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# Food-Seeking Behaviors and Food Insecurity Risk During the Coronavirus Disease 2019 Pandemic

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## ABSTRACT

**Objective:** Food insecurity risk increases among disaster-struck individuals. The authors employed the social determinants of health framework to (1) describe the characteristics and food-seeking behaviors of individuals coping with the coronavirus disease 2019 pandemic and (2) evaluate the relationship between these factors and food insecurity risk.

**Design:** A cross-sectional Qualtrics survey was administered May 14–June 8, 2020.

**Participants:** Adults living in New York were recruited online (n = 410).

**Main Outcome Measure:** Food insecurity risk.

**Analysis:** Logistic regression analyses were conducted using a model-building approach.

**Results:** A total of 38.5% of the sample was considered food insecure after the coronavirus disease 2019 outbreak. The final model revealed that not knowing where to find help to acquire food, reporting that more food assistance program benefits would be helpful, being an essential worker, having general anxiety, and being a college student were risk factors for food insecurity regardless of demographic characteristics.

**Conclusions and Implications:** With more individuals experiencing food insecurity for the first time, there is a need for enhanced outreach and support. The findings complement emerging research on food insecurity risk during and after the pandemic and can help to inform food assistance programs and policies.

**Key Words:** COVID-19, food insecurity, social determinants of health, food-seeking behavior (*J Nutr Educ Behav.* 2022;54:159–171.)

## INTRODUCTION

Health is deeply rooted in homes, schools, workplaces, neighborhoods, and communities. The social determinants of health (SDH) were introduced by the World Health Organization nearly 2 decades ago to characterize the social and economic conditions that shape and affect a wide range of health risks and outcomes.[1] The SDH have since evolved to encompass resources such as food supply, housing, social relationships, transportation, education, and health care.[2] The distribution of these factors across populations ultimately determines the length and quality of life.[2]

Food insecurity refers to a lack of availability and access to safe, sufficient, nutrient-dense food at all times to support and maintain a healthy lifestyle.[3] According to the US Department of Agriculture, 10.5% (13.7 million) of US households reported experiencing food insecurity at some time during 2019.[4]

Currently, food insecurity is considered to contribute to a major health crisis in the US.[5]

Previous research in the US has found that food insecure individuals often cycle between having adequate food availability and experiencing food scarcity. During this chronic cycle, low-cost, energy-dense food are typically overeaten when food is available, and restrictive behaviors are typically promoted when food is scarce. Unstable eating habits similar to these may lead to shifts in physiologic functioning, thus resulting in disordered food-seeking and eating behaviors.[6] Food-seeking behavior results from the complex integration of environmental cues, higher cognitive functioning, and internal physiologic signals.[7] In the context of this article, food-seeking behaviors encompass how food is acquired and consumed, including the finding, purchasing, and storage of food. Food-seeking behaviors can include habits such as frequency of grocery shopping, eating outside of the home, and number of items bought at one time.

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Food insecurity is disproportionately experienced by households that (1) are located in rural areas, (2) are headed by single adults with children, (3) are predominantly non-Hispanic Black or Hispanic, and (4) include children aged younger than 6 years.[8,9] These same groups are particularly vulnerable when a disaster strikes and often experience a disproportionate burden of adverse disaster consequences.[10] Previous research has shown that the risk for food insecurity increases over the short- and long-term among individuals who experience changes in life circumstances regarding financial obligations, household composition, or housing stability.[8,11]

The first coronavirus disease 2019 (COVID-19) case in New York was confirmed on March 1, 2020, and by April, New York was the worst-hit state in the country. At this time, New York City alone had more confirmed COVID-19 cases than China, the United Kingdom, or Iran and within 2 months, had more cases than any country besides the US.[12] Food insecurity in New York is relatively high compared with other states and has increased during the COVID-19 pandemic. Prepandemic, an estimated 11.1% New Yorkers were food insecure.[9] After the COVID-19 outbreak, food insecurity has increasingly affected individuals who did not struggle to access food before the pandemic.[13] Therefore, there is a need to understand the food-seeking behaviors associated with experiencing food insecurity while coping with the COVID-19 pandemic in this setting to enhance outreach and support new food assistance programs and policies.

The present study sought to (1) describe the characteristics and food-seeking behaviors of individuals coping with the COVID-19 pandemic and (2) evaluate the relationship between these characteristics and behaviors with food insecurity risk.

