

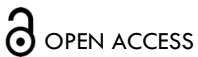
RESEARCH ARTICLE

Hunger Games: Food Access among Food Insecure Households during COVID-19 in the United States

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PUBLISHED

28 February 2025

CITATION

Peterson, HH., Baker, LM., et al., 2025.
Hunger Games: Food Access among Food Insecure Households during COVID-19 in the United States, European Society of Medicine. Medical Research Archives, [online] 13(2).
<https://doi.org/10.18103/mra.v13i2.6281>

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DOI

<https://doi.org/10.18103/mra.v13i2.6281>

ISSN

2375-1924

ABSTRACT

Food insecurity has profound implications for health outcomes. A global pandemic like COVID-19, when challenges are amplified, calls for a deeper understanding of factors influencing food security. This study analyzed the changes in food security status of households during the COVID-19 pandemic and described demographic characteristics of households and food access experiences by changes in food security status. Data were collected through an online survey using quota sampling based on age, race, ethnicity, region, and income for the sample to reflect the adult U.S. population. Questions were asked about food acquisitions, food security, and demographics, including health risks related to COVID-19. Data collection took place between July 14 and August 19, 2021, from 1,004 participants. We hypothesized that those with previous experience with food insecurity and familiarity with food assistance programs had greater access to these programs during the pandemic. Our findings supported this hypothesis and further revealed that those with prior food insecurity were more likely to use alternative food acquisition methods like gardening and fishing/hunting. Those who experienced food insecurity for the first time during the pandemic were less prepared to secure food for their families through social and community programs. Racial and ethnic minorities in our study were disproportionately affected by food insecurity, both pre-pandemic and during the pandemic. Younger individuals and those with more children were also more likely to face food insecurity. Individuals with pre-pandemic food insecurity were more likely to have poorer health outcomes, limited access to healthcare, and less likely to be vaccinated against COVID-19, putting them at higher risk for adverse health outcomes. Findings underscore the importance of addressing food insecurity as a public health issue. Pre-existing food insecurity led to a significant increase in food insecurity during the pandemic. Disproportionately affected groups highlight broader societal issues of poverty, discrimination, and lack of access to resources. The development of targeted interventions is recommended to address the needs of vulnerable populations, including racial/ethnic minorities, low-income individuals, families with children, and those who are food insecure for the first time.

Introduction

Food insecurity, the inability to consistently access sufficient food for a healthy diet, has profound implications for health outcomes. Research has consistently demonstrated a strong correlation between food insecurity and increased rates of chronic diseases, such as obesity, diabetes, hypertension, and cardiovascular disease.¹⁻⁵ This association can be attributed to the difficulty in obtaining a balanced diet when resources are limited, often leading to reliance on less nutritious, processed foods. Additionally, food insecurity can contribute to mental health challenges, including stress, anxiety, and depression, further exacerbating health disparities.⁶⁻⁸ In children, food insecurity can negatively impact cognitive development, growth, and academic performance.^{6,9,10}

Research consistently demonstrates that food insecurity disproportionately impacts specific demographic groups within the U.S.¹¹⁻¹⁴ Notably, households headed by Black¹⁵ and Hispanic¹¹ individuals experience significantly higher rates of food insecurity compared to White households. Additionally, households with lower incomes, particularly those below the poverty line, are more likely to face food insecurity.^{12,13} Women are also more likely to be food insecure within the U.S.¹³ Furthermore, rural residents often experience limited access to affordable and nutritious food, contributing to higher rates of food insecurity in these areas.¹⁶

The impact of food insecurity extends beyond individual health and has broader societal implications.^{17,18} Communities experiencing high rates of food insecurity may face increased healthcare costs,¹⁹⁻²⁰ reduced productivity,²¹ and lower educational attainment.^{22,23} Food insecurity can also lead to increased susceptibility to infection both generally^{24,25} and specifically to COVID-19.^{26,27}

Food insecurity can negatively impact vaccine adoption.²⁸⁻²⁹ Individuals facing food insecurity may prioritize immediate needs like food and shelter over preventative measures like vaccination.^{30,31} Additionally, the stress and uncertainty associated with food insecurity can impair decision-making and increase vaccine hesitancy.³² Limited access to healthcare and lower levels of health literacy can hinder food-insecure individuals' ability to obtain COVID-19 vaccinations in particular.³³ When considering vaccinating children against COVID-19,³⁴ parents were hesitant to vaccinate their children if they had lower trust in science, and food insecurity has been correlated with a lower trust in scientific advancements like vaccines.³⁵ These factors collectively contribute to a lower rate of vaccine adoption among food-insecure populations, potentially increasing their vulnerability to preventable diseases.

