of Health [MSDH], 2022). These factors, among others, contribute to higher mortality, leaving Mississippians with a life expectancy of 74.4 years, the lowest life expectancy in the U.S. compared to the national average of 78.8 years (Centers for Disease Control and Prevention [CDC], 2022). Furthermore, the COVID-19 pandemic has limited access to nutritious foods among some groups with low socioeconomic status (Picchioni et al., 2021). For Mississippians living below the poverty line, the COVID-19 pandemic may have increased disparities by further limiting access to nutritious foods.

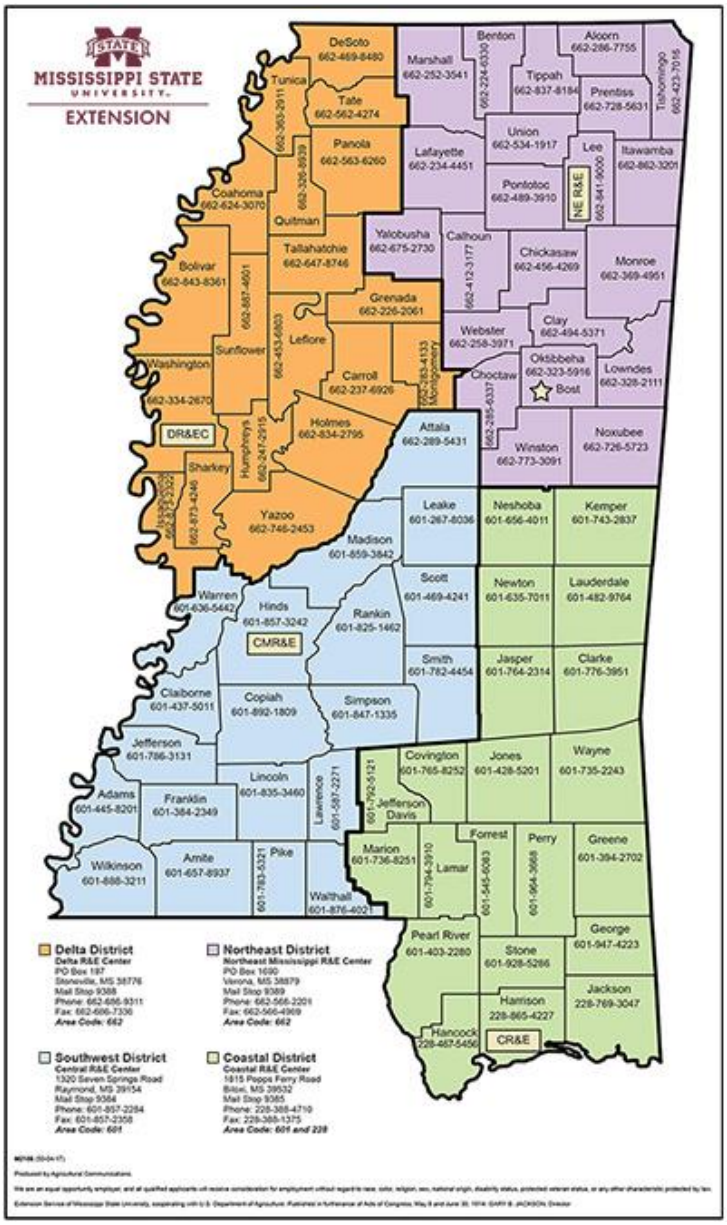
In 2019, Mississippi was home to 2.9 million residents, a population that has declined over time (United States Census, 2022). Mississippi has 82 counties that this study divides into

four distinct regions: the Delta, the Coast, Northeast Mississippi, and Central Mississippi. While the entire State struggles with public health issues and food disparities, residents of the Mississippi Delta experience the highest poverty rates and food insecurity prevalence in the State (United States Census, 2021; Stuff et al., 2004). The Mississippi Delta experiences higher poverty rates of 30% and above, compared to the State's overall poverty rate of 19.5% (United States Census, 2021). Stuff et al. (2004) found that the food insecurity rate in the Lower Delta was 21%, twice that of the national food insecurity rate in 2000.

This study examines COVID-19 pandemic's impact on the prevalence of food insecurity among adults living in Mississippi. To answer my research question, I collect quantitative data regarding past and current food insecurity among Mississippi residents by distributing a food insecurity survey to adults living in the four regions of Mississippi delineated by Mississippi State Extension Services. Figure 1 depicts a map of the four extension regions from Mississippi State Extension Services, where the counties highlighted in orange represent the Delta, the counties in purple reflect the Northeast, the counties in blue reflect the Central region (sometimes referred to as the Southwest region by Mississippi State Extension Services), and the counties in green represent the Coastal region. After the data are collected, food insecurity levels in the 12 month period prior to the start of the COVID-19 pandemic (before March 2020) and the period following the beginning of the COVID-19 pandemic (after March 2020) are thoroughly examined and compared to one another by calculating the food insecurity rate, food insecurity gap, and squared food insecurity gap using the Foster-Greer-Thorbecke (FGT) Methodology (Balistreri, 2016; Dutta, Gundersen, and Pattanaik, 2006; Gundersen, 2008). By comparing the food insecurity measurements in the 12-month period before March 2020 and the period after the

start of the COVID-19 pandemic, I identify how the prevalence of food insecurity changed for households in my sample across the pre- and post-pandemic periods.

Figure 1 Map of Four Extension Regions in Mississippi



Source: Mississippi State Extension Services (2022).

This comparison provides insights into how rates of food insecurity have changed for households in Mississippi. I also include a set of sociodemographic and economic characteristics from the periods before and after the start of the COVID-19 pandemic in my analysis determining how these conditions affect the likelihood of being food insecure after the start of the pandemic. For the period before March 2020, my study finds that food insecurity rates for households with low food security and very low food security were 44.64% and 26.07%, respectively. After March 2020, the rate increased to 48.55% for households with low food security and to 31.33% for households with very low food security. The food insecurity gap for households with low and very low food security before March 2020 was 12.94% and 4.41%, respectively. After March 2020, the food insecurity gap increased to 15.41% for households with low food security and to 5.40% for households with very low food security. The food insecurity gap measures the normalized amount, on average, that households fall below the food security threshold. By squaring this gap, a weighted measurement is obtained. The squared food insecurity gap rose from 6.06% before March 2020 to 7.44% after March 2020 for households with low food security, and it rose from 1.37% before March 2020 to 1.77% after March 2020 for households with very low food security.