## METHODS

### Study Design

A semistructured cross-sectional survey was administered as a web-based survey by Qualtrics (Qualtrics, May 2020)

online among New York residents (n = 410). Data were captured pertaining to pandemic-related food-seeking behaviors and the experience of food insecurity after the COVID-19 outbreak. The survey comprising 39 closed- and open-ended questions aimed at assessing food insecurity, accessibility, availability, sources, and improvisation related to meeting food needs, as well as how the social role of food has been affected. This survey, referred to as the Social and Health Consequences of COVID-19 in New York State Survey was adapted from the validated Food Access and Security During Coronavirus Survey developed as part of the National Food Access and COVID Research Team.[14] Additions to the original survey included validated questions for anxiety and depression as well as questions regarding the impact on employment and health. Survey questions used in the present study were adopted from validated surveys assembled by expert working groups.[15]

### Sampling

A quota sample of individuals in New York was recruited online to examine health disparities related to the COVID-19 pandemic. Quotas were set to recruit a sufficient sample for analysis of the experiences of individuals at high risk for adverse COVID-19–related impacts and food insecurity based on an indexed panel of demographic characteristics. This approach was chosen for recruitment because it was most appropriate for the context of the pandemic when in-person recruitment would have put participants and researchers at an increased risk of COVID-19 exposure. Quotas included (1) 50% Black, African American; (2) 50% Hispanic; (3) 50% low income (< $25,000 per year) or low education (high school or less); and (4) 50% male. Inclusion criteria were 2-fold: (1) being age 18 years or older; and (2) residing in New York, excluding the New York City metropolitan area. Individuals who resided outside of New York, were younger than age 18 years, or did not fit in the sampling quotas for the study were excluded from completing the survey.

### Conceptual Framework

It is well documented in the disaster and food security literature that the SDH framework is important for understanding adverse experiences and mid- to long-term health impacts.[16] The measures selected from the Social and Health Consequences of COVID-19 in New York State Survey capture data across the socioeconomic and political context level, the intermediary determinants level, and the individual socioeconomic position level based on an adapted version of the Commission on Social Determinants of Health (CSDH) conceptual framework for action on the SDH[17] (Figure).

### Measures

*Main outcome variable.* The outcome, food insecurity risk since the COVID-19 outbreak, was assessed using a validated 2-item food security screener developed from the US Department of Agriculture Household Food Security Survey. The 2-item screener has 97% sensitivity and 83% specificity for accurately classifying people as at risk for food insecurity.[18] Participants were asked to report how often (often true, sometimes true, never true) after the coronavirus outbreak began ("After coronavirus" refers to since the outbreak began in New York on March 1, 2020): "The food that my household bought just didn't last, and I/we didn't have money to get more" and "I/we couldn't afford to eat balanced meals." Consistent with recent food insecurity research, the participants who indicated "often true" or "sometimes true" for either measure were categorized as at risk for food insecurity, whereas the participants who indicated "never true" for either question were categorized as food secure.[18–22] The term "food insecurity risk" is used in this article to refer to the main outcome variable, whereas the term "food insecurity" is used elsewhere to refer to the general concept in discussion of the literature and present findings.

*Socioeconomic and political context level factors.* At the socioeconomic and political context level, participants
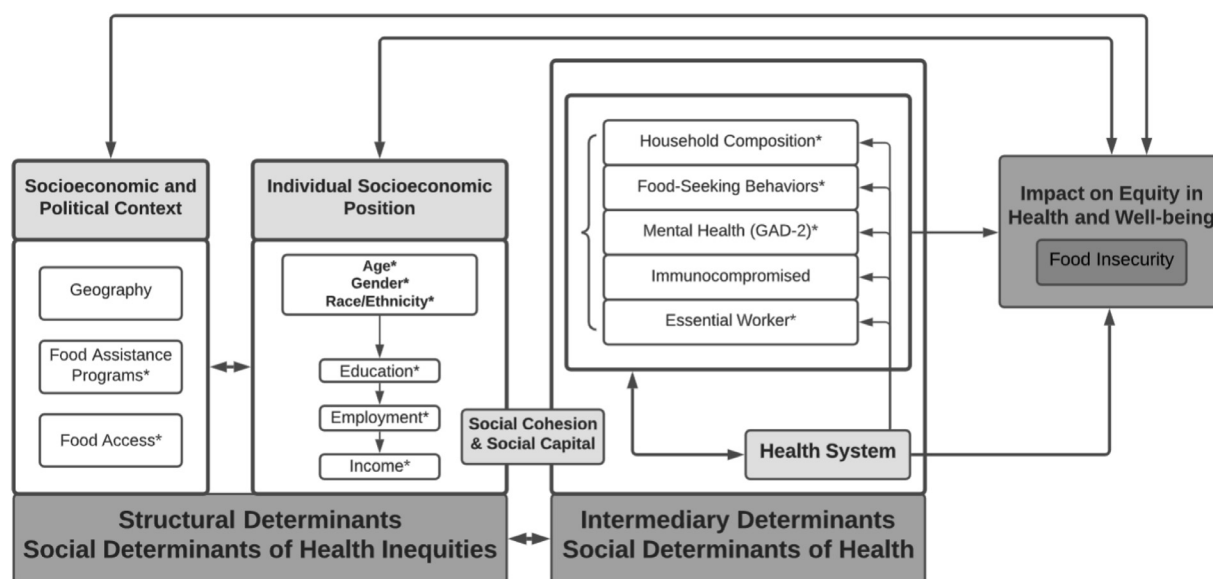
**Figure.** Social determinants of health conceptual framework in the context of COVID-19. Adapted from Solar and Irwin.[17] COVID-19 indicates coronavirus disease 2019; GAD, generalized anxiety disorder. *Significantly associated with the outcome (food insecurity risk since the COVID-19 outbreak) at the $P \leq 0.05$ level.