This linkage, which creates a broader concern for health disparities for food-insecure individuals in a global pandemic, calls for a deeper understanding of factors influencing food security during a health crisis. We analyze the changes in the food security status of households during the COVID-19 pandemic and describe demographic characteristics of households and food access experiences by the changes in their food security

status. We hypothesize that those who had experience with food insecurity prior to the pandemic and were familiar with food assistance programs had greater access to these programs during the pandemic.

Food Acquisition During COVID-19

Food assistance programs, like benefit transfers through federal nutrition assistance and free food distributed through charitable organizations and food banks, have been alternative channels for food acquisition for food-insecure families, and have been credited with helping food insecure families early in the COVID-19 pandemic.³⁹ The federal nutrition assistance programs including the largest Supplemental Nutrition Assistance Program (SNAP), WIC (Women, Infants, and Children), and Child Nutrition Programs like the National School Lunch Program spent a combined budget of \$166.4 billion in 2023.³⁶ The most recent data on the use of federal food assistance programs in the U.S. indicates that in fiscal year 2023, SNAP served an average of 42.1 million people per month, or 12.6% of the population, which represents a slight decrease from the previous year.³⁷ Spending on the U.S. Department of Agriculture (USDA) food and nutrition assistance programs fell in fiscal year 2023, due in part to lower spending on Pandemic Electronic Benefit Transfer (P-EBT).

During COVID-19, expansions were made to several nutrition assistance programs.²¹ By May 2020, the USDA Food and Nutrition Service approved over 1,800 program flexibilities across its 15 nutrition assistance programs.³⁸ Benefits for SNAP were increased for 90% of participating households to the maximum benefit amount as an emergency measure.³⁸ By December 2020, SNAP had expanded its caseload to 6.2 million more participants than pre-COVID.³⁷ Provisions in the Families First Coronavirus Act enabled states to issue pandemic electronic meal replacement benefits for households with children eligible for free or reduced school lunches and a suspension of the three-month time limit on low-income adults without children to receive SNAP benefits.³⁶ The USDA's summer meal program funding to support children when they are not part of the school lunch program was used during COVID-19 school closures.⁴⁰

In addition to three rounds of federal stimulus checks to families in April 2020, December 2021, and March 2021, the Coronavirus Aid, Relief, and Economic Security (CARES) Act extended unemployment benefits.⁴¹ In addition, as a way for households to acquire food, the USDA promoted the Farmers to Families Food Boxes to support and respond to severe market disruptions caused by COVID-19.⁴² The USDA Agricultural Marketing Service partnered with national, regional, and local distributors whose businesses and workforces had been impacted by the closures caused by COVID-19 to purchase fresh produce, dairy, and meat products from American producers of all sizes. Distributors packaged these fresh products into boxes large enough for families and transported them to foodbanks, community organizations, and nonprofits. The program distributed over \$6 billion worth of products and over 155 million total boxes to families before ending on May 31, 2021.⁴²

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Supply and demand shocks during the pandemic left grocery stores shelves empty. As people worried grocery stores would run out of food, media articles surfaced focusing on gardening and hunting and foraging as an alternative to buying food in the grocery stores.⁴³⁻⁴⁶ It is unclear how many people across the U.S. acquired food through hunting, fishing, or gathering during COVID-19, or how many of these people were food insecure, but a positive relationship between economic hardship and the likelihood of a household having a garden was noted prior to COVID-19.⁴⁷ During COVID-19, gardening increased⁴⁸⁻⁵⁰ as an opportunity for greater control over their selection of food and to donate food to others,⁵¹ while time for gardening also increased.⁵² Pre-COVID-19 there were 13.7 million hunters and 33.1 million anglers catching food.⁵³ During times of economic hardships, hunting and gathering practices are a way to satisfy basic needs.⁵⁴ In South Carolina, hunting, fishing, or trapping were among the top sources for acquiring food for food-insecure households.⁵⁵