The food insecurity rates for my survey sample are significantly higher than Mississippi's overall food insecurity rate. This is likely due to two reasons. First, my study did not sample based on income. Most households in the survey have incomes below $40,000, while Mississippi's median household income is $46,511 (United States Census, 2021). Second, the survey used in my study did not screen applicants as they were asked questions from the USDA food security questionnaire. Survey respondents were allowed to answer all food security questions from the questionnaire regardless of their responses to previous food security

questions. In most studies, respondents are screened throughout the USDA food security questionnaire. Respondents who do not respond affirmatively to at least one question in the first round of screening may not proceed to the second round, and those who do not respond affirmatively to any questions in the second screener cannot proceed to the third. In our study, applicants could respond to questions in one part of the questionnaire without having to respond affirmatively to questions in the sections preceding it. These two factors may contribute to the higher food insecurity rates found by my study.

In addition to my analysis of general changes in food security outcomes, I estimate a logit model and produce marginal effects which I use to examine the impact of sociodemographic, economic, and physical and mental health factors on food insecurity prevalence among Mississippians during the post-pandemic period. The marginal effects of my analysis can be interpreted as the change in the likelihood that a household falls below the food security threshold when these factors are present. My analysis found six statistically significant variables associated with the likelihood of being food insecure in Mississippi after March 2020. Food insecurity in the period before March 2020, being married, job loss during COVID-19, identifying as a race other than White or Black or African American, and not purchasing online groceries increased the likelihood of being food insecure in the period after March 2020. Alternatively, traveling outside the home to use Wi-Fi decreased the likelihood of being food insecure in the period after March 2020. In understanding how food insecurity changes due to a pandemic and how household characteristics change the likelihood of being food insecure, policymakers can draft meaningful legislation to help households that require the most assistance to prevent heightened rates of food insecurity during future public health crises.

CHAPTER II

LITERATURE REVIEW

To measure the prevalence of household food insecurity in the U.S., most studies use the USDA Household Food Security Scale (HFSS) which is calculated using a 10-item questionnaire for all households (see Table 1) with an additional 8-item questionnaire for households with children (USDA ERS, 2022). Each household's food security level is calculated using the HFSS based on their number of affirmative responses to the questions. This scale places households into three categories: food secure, food insecure (also known as low food security), and very low food security (Balistreri, 2016). If a respondent answers affirmatively to at least three of the questions on the questionnaire, then the respondent's household is classified as having low food security. If a respondent answers affirmatively to six or more questions on the questionnaire, their household is classified as having very low food security, which is also known as being food insecure with hunger. An additional scale can be used to determine the food insecurity level of children for households with children who answer the 8 additional questions. A food insecure household with children may or may not have children who are also food insecure.

Table 1 USDA Food Security Questionnaire

	Question	Answer Choices
1.	You and your household worried about whether your food would run out before y'all got money to buy more.	• Often true • Sometimes true • Never true • Don't know
2.	The food that you and your household bought just didn't last, and y'all didn't have money to get more.	• Often true • Sometimes true • Never true • Don't know
3.	You and your household couldn't afford to eat balanced meals.	• Often true • Sometimes true • Never true • Don't know
4.	Did you or other adults in your household ever cut the size of your meals or skip meals because there wasn't enough money for food?	• Yes • No • Don't know
5.	How often did this happen?	• Almost every month • Some months but not every month • Only 1 or 2 months • Don't know
6.	Did you or other adults in your household ever eat less than you felt you should because there wasn't enough money for food?	• Yes • No • Don't know
7.	Were you or other adults in your household ever hungry but didn't eat because there wasn't enough money for food?	• Yes • No • Don't know
8.	Did you or other adults in your household ever lose weight because there wasn't enough money for food?	• Yes • No • Don't know
9.	Did you or other adults in your household ever not eat for a whole day because there wasn't enough money for food?	• Yes • No • Don't know
10.	How often did this happen?	• Almost every month • Some months but not every month • Only 1 or 2 months • Don't know

Source: Coleman-Jensen et al. (2021).

Since the USDA HFSS only classifies households into one of three food security categories, it does not provide information about the severity of food insecurity among households within the same category (Gundersen, 2008). Understanding the severity of food insecurity is critical to understanding where households lie on the food insecurity spectrum. For example, a household that responds affirmatively to six questions is not experiencing food insecurity to the same degree of the household that responds affirmatively to all ten questions even though both households would be assigned to the same food security category. If there is a household that responds affirmatively to five questions, it would be classified as being food insecure, but it is only one affirmative response away from having very low food security. Since respondents who answer affirmatively to three to five questions are placed in the same category, it is impossible to know which household responded affirmatively to three questions and which responded affirmatively to five. All households in the same category are considered to experience food insecurity to the same extent, a simplification that gives a rough measure of food insecurity rather than the in-depth measurement required for more rigorous analyses. This inability to measure the depth of food insecurity across households is seen as a major limitation of the traditional HFSS.

To overcome this limitation in the HFSS, existing studies have applied the Foster-Greer-Thorbecke (FGT) Methodology after determining where households lie on the commonly used scale. The FGT Methodology originated as a class of poverty measures which have since been adapted to capture the intensity and depth of food insecurity (Foster et al., 2010). Applied to food security, the FGT Methodology provides the food insecurity rate, as well as measures of the gap and severity in food insecurity across households (Gundersen, 2008). The food insecurity rate demonstrates the percentage of households that are food insecure within a given population or

sample, while the food insecurity gap is the amount, on average, that households fall below the food insecurity threshold. By squaring this measure, the squared food insecurity gap is obtained, which measures food insecurity severity by placing a greater weight on households with higher levels of food insecurity. The FGT Methodology can also determine which households are close to a lower food security category, such as households that respond affirmatively to five questions on the food security questionnaire. A household that responds affirmatively to five questions is classified as having low food security but is only one affirmative response away from being classified as having very low food insecurity. The FGT Methodology captures this information in the food insecurity gap. While providing a more comprehensive measure of food security, the FGT Methodology also satisfies the axioms of anonymity, normalization, monotonicity, and transfer (Gundersen, 2008). The USDA HFSS only satisfies the axioms of normalization and anonymity (Gundersen, 2008). Without the axiom of monotonicity, an increase in the food insecurity of a household does not necessarily increase the food insecurity of society, and without the axiom of transfer, transfers between one food insecure household and a household with a greater level of food insecurity has no impact on the food insecurity index of the greater population (Gundersen, 2008). The lack of these axioms exemplifies the need for the FGT Methodology. In general, the FGT Methodology allows for greater specificity and provides a more exact measure of food insecurity within households than the HFSS (Dutta, Gundersen, and Pattanaik, 2006).

While households with children are more likely to be food insecure, the rate of food insecurity for households without children is increasing at a faster rate (Balistreri, 2016). In their sampled population, Balistreri (2016) found that households without children experienced an 8% increase in their rate of food insecurity from 20% to 28% in 2016. In comparison, households

with children experienced a 3% increase in their food security rate in 2016, moving from 35% to 38% (Balistreri, 2016). Additionally, Balistreri (2016) found that among households with children, the growth rate in very low food insecurity has been greater than the growth rate of low food security.