reported the county that they currently reside in, and then geography was dichotomized (rural/urban) based on the US Census List of Rural Counties And Designated Eligible Census Tracts in Metropolitan Counties.[23] Participants were also asked the following questions: (1) "Since the coronavirus outbreak began in New York (March 1, 2020), how often did the following situations happen to your household?" to which they were asked to respond to, "Not knowing where to find help for getting food" (never, sometimes, most of the time, always; dichotomized as never [never] or ever [sometimes, most of the time, or always]) and (2) "Since the coronavirus outbreak began in New York (March 1, 2020), how helpful would it be for your household to have more food assistance program benefits (like *Supplemental Nutrition Assistance Program* [SNAP] or *Special Supplemental Nutrition Program for Women, Infants and Children* [WIC])" with a response of not helpful, somewhat helpful, helpful, very helpful; dichotomized as not helpful (not helpful) or helpful (somewhat helpful, helpful, or very helpful).

*Intermediary determinants level factors.* At the intermediary determinants

level, household size, including the respondent, was reported (0, 1, 2, 3, 4, 5, 6, ≥ 7) across 3 levels: (1) adults aged > 65 years, (2) adults 18 −65 years, and (3) children younger than 18 years, each of which were then summed for a total household size (1, 2, 3, 4, 5, 6, ≥ 7). Whether the household included children younger than 18 years was dichotomized (yes/no), and whether the household included a member considered to be high-risk for COVID-19 was dichotomized (yes/no). In the context of this article, being considered high-risk for COVID-19 is defined on the basis of guidance from the Centers for Disease Control and Prevention as well as health disparities present in New York.[24−26] The participants were asked, "Are you considered an essential worker, working outside of the home during statewide restrictions requiring nonessential workers to stay home?" (dichotomized as yes/ no). Mental health was assessed (likely generalized anxiety disorder [GAD] [dichotomized as yes/no]) using the GAD-2 2-item validated screener. For the GAD-2, a score of 3 points is the preferred cutoff for identifying possible cases and in which further diagnostic evaluation for GAD is warranted. When a cutoff of 3 is used, the GAD-2 has a sensitivity

of 86% and specificity of 83% for diagnosing GAD.[27] Finally, the participants were asked, "Since the coronavirus outbreak began in New York (March 1, 2020), how often did the following situations happen to your household?" to which they were asked to respond to, "Going to restaurants/bars less than usual (before March 17, 2020 closing)," and "Making fewer grocery tripes to avoid coronavirus exposure" (never, sometimes, most of the time, always; dichotomized as never [never] or ever [sometimes, most of the time, or always]).

*Individual socioeconomic position level factors.* Individual socioeconomic position characteristics included age (reported in years; categorized as 18−24, 25−34, 35−44, 45−54, 55−64, ≥ 65); gender (female, male, transgender, nonbinary, other; categorized as female, male, and other); race/ethnicity (American Indian or Alaska Native, Asian Indian, Black or African American, Chamorro, Chinese, Filipino, Japanese, Korean, Native Hawaiian, Samoan, Vietnamese, White or Caucasian American, Mexican/Mexican American/Chicano, Puerto Rican, another Hispanic/Latino/Spanish origin, other race/ethnicity; categorized as non-

Hispanic White, non-Hispanic Black, Hispanic and other); employment status before the COVID-19 pandemic outbreak (employed hourly full-time, employed hourly part-time/seasonal, employed salaried full-time, employed salaried part-time/seasonal, disabled, retired, home maker, college student, unemployed); education (some high school, high school graduate or general equivalency diploma [GED], some college, associate degree or technical school, bachelor's degree, postgraduate degree; and categorized as some high school or GED, some college or associate/technical degree, and bachelor's or postgraduate degree); and household income for 2019 before taxes (< $12,999, $13,000−$24,999, $25,000−$49,999, $50,000−$74,999, $75,000−$99,999, $100,000−$124,999, $125,000−$149,999, ≥ $150,000; categorized as < $49,999, $50,000−$99,999, or ≥ $100,000).