Record unemployment rates were seen in the U.S. during COVID-19, exacerbating existing healthcare disparities⁵⁶ and increasing food insecurity.^{57,58} While unemployment insurance⁵⁹ and food assistance programs⁶⁰ lessened this increase in food insecurity correlated with unemployment for some, access to these resources may not have been equitable. We already know that food insecurity affects some populations more than others, and unfortunately, those same populations were at higher risk for health disparities specific to COVID-19. Black, Hispanic, and Indigenous populations experienced higher rates of COVID-19 infection, hospitalization, and mortality.⁶¹ Individuals with lower incomes and those lacking health insurance faced significant challenges accessing testing, treatment, and vaccination services.⁶² Financial constraints, limited access to transportation, and lack of paid sick leave further hindered their ability to seek care. Rural communities often experience limited access to healthcare providers, testing sites, and vaccination clinics.⁶³ Long distances, transportation challenges, and digital divides amplified these disparities. While telehealth emerged as a crucial tool during the pandemic, digital literacy, reliable internet access, and suitable devices were not equally distributed across populations.⁶⁴ This limited the effectiveness of telehealth for marginalized groups including rural communities, older adults, and those with lower socioeconomic status.⁶⁵

Methods

The experience of the adult population in the U.S. was collected through an online survey. Quota sampling based on age, race, ethnicity, region, and income, was used to ensure the sample reflected the adult U.S. population based on the 2020 Annual Social and Economic Supplement of the Current Population Survey Public Use Data Dictionary to produce results intended to approximate the population of interest. A screening question at the start of the survey was asked on the amount of food shopping the survey respondent was responsible for in their household. For the study, a household was defined as “people who live together and share food.” Respondents were asked to choose one response from “more than half,” “about half,” “less than half,” or “hardly any.” Any respondent marking “hardly

any” was terminated from the remainder of the survey. Data were collected from 1,004 participants from July 14 to August 19, 2021.

Participants answered a total of 67 questions. Three sections of the survey were used to meet the objectives of this study: a) food acquisitions, b) food security, and c) demographics, including health risks related to COVID-19 and vaccination status. Questions in the online survey were based on extant food insecurity research from the start of the COVID-19 pandemic in March 2020 and previous research on food-purchasing behaviors (Previous surveys from the USDA,⁶⁶ UF/IFAS Center for Public Issues Education in Agriculture and Natural Resources, Feeding America,⁶⁷⁻⁷⁰ Colorado State University,⁷¹ and Niles et al.⁷² The study was approved by the Institutional Review Boards at the authors’ institutions.

Respondents indicated various ways they acquired food outside store purchases during the pandemic. They were presented with two lists of various methods of food acquisition and asked to mark ones that they used. One list included food pantry and/or foodbank, SNAP, WIC and/or other financial assistance programs, fresh produce box or farm-to-community box, prepared (cooked) food distribution, school food program, other food resource and/or distribution (please describe), or not applicable. The second list included gardening and growing your own food, hunting, fishing, foraging/gathering, and/or not applicable. Income impact was measured based on a series of responses indicating whether they experienced a change in the income from the preceding period relative to the three reference periods of early pandemic (March-April 2020), mid-pandemic (August-September 2020), and current (June-July 2021). It was coded as one for those who indicated a decline in the early pandemic period, no change in the early period but a decline in the mid-pandemic period, or no changes in the first two pandemic periods but a decline in the last period. Others are coded as 0.

The USDA Six-Item Short Form of the Food Security Survey Module was used to assess food security during the COVID-19 pandemic (March 2020-July 2021). This form has been validated as an effective measure for determining food insecurity.⁷³ Each of the six questions is coded as affirmative or not, and the household score is computed as the sum of affirmative responses on a scale of 0-6.⁷⁴ Scores of 0-1 represent high/marginal food security, scores of 2-4 represent low food security, and scores of 5-6 represent very low food security. Scores 2-6 represent the total food insecurity level among the sample.

Given the length of the overall survey, we used a two-item version of the USDA Food Security Survey Module^{75,76} to gauge food insecurity experience prior to the COVID-19 pandemic. Respondents answered how applicable two statements about food situations were to their household before March 2020 on a three-point scale, ranging from never true, sometimes true, and often true. The first statement was “We worried whether our food would run out before we got money to buy more”

and the second statement was “The food that we bought just didn’t last, and we didn’t have money to get more.” If either of the questions was affirmative, the response was coded as being food insecure.