Households also face varying levels of food insecurity based on their ethnic and racial characteristics (Eicher-Miller et al., 2009). Low-income minority households are more likely to experience food insecurity compared to low-income White households (Balistreri, 2016). Specifically, Black low-income households with children and American Indian households experience a higher prevalence of food insecurity compared to Hispanic and non-Hispanic White households (Balistreri, 2016; Gundersen, 2008). Gundersen (2008) did not find a distinction in food insecurity between American Indian households with and without children. American Indian households have higher rates of food insecurity than all non-American Indian households, and more American Indian households experience food insecurity with hunger compared to non-American Indian households (Gundersen, 2008). Minority households already suffer from a disadvantage in food security compared to White households, and American Indians have the greatest disadvantage of all minority populations in the U.S. (Gundersen, 2008). Stuff et al. (2004) found that within the Mississippi Delta, low-income households and Black households had the highest prevalence of food insecurity, and households with Black children experienced more severe food insecurity than households with White children. The reasons for this disparity may stem from systemic problems, such as lack of educational attainment and employment, structural racism, substance abuse, and pre-existing health conditions (Flores and Amiri, 2019; Odoms-Young, 2019). Minorities experience these challenges more often than White Americans,

placing them at an increased risk of food insecurity (Flores and Amiri, 2019; Odoms-Young, 2019).

It is likely that the COVID-19 pandemic has impacted the rates of growth in food insecurity, leading to higher rates of food insecurity than would be expected to occur in the absence of the pandemic. Gundersen (2020) found that for the five states with the highest food insecurity rates, including Mississippi, the COVID-19 pandemic did not have an impact on the growth rate of food insecurity. For other states, however, the rate of food insecurity drastically increased. Nevada, for example, is currently projected to have the 8th highest number of food insecure households without children but was only the 15th highest state prior to the COVID-19 pandemic (Gundersen, 2020). For food insecure households with children, Nevada is now 3rd highest in food insecurity while it was only the 9th highest prior to the start of the pandemic (Gundersen, 2020). In contrast, Ahn et al. (2020) found that the COVID-19 pandemic did not have a significant impact on the food insecurity rates of households without children. In households with children, Ahn et al. (2020) found that the COVID-19 pandemic had a significant impact on food insecurity rates, with increases similar to those observed during the Great Recession in 2008.

In addition to studying the prevalence of household food security, previous studies have also identified the impacts of food insecurity on individual health outcomes. Food insecurity is associated with poorer health and nutrition in adults aged 18-64, including higher rates of diabetes, chronic illness, and asthma (Hanson and Conner, 2014; Gundersen, 2011; Gundersen and Ziliak, 2015). Food insecurity also has detrimental impacts on the health outcomes of children, with children living in food insecure households being twice as likely to suffer from poor health compared to children in food secure households (Gundersen, 2011). Additionally,

Gundersen (2011) found that households with children are more likely to be food insecure than households without children. Within these food insecure households with children, those that participate in the Supplemental Nutrition Assistance Program (SNAP), formerly known as the Food Stamp Program, are less likely to have poor health compared to children in households that do not participate in the program. This relationship between SNAP participation and health suggests that programs designed to reduce food insecurity have the potential to improve the health of program participants.

CHAPTER III

DATA AND METHODOLOGY

To examine the COVID-19 pandemic's impact on the food security of adult Mississippians, I analyze data from the Mississippi Food Security and Online Purchasing Survey (MFSOPS), an online survey administered to adult Mississippi residents. Data collection for the MFSOPS took place during February and March 2022, providing a final sample of $N = 560$ households. The MFSOPS was designed by a team of researchers at Mississippi State University. The survey included the 10-item USDA Food Security Questionnaire, providing a measure of household food security status. The additional set of 8 child food security questions was not included in the survey to reduce survey burden, although households with and without children were sampled. The 10-item questionnaire included questions used to measure the food security status of Mississippi households both before March 2020 (before the start of the COVID-19 pandemic) and during the period after March 2020 (after the start of the COVID-19 pandemic). A list of these questions and the response options can be found in Table 2. The survey also included questions about the demographic and health characteristics of respondents and their households, as well as questions about online food purchasing habits. The demographic portion included topics such as race, age, gender, education, marital status, housing characteristics, language spoken at home, and location of residence. The health portion of the survey included questions related to the current state of health of the survey respondents, covering topics such as overall self-reported physical and mental health, body composition, and diagnosis history of

COVID-19. The survey was distributed to respondents online through partnership with Qualtrics^{XM}, a company specializing in online survey data collection. To maintain an accurate representation of Mississippi's population, target goals were set for collecting data from the four regions of Mississippi based on the share of the state's population living in each region: the Coast ($n = 186\ households$), the Delta ($n = 92\ households$), Central Mississippi ($n = 154\ households$), and Northeast Mississippi ($n = 122\ households$). In addition to region of residence, survey data were collected to ensure a state-representative sample based on age, gender, and race. Therefore, participants were sampled by cluster and population proportion random sampling based on region of residence, age, gender, and race. Respondents were not directly compensated by the research team for their participation.

Additionally, the survey did not screen respondents as they answered the USDA Food Security Questionnaire. Usually, there are three screening phases in the USDA Food Security Questionnaire (Coleman-Jensen et al., 2021). If respondents do not respond affirmatively to any questions in the first screener, they are not allowed to continue on to the second round of questions, and if they do not respond affirmatively to any questions in the second screener, they will not proceed to the third and final round of questions. In the survey, respondents were allowed to answer the full set the food security questions regardless of their previous responses. There are 22 households in the sample that responded affirmatively to questions in one round without responding affirmatively to any questions in the previous round. The approach used in this study to the USDA Food Security Questionnaire, compared to the USDA's approach, captures more accurate food insecurity measurements, as households that would usually be screened out of the Questionnaire are able to express the food insecurity prevalence within their household.

To measure a household's level of food insecurity using the FGT Methodology, this study follows the empirical framework set by Dutta et al. (2006). The first step in implementing the FGT methodology is to construct each household's food indicator (FI) value. Let N = {1, …, *n*} be the set of all households in consideration, where *n* is the total number of all households in the sample. In this study, households in consideration are the set of households in the MFSOPS sample. For each household $i \in N$, the FI is denoted by s_i, where a higher value of s_i signifies a lower level of household food security. For this study, each s_i is assigned as the household's HFSS Rasch score based on their number of affirmative responses to the 10-item questionnaire (see Table 2). The HFSS Rasch scores used in this study were calculated in the USDA's *Guide to Measuring Household Food Security* (2000). It is assumed that s_i falls in the interval [0, *z*] where 0 indicates complete food security and *z* indicates complete food insecurity. Now, let *e* $(1 > e \geq 0)$ be the benchmark such that household i is considered food insecure if and only if $s_i > e$.