## Data Collection

Data collection took place from May 14 to June 8, 2020. Median time to complete the survey was 13 minutes. The participants who completed the survey faster than half the median time were automatically excluded for poor data quality, and all participants who completed the survey in less than 10 minutes were reviewed individually for quality and missingness.[28] Qualtrics completed the recruitment of the sample with the target of sufficiently filling the predefined quotas. Overall, 1,274 people were invited to complete the survey; 475 were excluded owing to ineligibility such as living outside of the target geography for the study, not consenting to participate, or not falling within the sample quotas; and 389 people were removed from the sample for poor quality responses such as not completing the survey to the end or speeding. The final sample size was n = 410.

## Data Analysis

Each exposure variable was examined independently with a chi-square test of independence for association with the outcome (food insecurity risk since the COVID-19 outbreak). All

factors that demonstrated an independent statistically significant association with the outcome were retained for multivariate analysis. Logistic regression was chosen as the method of analysis for its ability to model categorical variables, analyze dichotomous dependent variables, and estimate parameters regardless of the distribution of independent variables.[29,30] Using a model-building approach, a series of 3 logistic regression models was chosen to represent the natural movement from proximal factors (ie, socioeconomic and political context), to intermediate factors (ie, intermediary determinants), and finally down to more individual characteristics and behaviors (ie, individual socioeconomic position) as depicted in the Figure.

The first model included the socioeconomic and political context variables significantly associated with the outcome, including not knowing where to look for help getting food and reporting that more food assistance program benefits would be helpful during the COVID-19 pandemic. The second model retained all socioeconomic and political context variables significantly associated with the outcome and added intermediary determinants variables including whether there were children younger than 18 years living in the household, whether they were considered an essential worker during the COVID-19 pandemic, their mental health (GAD-2), and whether they visited the grocery store and restaurants less often because of the COVID-19 pandemic. The final model retained all variables associated with the outcome from the second model and added individual socioeconomic position variables including age, gender, race/ethnicity, employment status before the COVID-19 outbreak, education, and income. To determine the model with the best fit, the log-likelihood, Akaike information criterion, and Bayesian information criterion tests were performed (Table 3).[31,32] Multivariate regression results were evaluated for statistical significance at the $P \leq 0.05$ level. Adjusted odds ratios and 95% confidence intervals (CIs) were reported. Stata version 16 (StataCorp., 2019) was used for all statistical analyses.

This research was reviewed and approved by the D'Youville College Institutional Review Board.

## RESULTS

### Descriptive Analysis

Descriptive characteristics for the sample (n = 410) are described in later text according to the CSDH conceptual framework (Table 1). At the socioeconomic and political context level, most (87.1%) of the households were located in an urban-designated New York county. Just more than 40% (42.2%) of the sample reported not knowing where to find help for getting food since the COVID-19 outbreak, and 61.5% reported that food assistance program benefits would be helpful for their household during the COVID-19 pandemic.

At the intermediary determinants level, most (61.8%) of the participants reported living in a household with 3 people or fewer, and half (50%) reported having at least 1 household member aged younger than 18 years. A little more than 41% (41.5%) of the participants reported having at least 1 household member at high risk for COVID-19, and slightly more than one-third (35.9%) reported themselves as being considered an essential worker during the COVID-19 pandemic. Nearly 40% (39.5%) met the criteria for likely having a GAD (a GAD-2 score of ≥ 3) when asked "Over the last 2 weeks, how often have you been bothered by the following problems?" A total of 80.5% reported going to the grocery store less than usual to avoid COVID-19 exposure, and almost two-thirds (63.7%) reported going to restaurants less than usual before the outbreak.