Demographic data collected included race and ethnicity, age, household income in 2020, educational attainment, and number of children in the household. In addition, we asked for information about their residence, asking them for their zip codes, from which we identified Census regions, and to self identify their residence as rural or urban from five options. The rural options included “a farm in a rural area” and “rural area, not a farm,” and urban options included “urban or suburban outside of the city limit,” “subdivision in a town or city,” and “downtown area in a city or town.” Respondents were also asked to self identify their political beliefs and values on a 5-point scale from very liberal to very conservative. The binary indicators for liberal and conservative were coded for those selecting “very liberal” or “liberal” and “very conservative” or “conservative,” respectively. Lastly, we collected information about COVID-related health risks. Respondents were asked whether self or others in their households were considered at higher risk for COVID-19 due to factors such as underlying medical conditions, and whether they were fully vaccinated against COVID-19. As of summer of 2021, fully vaccinated implied receiving two doses of Pfizer or Moderna vaccine or a single dose of the Johnson and Johnson vaccine. Responses of yes or “in progress” were coded as one, and zero for responses of no.

We cross tabulated the sample into four groups, based on their food insecurity experience before March 2020 and their food insecurity status during the pandemic. That is, the four groups consisted of the combinations of food security status before and during the pandemic: (1) Insecure/Insecure, (2) Insecure/Secure, (3) Secure/Insecure, and (4) Secure/Secure. The statistical equivalence in the mean responses to food acquisition methods used, along with the demographic information, across groups were tested one-way analysis of variance with Scheffe post-hoc analyses in SPSS 29.0.

Results

Table 1 cross tabulates the sample into the four groups. Of the sample of 1,040 individuals, 31.2% (N = 313) indicated an experience of being food insecure sometime before March 2020. This rate exceeds the nationally reported rate of being food insecure in a given year (e.g., the reported rate for 2023 was 13.5%) because it reports an experience of being food insecure over a lifetime. In contrast, more than half (56.1%, N = 563) of the respondents answered the 6-item food security module to suggest being food insecure during the 16 months since March 2020. While most individuals (N = 293) who reported being food insecure before March 2020 continued to report being food secure (Group 1), 6% (N = 20) scored as being food secure during the pandemic period (Group 2). Of those reporting with no experience of being food insecure, 39% (N = 270) reported being food insecure during the 16 months since March 2020 (Group 3).

Table 1: Food Insecurity Comparison Before and During The COVID-19 Pandemic

	Between March 2020 and July 2021		
	Food insecure	Food secure	Row total
Before March 2020			
<u>Food insecure</u>	Group 1 N = 293 (29.2%)	Group 2 N = 20 (2.0%)	N = 313 (31.2%)
<u>Food secure</u>	Group 3 N = 270 (26.9%)	Group 4 N = 421 (41.9%)	N = 691 (68.8%)
Column total	N = 563 (56.1%)	N = 441 (43.9%)	N = 1,004 (100.0%)

Note. N = 1,004 for full sample.

Table 2 compares the groups by demographic characteristics. For each row, shared superscripts imply statistical equivalence at the 5% significance level. Groups 1 and 3 (who experienced food insecurity during the pandemic) consisted of greater shares of Black and Hispanic/Latino/Chicano (HLC) individuals (25% and 18%, respectively) and lower shares of white, non-HLC individuals (48% and 58%) than Group 4 (6% Black, 8% HLC, and 79% white, non-HLC), who did not experience food insecurity before or during the pandemic.

Group 1 on average was younger (36 years old) than Group 3 (41 years old), which was also younger than Group 4 (57 years old). The age differences were reflected in the average number of children living in the household, where Group 1 had the highest number (2.09), followed by Group 3 (1.76), and Group 4 (1.31). There were no statistical differences across groups by 2020 household income or the highest educational attainment by a household member.

The groups were also statistically similar in terms of the proportion of individuals living in rural areas, which was roughly 1 in 5 individuals (ranging from 15% in Group 2 to 23% in Group 3) or the geographic representation across Census regions. While there were no proportional differences in individuals with liberal values (ranging from 30% in Group 2 to 39% in Group 1), Group 4 had a statistically higher proportion of individuals holding conservative values (34%) than Group 3 (22%).

In terms of COVID-related health risks, food insecurity experienced prior to the pandemic was associated with relatively poor health conditions. Nearly half (49%) of Group 1 individuals identified themselves as at higher risk, which was a statistically higher proportion than Group 3 of 29% or Group 4 of 36%. Similarly, a higher proportion of Group 1 individuals indicated living with other household members at a higher risk. Conversely, food insecurity experienced during the pandemic period was associated with lower access to health care. Groups

1 and 3 were proportionally less vaccinated than Group 4 (69% and 67%, respectively, versus 78%).