Table 2 10-Item Household USDA Food Security Questionnaire Responses and Corresponding Rasch Scores

Number of Affirmative Responses	s_i **(Rasch score)**
0	0
1	1.72
2	3.10
3	4.23
4	5.24
5	6.16
6	7.07
7	8.00
8	8.98
9	10.15
10	11.05

The FGT Methodology is used to create a more comprehensive index of food insecurity than the standard HFSS. This index, known as the food security index (FII), measures the extent to which a household is food insecure by calculating how far away the household is from the set threshold of food security, e. If $s_i \leq e$, then the household's FII is defined as zero, and if $s_i > e$, then the FII is defined as $(s_i - e)$. To calculate a normalized food insecurity index (NFII) which provides a comparable measure of food insecurity severity for potentially different values of e, each household's FII is divided by $(z - e)$, normalizing their FI by the difference between the highest possible level of s, z, and the food security threshold level, e. More formally, let the NFII be denoted by d_i for each household i, such that:

$$d_i = \begin{cases} \frac{s_i - e}{z - e} \; if \; s_i > e \\ 0 \; if \; s_i \leq e \end{cases} \tag{1}$$

Higher levels of d_i correspond to higher levels of food insecurity in a household. The aggregate measure, d, is a function of $d_1, \ldots, d_n$ which represents the degree of food insecurity among all households in N. Since d_i represents the food insecurity level of a single household, d must be aggregated over all households to measure the food insecurity of households collectively rather than individually. To produce the aggregate measure d, we utilize an aggregation rule that is a function of $D: [0,1]^n \rightarrow R^n$. Therefore, $d = D(d_1, \ldots, d_n)$. The values of s_i, z and, e originate from the USDA Rasch model, which gives a Rasch score value for each number of affirmative responses to the USDA food security questionnaire (Gundersen, 2007). The set of Rasch scores ranges from 0 to 13.03 for households with children and from 0 to 11.05 for households without children, where lower scores indicate fewer affirmative responses and lower levels of food insecurity (Gundersen, 2007). The s_i for a household is the household's Rasch score (Gundersen, 2007). The value of z is the maximum possible level of s for a household. Specifically, the level

of z for a household without children is 11.05 and 13.03 for a household with children based on the underlying Rasch model (Gundersen 2008). Because this study utilizes the 10-item questionnaire used to measure household food security without the 8 additional questions on child food security for households with children, the value of z is set to 11.05 for all households. The value of e may vary based on the level of food insecurity considered. For example, if the benchmark for food security is food insecurity without hunger, the Rasch score that corresponds to the value of e would be different than if the benchmark for food security was to be food insecure with hunger (Gundersen, 2008). It is important to note that because the Rasch scores vary based on household composition, the relative differences between the values matter rather than their absolute differences (Gundersen, 2008). For the purposes of this study, I use two benchmark values of e. The first benchmark value is low food security, where $e = 3.10$. The second benchmark value is having very low food security, where $e = 6.16$. These benchmark values of e are based on Rasch scores provided by the USDA's *Guide to Measuring Household Food Security* (2000).

I consider three forms of the aggregation rule D aggregating all d_i for households in the MFSOPS:

Food Insecurity Rate:

$$d^H = \frac{n'}{n} \tag{2}$$

Food Insecurity Gap:

$$d^G = \frac{\sum_{i=1}^{n} d_i}{n} \tag{3}$$

Squared Food Insecurity Gap:

$$d^{SG} = \frac{\sum_{i=1}^{n}(d_i)^2}{n} \quad (4)$$

Where n' represents the total number of food insecure households present in the sample. The first measurement, denoted by d^H, gives a proportion of food insecure individuals present in the total sample which represents the food insecurity rate. d^H is often referred to in the literature as the headcount measure. The second measurement, denoted by d^G, is the food insecurity gap, which measures the average shortfall of households in a group from the food security threshold, e. Since it is uniformly weighted, one issue with the food insecurity gap is that it tends to underestimate the shortfall of food insecure households in cases where there are high numbers of food secure households with $d_i = 0$. More specifically, if there are numerous food secure households, but only a small number of households are very food insecure, then the food insecurity gap will still be low despite the presence of these very food insecure households, masking the shortfall of the most severely food insecure households. The third measurement is the squared food insecurity gap, denoted by d^{SG}, which places a higher weight on households with high values of d_i. By weighting the measurement with respect to food insecurity level, the squared food insecurity gap provides an average measure of the food security shortfall for a group that heavily weights the most food insecure households in the sample. In other words, households with the highest levels of food insecurity have more impact on the value of d^{SG}, and households with lower levels of food insecurity are given less weight.

With these aggregation measures, I examine the aggregate food insecurity of the full sample of MFSOPS respondents in the periods before and after the start of the COVID-19

pandemic. These periods represent the 12 months before the start of the COVID-19 pandemic (before March 2020) and the period after the start of the COVID-19 pandemic (after March 2020), respectively. Respondents were asked to recall their food security status in the 12 months before the start of the COVID-19 pandemic (before March 2020), as well as their food security status since the beginning of the pandemic (after March 2020). Food security before March 2020 is measured in a 12-month period while food security after March 2020 measures food security from March 2020 to March 2022 (the final month of survey data collection), which is a 24-month period.

Using the headcount measure, the food insecurity rate of households in Mississippi can be estimated. The headcount measure for the post-pandemic period can be compared to the same headcount measure during the period before March 2020 to identify if households in my sample experienced an increase in the rate of food insecurity after the start of the COVID-19 pandemic. With the food insecurity gap and the weighted food insecurity gap, the change in the shortfall and severity of food insecurity among Mississippians can be measured across the pre- and post-pandemic periods.

Differences in food security prevalence across demographic groups of interest can be evaluated using a logit model. Specifically, I examine the differences in aggregate food security among female and male respondents; households with children and households without children; White and Black respondents; households with varying levels of educational attainment; married and unmarried respondents; households that did and did not participate in SNAP, Women, Infants, and Children (WIC), or Pandemic Electronic Benefit Transfer (P-EBT); households that did and did not experience job loss after March 2020; employed and unemployed respondents; respondent age; respondents with poor, fair, good, and excellent physical and mental health;

households with close and far proximity to the nearest grocery store; households with and without Wi-Fi access; households that do and do not travel outside the home to use Wi-Fi; respondents that contracted COVID-19 and respondents that did not; households that own personal vehicles and those that do not; and households that do and do not purchase groceries online.

Mississippi is a state with large rural areas and a significant low-income population. The sociodemographic and economic variables examined in the logit model were chosen to reflect characteristics that may be present and affect household food security in Mississippi. Because Mississippi has large rural areas, households' ownership of a personal vehicle is more important than in states with large metropolitan areas and reliable public transportation. Many of these rural areas also lack the infrastructure to support Internet access, including household Wi-Fi access. Therefore, asking respondents about their household Wi-Fi access and whether they travel outside the home to use Wi-Fi helps determine the likelihood of being food insecure in the period after COVID-19 in areas with limited Internet access. The probability of household food insecurity will be compared across these groups of interest as well in the analyses outlined below.