At the individual socioeconomic position level, half (n = 205) of the study participants reported age 18−34 years (mean = 37.9, SD = 16.7). A little more than half of the sample (55.9%) reported being female. Just less than one-third (31.5%) reported being non-Hispanic Black or African American, 21.8% reported being non-Hispanic White, 43.7% reported being Hispanic, and 3.1% identified as another race/ethnicity. A total of

**Table 1.** Descriptive Sample Characteristics (n = 410)

| Characteristics | Frequency | Percent |
|---|---|---|
| Food insecure (during COVID-19) | 158 | 38.5 |
| Food secure | 252 | 61.5 |
| Socioeconomic and political context | | |
|   Geography | | |
|     Urban | 357 | 87.1 |
|     Rural | 53 | 12.9 |
|   Don't know where to find help to get food | | |
|     Never | 237 | 57.8 |
|     Sometimes, most of the time, or always | 173 | 42.2 |
|   SNAP/WIC would be helpful during this time | | |
|     Not helpful | 158 | 38.5 |
|     Somewhat helpful, helpful, or very helpful | 252 | 61.5 |
| Intermediary determinants | | |
|   Household size | | |
|     1 | 70 | 17.1 |
|     2 | 109 | 26.6 |
|     3 | 74 | 18.1 |
|     4 | 53 | 13.0 |
|     5 | 34 | 8.3 |
|     6 | 24 | 5.9 |
|     ≥7 | 46 | 11.2 |
|   Children under 18 y in the household | | |
|     Yes | 205 | 50.0 |
|     No | 205 | 50.0 |
|   Have member at high risk for COVID-19 | | |
|     Yes | 170 | 41.5 |
|     No | 240 | 58.5 |
|   Essential worker during COVID-19 | | |
|     Yes | 147 | 35.9 |
|     No | 263 | 64.1 |
|   Likely GAD-2 | | |
|     Yes | 162 | 39.5 |
|     No | 248 | 60.5 |
|   Visit grocery store less often than usual | | |
|     Never | 80 | 19.5 |
|     Sometimes, most of the time, or always | 330 | 80.5 |
|   Go to restaurants less often than usual | | |
|     Never | 149 | 36.3 |
|     Sometimes, most of the time, or always | 261 | 63.7 |
| Individual socioeconomic position | | |
|   Age,** y | | |
|     18−24 | 127 | 31.0 |
|     25−34 | 78 | 19.0 |
|     35−44 | 75 | 18.3 |
|     45−54 | 49 | 12.0 |
|     55−64 | 39 | 9.5 |
|     ≥65 | 42 | 10.2 |
|   Gender | | |
|     Female | 229 | 55.9 |
|     Male | 176 | 42.9 |
|     Other | 5 | 1.2 |
|   Race/Ethnicity (n = 394) | | |
|     Non-Hispanic Black | 124 | 31.5 |
|     Non-Hispanic White | 86 | 21.8 |
|     Hispanic | 172 | 43.7 |
|     Other | 12 | 3.0 |

(continued)

**Table 1.** (*Continued*)

| Characteristics | Frequency | Percent |
|---|---|---|
| Employment status before COVID-19 | | |
| Employed, hourly, full time | 98 | 23.9 |
| Employed, hourly, part time | 81 | 19.8 |
| Employed, salaried, full time | 29 | 7.1 |
| Employed, salaried, part time | 37 | 9.0 |
| Disabled | 26 | 6.3 |
| Retired | 41 | 10.0 |
| Homemaker | 18 | 4.4 |
| College student | 32 | 7.8 |
| Unemployed | 48 | 11.7 |
| Education | | |
| Some high school or GED | 128 | 31.2 |
| Some college or associate/technical degree | 158 | 38.5 |
| Bachelor's degree or postgraduate degree | 124 | 30.3 |
| Household income | | |
| $\leq$$49,999 | 251 | 61.2 |
| $50,000−$99,999 | 110 | 26.8 |
| $\geq$$100,000 | 49 | 12.0 |

COVID-19 indicates coronavirus disease 2019; GAD, generalized anxiety disorder; GED, general equivalency diploma; SNAP, *Supplemental Nutritional Assistance Program*; WIC, *Special Supplemental Nutrition Program for Women, Infants, and Children.*

40.2% of the sample reported not working before the COVID-19 outbreak, and 60.2% reported their employment status having changed because of the COVID-19 pandemic. Most (54.9%) of the sample had graduated high school or received a GED or had attended some college. Almost two-thirds (61.2%) of the participants reported having an annual household income of less than $49,999.

**Bivariate Analysis**

Analysis of socioeconomic and political context level characteristics of the study participants showed that not knowing where to look for help getting food and reporting that more food assistance program benefits would be helpful during the COVID-19 pandemic had a statistically significant association with the outcome food insecurity risk since the COVID-19 outbreak. At the intermediary determinants level, having at least 1 child younger than 18 years living in the household, being an essential worker during the COVID-19 pandemic, having anxiety, and visiting grocery stores and restaurants less often to decrease the risk of COVID-19 exposure were significantly associated with the outcome. Finally, at the individual socioeconomic position level, age, gender, race/ethnicity, employment status before the COVID-19 outbreak, education level, and household income were significantly associated with the outcome. Table 2 reports the factors that exhibit statistically significant independent associations ($\chi^2$) with the outcome as well as the incidence of each factor among the subgroups of food secure and food insecure.