The results also show that individuals who had experienced food insecurity before March 2020 were

more likely to experience negative income changes during the pandemic period. Thirty-nine and fifty percent of individuals in Groups 1 and 2 reported a decline in income during the pandemic period compared to pre-pandemic period, compared to 20% of Group 4.

Table 2: Demographic Breakdown of Sample by Food Insecurity Before and During The COVID-19 Pandemic (N = 1,004)

	Group 1 (Insecure-Insecure)			Group 2 (Insecure-Secure)			Group 3 (Secure-Insecure)			Group 4 (Secure-Secure)		
	M	SD	N	M	SD	N	M	SD	N	M	SD	N
Race/ethnicity (Yes = 1; No = 0)												
American Indian or Alaska Native	0.03 ^a	0.17	293	0.05 ^a	0.22	20	0.03 ^a	0.17	270	0.02 ^a	0.14	421
Asian	0.10 ^a	0.29	293	0.00 ^a	0.00	20	0.07 ^a	0.26	270	0.09 ^a	0.28	421
Black	0.25 ^a	0.43	293	0.15 ^{a,b}	0.37	20	0.18 ^a	0.39	270	0.06 ^b	0.25	421
Hispanic, Latino, or Chicano	0.25 ^a	0.44	293	0.11 ^{a,b}	0.32	19	0.18 ^a	0.39	266	0.08 ^b	0.27	421
White, not Hispanic, Latino, or Chicano	0.48 ^b	0.50	293	0.70 ^{a,b}	0.47	20	0.58 ^b	0.49	270	0.79 ^a	0.41	421
Age (years)												
	36.05 ^c	13.44	292	39.40 ^{b,c}	19.36	20	41.44 ^b	16.18	270	56.90 ^a	16.29	421
Household income (\$1,000)												
	82.03 ^a	64.46	293	83.50 ^a	40.82	20	72.64 ^a	54.67	270	76.54 ^a	54.83	421
Education (Yes = 1; No = 0)												
High school graduate (includes GED)	0.96 ^a	0.21	293	0.95 ^a	0.22	20	0.97 ^a	0.16	270	0.98 ^a	0.13	421
4-year college degree	0.47 ^a	0.21	293	0.55 ^a	0.22	20	0.41 ^a	0.16	270	0.45 ^a	0.13	421
Number of children in household												
	2.09 ^a	1.38	293	1.80 ^{a,b}	0.89	20	1.76 ^b	1.10	270	1.31 ^c	0.70	421
Residence (Yes = 1; No = 0)												
Rural	0.22 ^a	0.41	290	0.15 ^a	0.37	20	0.23 ^a	0.42	270	0.21 ^a	0.41	418
South	0.44 ^a	0.50	293	0.25 ^a	0.44	20	0.43 ^a	0.50	270	0.40 ^a	0.49	421
Midwest	0.18 ^a	0.39	293	0.25 ^a	0.44	20	0.19 ^a	0.40	270	0.22 ^a	0.42	421
Northeast	0.13 ^a	0.33	293	0.25 ^a	0.44	20	0.16 ^a	0.37	270	0.18 ^a	0.39	421
West	0.25 ^a	0.43	293	0.25 ^a	0.44	20	0.22 ^a	0.41	270	0.20 ^a	0.40	421
Political belief (Yes = 1; No = 0)												
Liberal	0.39 ^a	0.49	293	0.30 ^a	0.47	20	0.34 ^a	0.48	270	0.33 ^a	0.47	421
Conservative	0.28 ^{a,b}	0.45	293	0.30 ^{a,b}	0.47	20	0.22 ^b	0.41	270	0.34 ^a	0.47	421
COVID-related health risk (Yes = 1; No = 0)												
Self	0.49 ^a	0.50	293	0.60 ^{a,b}	0.50	20	0.29 ^b	0.46	270	0.36 ^b	0.48	421
Others in household	0.41 ^a	0.49	293	0.50 ^{a,b}	0.51	20	0.24 ^b	0.43	270	0.30 ^b	0.46	421
Vaccinated	0.69 ^b	0.47	293	0.75 ^{a,b}	0.44	20	0.67 ^b	0.47	270	0.78 ^a	0.41	421

Note. For each item, mean (M), standard deviation (SD), and the number of observations (N) are reported by group. For each item, means with shared superscripts imply that they are statistically equivalent at the 5% level.