I utilize a logit model to estimate my effects of interest. For each household i, the probability of being food insecure during the period after the start of COVID-19 pandemic, $P(FIA_i = 1)$, is modeled such that:

$$\frac{P(FIA_i = 1|FIB_i, X_i) = \exp(\alpha + \gamma FIB_i + \beta X_i)}{(1 + \exp(\alpha + \gamma FIB_i + \beta X_i))} \quad (5)$$

Where FIA_i is an indicator variable equal to 1 if household i is food insecure during the period after the start of the COVID-19 pandemic and 0 otherwise, FIB_i is an indicator variable equal to 1 if household i was food insecure during the 12 months prior to the start of the COVID-19 pandemic and 0 otherwise, X_i is the set of respondent and household characteristics described above. The coefficient, α, is the model's intercept term and β is a vector of coefficients corresponding to each variable in X_i. Both FIA_i and FIB_i are created using the HFSS classifications of food insecurity. The model is estimated by maximum likelihood estimation in STATA. The model given in equation (5) allows me to estimate the probability of household food insecurity during the period following the start of the COVID-19 pandemic conditional on household food insecurity during the 12 months prior to the start of the pandemic and my set of respondent/household covariates. Since the coefficients of the logit model provide little direct interpretation, I present average marginal effects for each of the model's independent variables of interest. See Table 3 for a full description of the model's variables as well as their mean and standard deviation.

Table 3 Descriptive Statistics

Variable Name	Definition	Mean (Standard Deviation)
FIA	Household food security status after COVID-19 =1 if household is food insecure =0 otherwise	0.4482 (0.4978)
FIB	Household food security status before COVID-19 =1 if household is food insecure = 0 otherwise	0.4464 (0.4976)
P-EBT	= 1 if household participates in P-EBT = 0 otherwise	0.3339 (0.4720)
SNAP	= 1 if household participates in SNAP = 0 otherwise	0.3363 (0.4729)
WIC	= 1 if household participates in WIC = 0 otherwise	0.1125 (0.3163)
Job loss during COVID-19	= 1 if respondent lost job after the start of the COVID-19 pandemic = 0 otherwise	0.2732 (0.4460)
Income	= 1 if household income is between $0 - $40,000 = 0 otherwise	0.5232 (0.4999)
Children	= 1 children are not present = 0 otherwise	0.3339 (0.4720)
Education (Reference group – bachelor's degree)		
No high school - Respondent	= 1 if respondent's highest level of education is less than = 0 otherwise	0.0735 (0.2612)
No high school – Other household members	= 1 if other household members' highest level of education is less than = 0 otherwise	0.0789 (0.2698)
High school diploma or equivalent (GED) - Respondent	= 1 if respondent's highest level of education is a high school diploma or equivalent = 0 otherwise	0.2509 (0.4339)
High school diploma or equivalent (GED) – Other household members	= 1 if other household members' highest level of education is a high school diploma or equivalent = 0 otherwise	0.2706 (0.4447)

Table 3 (continued)

Variable Name	Definition	Mean (Standard Deviation)
Some college - Respondent	= 1 if respondent's highest level of education is some college = 0 otherwise	0.2724 (0.4456)
Some college – Other household members	= 1 if other household members' highest level of education is some college = 0 otherwise	0.1828 (0.3868)
Marital status	= 1 if respondent is married = 0 otherwise	0.3578 (0.4798)
Sex	= 1 if respondent is female = 0 otherwise	0.5591 (0.4969)
Age (Reference group – 18-35 years of age)		
35-44 years of age	= 1 if respondent is 35-44 = 0 otherwise	0.2054 (0.4043)
45-54 years of age	= 1 if respondent is 45-54 = 0 otherwise	0.1339 (0.3409)
55-64 years of age	= 1 if respondent is 55-64 = 0 otherwise	0.1375 (0.3447)
65+ years of age	= 1 if respondent is 65+ = 0 otherwise	0.1500 (0.3574)
Employment status (Reference group – unemployed)		
Part-time	= 1 if respondent is employed part-time = 0 otherwise	0.1311 (0.3378)
Full-time	= 1 if respondent is employed full-time = 0 otherwise	0.4129 (0.4928)
Race (Reference group – White)		
Black or African American	= 1 if respondent is Black or African American = 0 otherwise	0.3554 (0.4790)
Other race	= 1 if respondent is a race other than White or Black or African American = 0 otherwise	0.0375 (0.1902)
Online groceries	= 1 if household did not purchase groceries online within the last 12 months = 0 otherwise	0.5903 (0.4922)
Vehicle	= 1 if household does not own a personal vehicle = 0 otherwise	0.0930 (0.2907)

Table 3 (continued)

Variable Name	Definition	Mean (Standard Deviation)
Employment status – Other household members	= 1 if other household members are not employed = 0 otherwise	0.2386 (0.4267)
Distance (Reference group – 30+ miles)		
Less than 5 miles	= 1 if the nearest grocery store is less than 5 miles away = 0 otherwise	0.3768 (0.4850)
5 to 10 miles	= 1 if the nearest grocery store is 5-10 miles away = 0 otherwise	0.3839 (0.4868)
11 to 20 miles	= 1 if the nearest grocery store is 11-20 miles away = 0 otherwise	0.1696 (0.3757)
21 to 30 miles	= 1 if the nearest grocery store is 21-30 miles away = 0 otherwise	0.0518 (0.2218)
COVID-19	= 1 if respondent contracted COVID-19 = 0 otherwise	0.3309 (0.4710)
Mental health	= 1 if respondent reports poor mental health = 0 otherwise	0.0717 (0.2582)
Physical health	= 1 if respondent reports poor physical health = 0 otherwise	0.0448 (0.2071)
Travels to use Wi-Fi	= 1 if respondent must travel to use Wi-Fi = 0 otherwise	0.7571 (0.4292)
Household Wi-Fi	= 1 if household does not have Wi-Fi access = 0 otherwise	0.1018 (0.3026)

While MFSOPS included 560 total observations, only 405 observations were included in the logit model due to missing values for some questions. There could exist a response bias to the survey, as households that are food insecure may be more likely to participate in the survey relative to the rates observed among the general population. While my model controls for observable household characteristics, there is the potential for bias in my results based on unobservable factors which may be correlated with both the dependent and independent variables. Therefore, my model's results should be interpreted as associations rather than causal estimates. Finally, the food insecurity rates in my study are significantly higher than the food insecurity rate in Mississippi due to survey design and sampling strategies. My study did not proportionally sample based on income, and a large portion of the survey sample consists of households with incomes below Mississippi's median household income level. This oversampling of lower income households impacts the external validity of my findings, so the results of my study are more applicable to low-income Mississippi households than for the average Mississippi household and the State in general.