**Multivariate Analysis**

Starting with more proximal factors, socioeconomic and political context level factors associated with the outcome were examined first using logistic regression, and risk factors for food insecurity included not knowing where to get help for finding food (odds ratio [OR], 4.28; 95% CI, 2.72−6.74) compared with never, and reporting that more food assistance program benefits would be helpful during the COVID-19 pandemic (OR, 2.07; 95% CI, 1.27−3.38) compared with not helpful.

Next, model 2 added intermediary determinants level factors that were significantly associated with the outcome in addition to the socioeconomic and political context level factors that were significantly associated with the outcome in model 1. All associations from model 1 remained statistically significant, and in addition, being considered an essential worker during the COVID-19 pandemic (OR, 1.80; 95% CI, 1.12−2.87) and likely having GAD (OR, 1.85; 95% CI, 1.16−2.95) were found to be risk factors for food insecurity. None of the intermediary determinants level factors were found to be protective against food insecurity. Posttesting revealed that the associations that were not found to be statistically significant, including having children in the household and visiting grocery stores and restaurants less than usual since the outbreak, did not strengthen the model and were thus not included in model 3.

Finally, model 3 added individual socioeconomic position level factors that were significantly associated with the outcome in addition to the socioeconomic and political context level factors and the intermediary determinants level factors that were significantly associated with the outcome in model 2. Not knowing

**Table 2.** Frequency of Factors Among Food Secure and Insecure Individuals

| Factor | Food Insecure n (Within Column %) | Food Secure n (Within Column%) |
|---|---|---|
| Total | 158 (38.5) | 252 (61.5) |
| Socioeconomic and political context | | |
| Geography | | |
| Urban | 137 (86.7) | 220 (87.3) |
| Rural | 21 (13.3) | 32 (12.7) |
| Don't know where to find help to get food** | | |
| Never | 53 (33.5) | 184 (73.0) |
| Sometimes, most of the time, or always | 105 (66.5) | 68 (26.0) |
| SNAP/WIC would be helpful during this time** | | |
| Not helpful | 35 (22.2) | 123 (48.8) |
| Somewhat helpful, helpful, or very helpful | 123 (77.8) | 129 (51.2) |
| Intermediary determinants | | |
| Household size | | |
| 1 | 26 (16.5) | 44 (17.5) |
| 2 | 32 (20.3) | 77 (30.6) |
| 3 | 30 (19.0) | 44 (17.5) |
| 4 | 20 (12.7) | 33 (13.1) |
| 5 | 12 (7.6) | 22 (8.7) |
| 6 | 14 (8.9) | 10 (4.0) |
| ≥7 | 24 (15.2) | 22 (8.7) |
| Children under 18 y in the household** | | |
| Yes | 95 (60.1) | 110 (43.7) |
| No | 63 (39.9) | 142 (56.3) |
| Have member at high risk for COVID-19 | | |
| Yes | 74 (46.8) | 96 (38.1) |
| No | 84 (53.2) | 156 (61.9) |
| Essential worker during COVID-19* | | |
| Yes | 70 (44.3) | 77 (30.6) |
| No | 88 (55.7) | 175 (69.4) |
| Likely GAD-2** | | |
| Yes | 87 (55.1) | 75 (29.8) |
| No | 71 (44.9) | 177 (70.2) |
| Visit grocery store less often than usual* | | |
| Never | 21 (13.3) | 59 (23.4) |
| Sometimes, most of the time, or always | 137 (86.7) | 193 (76.6) |
| Go to restaurants less often than usual** | | |
| Never | 40 (25.3) | 109 (43.3) |
| Sometimes, most of the time, or always | 118 (74.7) | 143 (56.7) |
| Individual socioeconomic position | | |
| Age,** y | | |
| 18−24 | 53 (33.5) | 74 (29.4) |
| 25−34 | 38 (24.1) | 40 (15.9) |
| 35−44 | 29 (18.4) | 46 (18.3) |
| 45−54 | 24 (15.2) | 25 (9.9) |
| 55−64 | 12 (7.6) | 27 (10.7) |
| ≥ 65 | 2 (1.3) | 40 (15.9) |
| Gender* | | |
| Female | 99 (62.7) | 130 (51.6) |
| Male | 55 (34.8) | 121 (48.0) |
| Other | 4 (2.5) | 1 (0.4) |
| Race/Ethnicity (n = 394)* | | |
| Non-Hispanic Black | 50 (33.6) | 74 (30.2) |
| Non-Hispanic White | 19 (12.8) | 67 (27.3) |
| Hispanic | 77 (51.6) | 95 (38.8) |
| Other | 3 (2.0) | 9 (3.7) |