Table 3 summarizes the different ways individuals acquired food outside the marketplace during the pandemic period. Our hypothesis, that individuals with experience in food insecurity before the pandemic would be more familiar with these programs and would more likely acquire food through this way, held true for food pantry/bank, SNAP and WIC, fresh produce box, and congregate meals. Shares of individuals acquiring food through these means in Group 1 were statistically higher than those in Group 3. In both Groups 1 and 3, SNAP and WIC programs were most popular, used by 46% of Group 1 individuals and 29% of Group 3 individuals, followed by food pantries and food banks (41% in Group 1, 28% in Group 3). The school meal program was the only one where there was no statistical difference between the two groups with 20% of Group 1 and 13% of Group 3 individuals using it.

A similar pattern was observed for non-assistance alternative means. Two thirds (66%) of Group 1 individuals obtained food through gardening and other ways of growing their own food, with 51% for the first time during the pandemic. These shares were statistically higher than 44% among Group 3 individuals (with 26% for the first time), which were higher than 24% among Group 4 (with 9% for the first time). The shares of individuals acquiring food through foraging were lower but following the same pattern where it was the highest among Group 1, followed by Group 3, then Group 4. The proportions of those who had experience using the alternative means prior to the pandemic (15% among Groups 1 and 4 and 18% among Group 3 for gardening like activities) seem comparable across groups, even though they were not statistically compared.

Table 3: Food Acquisition Before and During The COVID-19 Pandemic Across Food Secure and Food Insecure Groups (N = 1,004)

	Group 1 (Insecure-Insecure)			Group 2 (Insecure-Secure)			Group 3 (Secure-Insecure)			Group 4 (Secure-Secure)		
	M	SD	N	M	SD	N	M	SD	N	M	SD	N
Assistance food acquisition (Yes = 1; No = 0)												
Food pantry and/or food bank	0.41 ^a	0.49	293	0.30 ^{a,b}	0.47	20	0.28 ^b	0.45	270	0.10 ^c	0.30	421
SNAP, WIC, and/or other financial assistance programs	0.46 ^a	0.50	293	0.30 ^{a,b}	0.47	20	0.29 ^b	0.45	270	0.09 ^c	0.28	421
Fresh produce box, farm-to-community box	0.30 ^a	0.46	293	0.15 ^{a,b}	0.37	20	0.19 ^b	0.39	270	0.03 ^c	0.17	421
Prepared (cooked) food distribution	0.27 ^a	0.44	293	0.10 ^{a,b}	0.31	20	0.15 ^b	0.36	270	0.03 ^c	0.16	421
School meal program	0.20 ^a	0.40	293	0.25 ^a	0.44	20	0.13 ^a	0.34	270	0.04 ^b	0.20	421
Other food acquisition (Yes = 1; No = 0)												
Gardening and growing own food	0.66 ^a	0.47	293	0.40 ^{a,b}	0.50	20	0.44 ^b	0.50	270	0.24 ^c	0.43	421
First time during COVID	0.51 ^a	0.50	293	0.35 ^{a,b}	0.49	20	0.26 ^b	0.44	270	0.09 ^c	0.29	421
Fishing, hunting, gathering	0.25 ^a	0.43	293	0.15 ^{a,b}	0.37	20	0.16 ^b	0.37	270	0.05 ^c	0.21	421
First time during COVID	0.18 ^a	0.39	293	0.10 ^{a,b}	0.31	20	0.08 ^b	0.27	270	0.02 ^b	0.15	421
Income impact (Yes = 1; No = 0)												
	0.39 ^a	0.49	293	0.50 ^a	0.51	20	0.29 ^{a,b}	0.45	270	0.20 ^b	0.40	421

Note. For each item, mean (M), standard deviation (SD), and the number of observations (N) are reported by group. For each item, means with shared superscripts imply that they are statistically equivalent at the 5% level.

Conclusion

Results from this study offer a deeper understanding of factors influencing food security during a public health crisis. We analyzed the changes in the food security status of households during the COVID-19 pandemic and described the demographic characteristics of households by food access experiences and changes in food security status. Our study confirmed previous demographic differences in food insecurity.^{11-14,39} Specifically, demographic disparities in food insecurity highlighted in our sample showed racial and ethnic minorities (Black and Hispanic/Latino/Chicano) were disproportionately affected by food insecurity, both pre-pandemic and during the pandemic. Younger individuals and those with more children were also more likely to face food insecurity.