CHAPTER IV

RESULTS

MFSOPS surveyed 560 Mississippi households to measure the prevalence and intensity of food insecurity before and during the COVID-19 pandemic. Only 405 households were included in the logit model analysis due to missing variables. Table 4 contains demographic information for MFSOPS survey respondents and the state of Mississippi. The total number of observations for each demographic category vary for MFSOPS. Most demographic categories contained 560 observations; however, some had fewer due to missing values in the MFSOPS data. For respondents in my sample, the primary language spoken at home was English, with only 2 households speaking a primary language other than English. With regards to the race of survey participants, 61% of respondents identified as White, 36% identified as Black or African American, and 3% of respondents identified as a race other than White, or Black or African American. The gender makeup of respondents in the sample was 55.7% female, 43.6% male, and 0.7% respondents who identified with a gender other than male or female. Roughly 93% of respondents held at least a high school diploma or equivalent (GED), with only 7% of respondents having an education level below the high school level. Fifty-six percent of respondents were employed part-time or full-time at the time of the survey, and 44% of respondents said they were unemployed. Finally, 37% of respondents were between the ages of 18-34; 21% were between 35-44; 13% were between 45-54; 14% were between 55-64; and 15% were 65 years of age or older.

Table 4 Survey and State Demographics

Demographic Characteristic	Observations	% of Sample	% of Mississippi Population
Age			
18-34	209	37%	30%
35-44	115	21%	16%
45-54	75	13%	16%
55-64	77	14%	17%
65+	84	15%	21%
Race			
Black or African American	199	36%	37.8%
White	339	61%	59.1%
Other race/ethnicity	22	3%	3.1%
Sex			
Female	312	55.7%	51.5%
Male	244	43.6%	
Other sex	2	0.7%	
Education			
Less than high school	12	2.2%	28%
Some high school	29	5.3%	
High school diploma or equivalent (GED)	140	25%	30%
Some college, no degree	152	27.2%	25%
2-year college degree	91	16.3%	
4-year college degree	84	15%	13%
Graduate or professional degree	50	9%	7%
Language			
English	555	99.1%	96%
Other language	2	0.9%	4%
Employment			
Employed	303	56.8%	56.6%
Retired	109	20.4%	
Unemployed	121	23%	

Source: U.S. Census Bureau (2020).

To compare my survey demographics to the demographic makeup of Mississippi, I use data from the U.S. Census Bureau's American Community Survey (2020). The American Community Survey is an ongoing survey with results presented as 5-year averages; these averages are updated yearly (U.S. Census Bureau, 2022). Reviewing these data, I find that the percentage of White respondents is slightly higher in my sample (61.0%) than the State average (59.1%). In Mississippi, 59.1% of residents are White alone while 37.8% of residents are Black or African American alone. Roughly 4% of Mississippi households speak a language at home other than English, compared to 1% of survey respondents. The number of Mississippians with at least a higher school diploma or equivalent is 76%, which is lower than the 93% of respondents in my survey. Roughly 21% of Mississippi residents are 65 years of age and over, compared to the 15% in my study. Approximately 51.5% of Mississippians are female, compared to 55.7% of females in this study. The educational attainment of respondents was fairly consistent with the educational attainment of Mississippians; however, the percentage of Mississippians with educational attainment less than high school (28%) is significantly higher than in this study (2.2%).

Although some of these estimates are slightly higher or lower than the State's average, the survey sample is mostly representative of State demographics. In Table 4, the sociodemographic makeup of Mississippi can be compared to the sociodemographic makeup of this study; however, not all demographic characteristics are comparable as this study contained categories that are not currently available from the U.S. Census Bureau. For example, the Census Bureau reports that 51.5% of Mississippians are female. Because the Census Bureau does not report how many Mississippians identify as a sex other than male or female, the percentage of

male and other sex Mississippians cannot be identified from the percentage of female Mississippians.

Following the USDA HFSS to determine household food security status, it is determined that 250 households in the MFSOPS sample were food insecure prior to March 2020 and 251 households were food insecure after March 2020. Before March 2020, 146 households had very low food security, compared to 167 households with very low food security after March 2020. Table 5 contains a transition matrix of the household food security in the pre- and post-March 2020 periods. There were 282 households that stayed above the food security threshold before the start of the COVID-19 pandemic (before March 2020) and after the COVID-19 pandemic (after March 2020). Forty-five households remained in the low food security (food insecure) category before and after the start of the COVID-19 pandemic. Unfortunately, 120 households remained in the very low food security category before and after the start of the COVID-19 pandemic. Twenty-four households were food secure before the start of the COVID-19 pandemic but transitioned to low food security after the pandemic. Three households transitioned from being food secure in the period before March 2020 to having very low food security in the period after March 2020. Sixteen households had low food security before the start of the COVID-19 pandemic but became food secure after the COVID-19 pandemic. Twenty-three households had low food security before the COVID-19 pandemic and moved into the very low food security category after the COVID-19 pandemic. In terms of very low food security, 12 households had very low food security before the COVID-19 pandemic but attained food security after the COVID-19 pandemic. There were no households in the sample that transitioned from very low food security before the COVID-19 pandemic to low food security after the COVID-19 pandemic. The change in the number of households with food security, low food security, and

very low food security in the periods before and after the COVID-19 pandemic were tested for statistical significance using a paired 2-sample t-Test. The change in the number of food secure households before and after the COVID-19 pandemic and the change in the number of households with very low food security before and after the COVID-19 pandemic are both significant at the 1% level of statistical significance. The change in the number of households with low food security is significant at the 5% level of statistical significance.

The FGT Methodology provides further insight on how the depth of food insecurity has changed. Table 6 contains food insecurity measurements for households with low and very low food security. The food insecurity rate for households with low food security after March 2020 is 48.55%, compared to 44.64% before March 2020. The food insecurity rate for households with very low food security increased from 26.07% before March 2020 to 31.33% after March 2020. The food insecurity rate for households with low food security increased by 8.75%, while the rate for households with very low food security increased by 20.18%. These results imply that the food insecurity rate has increased for both food insecurity categories, but the rate for households with very low food security has increased more than the rate for households with low food security.

Using low food security as the threshold, the food insecurity gap was 12.94% before March 2020 and increased to 15.41% after March 2020. This change corresponds to a 19.09% increase in the average amount that Mississippi households that fall below the food security threshold. Using very low food security as the food security threshold, the food insecurity gap rose from 4.41% before March 2020 to 5.40% after March 2020, meaning that there was a 22.49% increase in the average amount households fell below the benchmark of very low food security after the start of the COVID-19 pandemic.

The squared food insecurity gap which provides a weighted measure that places more emphasis on households with higher levels of food insecurity. Using low food security as the benchmark category, the squared food insecurity gap increased from 6.06% before March 2020 to 7.44% after March 2020. When very low food security is set as the benchmark, I find that the squared food insecurity gap has risen from 1.37% before March 2020 to 1.77% after March 2020. Therefore, the squared food insecurity gap has increased by 22.72% at the food security benchmark and by 28.97% at the low food security benchmark.