(continued)

**Table 2.** (*Continued*)

| Factor | Food Insecure n (Within Column %) | Food Secure n (Within Column%) |
|---|---|---|
| Employment status before COVID-19** | | |
|    Employed, salaried, full time | 31 (19.6) | 67 (26.6) |
|    Employed, salaried, part time | 16 (10.1) | 13 (5.2) |
|    Employed, hourly, full time | 38 (24.1) | 43 (17.1) |
|    Employed, hourly, part time | 11 (7.0) | 26 (10.3) |
|    Disabled | 14 (8.9) | 12 (4.8) |
|    Retired | 1 (0.6) | 40 (15.9) |
|    Homemaker | 9 (5.7) | 9 (3.6) |
|    College student | 17 (10.8) | 15 (6.0) |
|    Unemployed | 21 (13.3) | 27 (10.7) |
| Education* | | |
|    Some high school or GED | 61 (38.6) | 67 (26.6) |
|    Some college or associate degree | 62 (39.2) | 96 (38.1) |
|    Bachelor's or postgraduate degree | 35 (22.2) | 89 (35.3) |
| Household income* | | |
|    ≤ $49,999 | 113 (71.5) | 138 (54.8) |
|    $50,000−$99,999 | 32 (20.3) | 78 (31.0) |
|    ≥ $100,000 | 13 (8.2) | 36 (14.2) |

COVID-19 indicates coronavirus disease 2019; GAD, generalized anxiety disorder; GED, general equivalency diploma; SNAP, *Supplemental Nutritional Assistance Program*; WIC, *Special Supplemental Nutrition Program for Women, Infants, and Children*.
*$P \leq 0.05$ of $\chi^2$ test; **$P \leq 0.001$ of $\chi^2$ test.

where to get help for finding food (OR, 3.59; 95% CI, 2.18−5.91), reporting that more food assistance program benefits would be helpful during the COVID-19 pandemic (OR, 1.75; 95% CI, 1.02−2.99), being considered an essential worker during the COVID-19 pandemic (OR, 2.53; 95% CI, 1.44−4.45), and likely having GAD (OR, 2.18; 95% CI, 1.33−3.56) all remained statistically significant risk factors for food insecurity in model 3. In addition, participants who reported being a college student before the COVID-19 outbreak were almost 6 times more likely (OR, 5.88; 95% CI, 1.78−19.41) to be food insecure compared with those employed full-time salaried. None of the added individual socioeconomic position level factors were found to be protective against food insecurity. Age, gender, race/ethnicity, education level, employment status before the COVID-19 outbreak, and household income were not found to be significantly associated with food insecurity in this final model. Model fit improved with each model (Table 3).

## DISCUSSION

Identifying food-seeking behaviors associated with risk for food insecurity can contribute to the enhancement of policies and programs that seek to alleviate food insecurity, especially during times that increase vulnerability. To the authors' knowledge, this is the first study to examine food-seeking behaviors as they relate to food insecurity risk owing to the COVID-19 pandemic in the particularly affected state of New York. Using a model-building approach based on the levels of the CSDH conceptual framework for action on the SDH, the present study found that not knowing where to find help getting food and reporting that more food assistance program benefits would be helpful were associated with increased risk of being food insecure, as were being considered an essential worker, suffering from GAD, and being a college student, regardless of demographic characteristics.

At the socioeconomic and political context level, the participants who reported not knowing where to get help for finding food were at a significantly higher risk of experiencing food insecurity than their counterparts. This aligns with previous research findings that individuals with low social capital are more likely to experience food insecurity, and individuals with high social capital are less likely to experience food insecurity.[33,34] In addition, the participants who reported that more food assistance program benefits would be helpful during the COVID-19 pandemic were at a significantly higher risk of experiencing food insecurity than their counterparts. In recent years, 93% of eligible individuals participated in the SNAP in New York, only amounting to a total of 14% of New York residents participating in the federal nutrition assistance program.[35] Almost two-thirds (61.5%) of the present sample indicated that more food assistance program benefits would be helpful during the pandemic. This finding may suggest that individuals who have not previously experienced food insecurity before the COVID-19 pandemic have now been pushed into food insecurity without access to adequate food assistance.