Additionally, our study highlighted some unique findings related to food insecurity and health outcomes during COVID-19. We hypothesized that individuals familiar with food assistance programs and with prior experience of food insecurity would have greater access to such programs during the pandemic. Our findings supported this hypothesis and further revealed that those with prior food insecurity experience were more proactive in exploring alternative food acquisition methods, such as

gardening and fishing/hunting. Results indicate that those who experienced food insecurity for the first time during the pandemic were less prepared to secure food for their families through social and community programs.

Specific COVID-19-related health risks and food insecurity were apparent in this study. Individuals with pre-pandemic food insecurity were more likely to have poorer health outcomes and limited access to healthcare. They were also less likely to be vaccinated against COVID-19, which put them at higher risk for adverse health outcomes. This supports previous work on the connection between food insecurity and vaccine adoption.^{28,29,33}

Unsurprisingly, the portion of the sample in this study who experienced food insecurity before March 2020 (31.2%) continued to face food insecurity challenges during the pandemic. However, it was noteworthy that the majority (56.1%) of respondents experienced food insecurity during the 16 months following March 2020. This highlights the significant impact of the pandemic on food security. Those who experienced pre-pandemic food insecurity were more likely to suffer negative income changes during the pandemic, exacerbating their food insecurity.

Discussion

The findings indicate that food insecurity is a complex issue with far-reaching consequences. Food insecurity is not simply about a lack of food. It is a multifaceted problem intertwined with economic, social, and health factors. Its consequences extend beyond hunger to impact physical and mental health, educational attainment, economic productivity, and social stability. Pre-existing food insecurity vulnerabilities were exacerbated by the pandemic, leading to a significant increase in the number of people experiencing food insecurity. The COVID-19 pandemic acted as a stress test for existing systems, revealing and amplifying pre-existing inequalities. Disruptions to supply chains, job losses, and increased healthcare costs worsened food insecurity for many, pushing more people into this vulnerable state.

Demographic disparities observed in this study highlight the systemic inequities that contribute to food insecurity. Racial/ethnic minorities and low-income individuals are disproportionately affected, reflecting broader societal issues of poverty, discrimination, and lack of access to resources. Furthermore, the connection between food insecurity and health outcomes is concerning. The findings suggest that individuals experiencing food insecurity are at higher risk of poor health and limited access to healthcare. Recognizing food insecurity as a public health issue is crucial. It requires a multi-pronged approach involving strengthening social safety nets, addressing systematic inequalities, promoting food access, and integrating healthcare. Addressing food insecurity requires a comprehensive and collaborative effort involving government, community organizations, healthcare providers, and individuals. By acknowledging the complex interplay of factors contributing to food insecurity and implementing targeted interventions, we can work toward creating a more food-secure and equitable society.

Implications and Recommendations

As policymakers, public health officials, and community organizations improve and learn from the COVID-19

pandemic, it should be a priority to continue to collect and analyze data on food insecurity to monitor trends and disparities across populations. The findings from this study underscore the importance of developing targeted interventions to address the needs of vulnerable populations, including racial/ethnic minorities, low-income individuals, and families with children. Additionally, those who are food insecure for the first time may need educational interventions to learn how to acquire food and access publicly available resources during a public health crisis like COVID-19.

Results highlight the importance of improving access to healthcare in the U.S. prior to the next pandemic. Increasing access to affordable, quality healthcare, including mental health services, is a necessity for food-insecure populations. Moreover, there is an opportunity to support community-based initiatives that address food insecurity, such as food banks, community gardens, and nutrition education programs. By addressing the root causes of food insecurity and implementing evidence-based solutions, we can work toward a more equitable and food-secure society that is more resilient to future crises.

Conflicts of Interest Statement

The authors have no conflicts of interest to declare.

Acknowledgments and Funding

This research was supported by the Agriculture and Food Research Initiative, grant no. 202068006-33037, from the USDA National Institute of Food and Agriculture, the Center for Rural Enterprise Engagement, and the UF/IFAS Center for Public Issues Education in Agriculture and Natural Resources.

The authors would like to acknowledge the contributions of those who helped develop survey items, which enabled the collection of this data. Specifically, the following individuals helped make this research work possible: Anissa Mattox, Michelle Miller, Li Zhang, Gustavo Oliveira, and Andrew Stevens.

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