My results suggest that the squared food insecurity gap has increased more than the food insecurity rate and food insecurity gap from the pre- to post-pandemic periods. This finding implies that while the prevalence of food insecurity and the average amount that households fall below the food insecurity benchmarks have worsened, the severity of food insecurity has increased at a higher rate. Food insecurity was more prevalent for households in my sample after March 2020. Additionally, the depth of food insecurity has worsened since March 2020 and the severity of food insecurity since March 2020 has deepened for households with low and very low food security.

Table 5 Food Security Transition Matrix

	Prior to COVID-19		
During COVID-19	Food Secure	Low Food Security	Very Low Food Security
Food Secure	282	16	12
Low Food Security	24	45	0
Very Low Food Security	3	23	120

Table 6 FGT Food Insecurity Measurements

	Prior to COVID-19	**During COVID-19**	**% Change**
Low Food Security ($e = 3.10$)			
Number of Low Food Security Households	250	251	0.40%**
Low Food Security Rate Rate	44.64%	48.55%	8.75%
Food Insecurity Gap	12.94%	15.41%	19.09%
Squared Food Insecurity Gap	6.06	7.44	22.72%
Very Low Food Security ($e = 6.16$)			
Number of Very Low Food Security Households	146	167	14.38%*
Very Low Food Security Rate	26.07%	31.33%	20.18%
Food Insecurity Gap	4.41%	5.40%	22.49%
Squared Food Insecurity Gap	1.37	1.77	28.97%

A logit model is used to estimate associations between the likelihood of food insecurity during the post-pandemic period and my set of respondent and household characteristics of interest. The independent variables considered in the logit model include households' food security status during the 12 months before March 2020; household participation in SNAP, WIC, and P-EBT; household job loss after March 2020; household income; the presence of children in the household; the education level of the respondent and other adults in the household; the employment status of the respondent and other adults in the household; the respondents' marital status, gender, race, age, physical health, and mental health; the distance to the nearest grocery store; household Wi-Fi access; whether the respondent or other adults in their household regularly travel to locations outside the home to use Wi-Fi; diagnosis history of COVID-19; whether the household purchases groceries online; and whether the household has a personal vehicle. In this model, household food security status after March 2020 is the dependent variable of interest.

The results of this logit model are presented as average marginal effects in Table 7 along with estimates for each coefficient. The statistical significance of the marginal effects is evaluated at the 1%, 5%, and 10% levels of significance. In total, six variables are statistically significant. My results suggest that household food insecurity before March 2020 and being married have a statistically significant impact on the probability of food insecurity during the post-pandemic period at the 10% level of significance. Traveling to use Wi-Fi and identifying as a race other than White or Black or African American are found to be statistically significant at the 5% level and job loss during COVID-19 and online grocery shopping are statistically significant at the 1% level.

I find that households who were food insecure before the start of the pandemic in March 2020 are 75 percentage points more likely to be food insecure during the period after the start of the pandemic, holding all else constant. This finding matches my expectations as households who experience food insecurity in one period are more likely to experience food insecurity in future periods. There were 250 households in my sample that were food insecure prior to the COVID-19 pandemic, and of these 250 households, 165 were still food insecure in the period after the COVID-19 pandemic. Respondents who lost their job after the start of the pandemic are 6.48 percentage points more likely to be food insecure during the period after the start of the pandemic, holding all else constant. This finding is also consistent with conventional expectations, as respondents who lost their job during the COVID-19 pandemic will likely be subject to additional resource limitations, such as a loss in income and health insurance benefits. For households with respondents that are married, my model predicts that the household is 8.89 percentage points more likely to be food insecure during the period after the start of the pandemic than households with unmarried respondents, holding all else constant. One may anticipate that unmarried households would be more prone to food insecurity; however, the results of my model suggest the opposite for households in my sample. This finding may be the result of additional resource constraints placed on married households relative to households with single respondents. Respondents who identified as a race other than White or Black/African American are 2.89 percentage points more likely to be food insecure during the period after the start of the pandemic compared to White Mississippians, holding all else constant. This finding is consistent with the food security literature, as minority populations are more likely to experience food insecurity (Odoms-Young, 2018).

My results also suggest that households that did not purchase groceries online after the start of the pandemic are 6.03 percentage points more likely to be food insecure during the period after the start of the pandemic compared to households that purchased groceries online, holding all else constant. The positive effect of online grocery purchases on food security may represent a buffering effect where households that purchase food online are able to partially address limited access to local food caused by the pandemic. According to the U.S. Census Bureau, 75.8% of Mississippians have a broadband Internet subscription (2021). In future situations like the COVID-19 pandemic, with reliable Internet access, Mississippians may order groceries for their household online and combat their likelihood of food insecurity. Grocery store retailers may expand their selection of online grocery services in preparation for future pandemics as well, partially alleviating the pandemic's negative effects on food access. Currently, major grocery store retailers such as Walmart and Kroger allow consumers to have their online grocery orders shipped directly to their home, but only in some regions. Extending the availability of online grocery delivery/shipping could help Mississippi residents without personal vehicles, and residents who live in food deserts, maintain reliable access to nutritious food both during and outside of public health crises. My results also suggest that households who travel outside the home to use Wi-Fi are 9.02 percentage points less likely to be food insecure during the period after the pandemic than households who do not travel to use Wi-Fi. Conditional on owning a car and having Wi-Fi at home, households who travel outside the home to use Wi-Fi may have greater access to other forms of transportation or locations that offer Wi-Fi services.

Conditional on food insecurity before the pandemic and my other covariates, I do not find that participation in SNAP, WIC, or P-EBT has a statistically significant impact on food

insecurity during the period after the pandemic. Additionally, I do not find a statistically significant effect for household income or educational attainment for any adults in the household. The presence of children in a household, access to a personal vehicle, employment status, distance to the nearest grocery store, mental and physical health of the respondent, the sex of the repodent, household Wi-Fi access, identifying as Black or African American, age, and self-diagnostic history of COVID-19 are also not found to have a statistically significant effect on food insecurity in the post-pandemic period. The finding that identifying as Black or African American does not affect a household's likelihood of food insecurity is inconsistent with findings from other studies, such as in Flores et al. (2019) and Odoms-Young (2018). This inconsistency demonstrates a need for further examination of the likelihood of food insecurity in the post-pandemic period for Black and African American individuals in Mississippi. Without understanding how being Black or African American impacts the likelihood of food insecurity in a future period, it is difficult to know how future pandemics may increase or decrease food security disparities for these households. Additionally, the finding that the presence of children in a household does not affect the likelihood of being food insecure is inconsistent with most food security literature. One reason for this may be that this study opted to ask respondents if children are present in the household and use the presence of children as a variable in the logit model rather than asking the additional 8-item food security questionnaire for households with children. The decision to not include the 8 additional questions for child food security was made to reduce survey burdern. However, reducing this survey burden came with the compromise of limiting information about food security in households with children. It is important to note that although these findings are inconsistent with other studies, this study controls for food security during the pre-pandemic period, which other studies do not control. If this study were to be

redone without controlling for food security in the pre-pandemic period, identifying as Black or African American and the presence of children in a household would likely be statistically significant. When future studies control for food security in the period before COVID-19, it will be easier to compare the findings of this study to studies like it.

Table 7 Logit Model Results

Variable Name	Coefficient Estimates (Standard Error)	Average Marginal Effect (Standard Error)
FIB	**5.1932*** (0.6042)**	**0.7557*** (0.364)**
P-EBT	0.0344 (0.5616)	0.0025 (0.0415)
SNAP	0.3773 (0.5961)	0.0289 (0.0479)
WIC	-0.7801 (0.6169)	-0.0550 (0.4190)
Job loss during COVID-19	**0.8054* (0.4430)**	**0.0648* (0.0370)**
Income	-0.2391 (0.4494)	-0.0172 (0.0317)
Employment Status (Reference group - unemployed)		
Part-time	0.6803 (0.6641)	0.0514 (0.0518)
Full-time	-0.5429 (0.4056)	-0.0392 (0.0285)
Employment status – Other household members	0.5468 (0.4863)	0.0403 (0.0359)
Education attainment (Reference group – bachelor's degree)		
Some college – Other household members	-0.6959 (0.6754)	-0.0513 (0.0502)
High school diploma or equivalent (GED) – Other household members	-0.4478 (0.5845)	-0.0322 (0.0411)
No high school – Other household members	-0.7104 (0.9283)	-0.0507 (0.0648)
Some college – Respondent	0.7635 (0.5123)	0.0565 (0.0371)
High school diploma or equivalent (GED) – Respondent	0.4386 (0.5157)	0.03340 (0.0407)
No high school – Respondent	0.5401 (1.1767)	0.0414 (0.0940)
Marital status	**1.2830*** (0.4748)**	**0.0889*** (0.0290)**
Sex	0.0971 (0.4174)	0.0072 (0.0309)
Children	-0.4280 (0.5370)	-0.0320 (0.0403)

Table 7 (continued)

Variable Name	Coefficient Estimates (Standard Error)	Average Marginal Effect (Standard Error)
Race (Reference group – White)		
Black or African American	-0.6222 (0.5022)	-0.0445 (0.0343)
Other race	**2.8944**** **(1.0643)**	**0.2780**** **(0.1147)**
Age (Reference group – 18-34 years of age)		
35-44 years of age	0.6679 (0.6018)	0.1591 (0.0853)
45-54 years of age	0.4824 (0.6023)	0.1400 (0.0728)
55-64 years of age	-0.9184 (0.9239)	0.0215 (0.0521)
65 years and over	-1.2082 (0.9028)	-0.9504 (0.0768)
Online groceries	**0.8310*** **(0.4758)**	**0.0603*** **(0.0320)**
Vehicle	0.8735 (0.7158)	0.0678 (0.0584)
Distance from nearest grocery store (Reference group – 30+ miles)		
Less than 5 miles	1.7805 (1.0982)	0.1365 (0.0906)
5 to 10 miles	1.7853 (1.1507)	0.1448 (0.1029)
11 to 20 miles	1.8105 (1.1604)	0.1573 (0.1196)
21 to 30 miles	1.5810 (1.3173)	0.1363 (0.1335)
COVID-19	-0.4083 (0.4220)	-0.0299 (0.0311)
Mental health	1.4507 (0.8384)	0.1207 (0.0797)
Physical health	-0.9195 (0.7722)	-0.0668 (0.0571)
Travels to use Wi-Fi	**1.0850**** **(0.4761)**	**-0.0902**** **(0.0432)**

Table 7 (continued)

Variable Name	**Coefficient Estimates (Standard Error)**	**Average Marginal Effect (Standard Error)**
Household Wi-Fi	-0.1638 (0.7149)	-0.0120 (0.0518)
$\boldsymbol{N = 405}$		
Log-Likelihood = -104.033		**McFadden's $\boldsymbol{R^2}$ = 0.625**

Robust standard errors in parentheses. $* p < 0.1, ** p < 0.05, *** p < 0.01$

CHAPTER V

CONCLUSION

Mississippi is predisposed to heightened levels of food insecurity compared to other U.S. States. This study provided information on the changes in Mississippi food insecurity rates from the pre- and post-pandemic periods. Additionally, it explained the impacts of certain sociodemographic characteristics on the likelihood of being food insecure in the post-pandemic period. The impacts of COVID-19 on the food insecurity of Mississippians were determined using data from the Mississippi Food Security and Online Purchasing Survey. The food insecurity calculations were made employing the FGT methodology and a logit model. The FGT Methodology provided food insecurity rates, gaps, and squared gaps for households with low and very low food security.

I find that the COVID-19 pandemic has increased the prevalence, depth, and severity of low and very low food security in Mississippi households. The severity of food insecurity increased more for households with very low food security than households with low food security. Mississippi households that were food insecure before March 2020 (the start of the COVID-19 pandemic) were 75 percentage points more likely to be food insecure after the start of the COVID-19 pandemic than households that were food secure prior to March 2020. This study finds that households have a higher probability of being food insecure during the period following the start of the pandemic if the respondent lost their job after March 2020, is married, identifies as a race other than Black or African American or White, or does not purchase

groceries online. Households where the respondent travels to use Wi-Fi are less likely to be food insecure than other households.

Although this study collected 560 observations, the logit model only included 405 observations due to missing values. Additionally, the income of survey respondents was lower than Mississippi's median annual household income, so the results of this study are more applicable to low-income Mississippians. The income of survey respondents being below Mississippi's median household income could be one of the reasons that this study's food insecurity rates are higher than Mississippi's reported food insecurity rate.

Knowing the extent to which Mississippi food insecurity has worsened and the households that are more likely to suffer from food insecurity provides an opportunity to draft targeted legislation to assist Mississippians in need of aid, such as households that were food insecure prior to the pandemic. This study finds that households that did not purchase groceries online were more likely to be food insecure in the period after the COVID-19 pandemic, holding all else constant. Grocery companies may use this information to decide to expand their online grocery access and selection.

A future study with a larger survey sample could provide more information about the Mississippi population and provide an improved understanding of the food insecurity experiences of Mississippi households during the COVID-19 pandemic. Future studies should inquire about additional sociodemographic characteristics that could increase the likelihood of being food insecure, such as sexual orientation, drug and alcohol consumption, veteran status, etc. Finally, studies expanding beyond the state of Mississippi are needed to provide vital information regarding the prevalence and determinants of food insecurity during the COVID-19 pandemic for households living outside of the State.

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