**Table 3.** Likelihood of Food Insecurity Across Multiple Levels of the CSDH Framework

| Factor | Model 1: Socioeconomic and Political Context Level, OR (95% CI) | Model 2: Intermediary Determinants Level, OR (95% CI) | Model 3: Individual Socioeconomic Position Level, OR (95% CI) |
|---|---|---|---|
| Don't know where to find help to get food | | | |
| Never | Referent | Referent | Referent |
| Sometimes, most of the time, or always | 4.28 (2.72−6.74)* | 3.42 (2.11−5.54)* | 3.59 (2.18−5.91)* |
| SNAP/WIC would be helpful | | | |
| Not helpful | Referent | Referent | Referent |
| Somewhat helpful, helpful, or very helpful | 2.07 (1.27−3.38)* | 1.88 (1.13−3.11)* | 1.75 (1.02−2.99)* |
| Children under 18 y in the household | | | |
| No | | Referent | |
| Yes | | 1.32 (0.84−2.08) | |
| Essential worker during COVID-19 | | | |
| No | | Referent | Referent |
| Yes | | 1.80 (1.12−2.87)* | 2.53 (1.44−4.45)* |
| Likely generalized anxiety disorder | | | |
| No | | Referent | Referent |
| Yes | | 1.85 (1.16−2.95)* | 2.18 (1.33−3.56)* |
| Visit grocery store less often than usual | | | |
| Never | | Referent | |
| Sometimes, most of the time, or always | | 1.18 (0.63−2.20) | |
| Go to restaurants less often than usual | | | |
| Never | | Referent | |
| Sometimes, most of the time, or always | | 1.58 (0.97−2.58) | |
| Age, y | | | |
| 18−24 | | | Referent |
| 25−34 | | | 1.35 (0.63−2.88) |
| 35−44 | | | 1.43 (0.65−3.15) |
| 45−54 | | | 2.29 (0.93−5.63) |
| 55−64 | | | 2.19 (0.75−6.41) |
| ≥65 | | | 0.83 (0.14−5.02) |
| Gender | | | |
| Female | | | Referent |
| Male | | | 0.85 (0.49−1.47) |
| Other | | | 3.97 (0.35−45.03) |
| Race/Ethnicity | | | |
| Non-Hispanic White | | | Referent |
| Non-Hispanic Black | | | 1.89 (0.85−4.22) |
| Hispanic | | | 1.76 (0.83−3.70) |
| Other | | | 1.48 (0.26−8.47) |
| Employment status before COVID-19 | | | |
| Employed, salaried, full time | | | Referent |
| Employed, salaried, part time | | | 2.58 (0.94−7.08) |
| Employed, hourly, full time | | | 2.32 (1.03−5.20) |
| Employed, hourly, part time | | | 0.63 (0.21−1.89) |
| Disabled | | | 1.92 (0.63−5.86) |
| Retired | | | 0.16 (0.02−1.49) |
| Homemaker | | | 2.75 (0.69−10.91) |
| College student | | | 5.88 (1.78−19.41)* |
| Unemployed | | | 2.46 (0.90−6.69) |
| Education | | | |
| Some high school or GED | | | Referent |
| Some college or associate degree | | | 0.75 (0.41−1.36) |
| Bachelor's or postgraduate degree | | | 0.57 (0.27−1.21) |

(continued)

**Table 3.** (*Continued*)

| Factor | Model 1: Socioeconomic and Political Context Level, OR (95% CI) | Model 2: Intermediary Determinants Level, OR (95% CI) | Model 3: Individual Socioeconomic Position Level, OR (95% CI) |
|---|---|---|---|
| Household income | | | |
| ≤$49,999 | | | Referent |
| $50,000−$99,999 | | | 0.63 (0.33−1.20) |
| ≥$100,000 | | | 1.06 (0.41−2.75) |
| Log likelihood | −237.6 | −227.3 | −210.3 |
| Akaike information criterion | 481.2 | 470.5 | 442.7 |
| Bayesian information criterion | 493.2 | 502.7 | 486.4 |

CI indicates confidence interval; COVID-19, coronavirus disease 2019; CSDH, Commission on Social Determinants of Health; GED, general equivalency diploma; OR, odds ratio; SNAP, *Supplemental Nutritional Assistance Program*; WIC, *Special Supplemental Nutrition Program for Women, Infants, and Children*.
*Indicates statistical significance with the outcome at the $P \leq 0.05$ level.

At the intermediary determinants level, participants who reported being considered an essential worker during the COVID-19 pandemic were at increased risk for food insecurity. Across the nation, low-income workers, ethnic minority workers, workers with lower educational attainment, and blue collar workers are all less likely than their peers to have been able to safely work from home since the COVID-19 outbreak.[36,37] In New York, African Americans and Latinos make up a large part of the essential workforce, and in the city alone, more than 60% of COVID-19 deaths have been among African American and Latino populations.[38] Essential workers have also reported a heavier financial burden, with difficulty affording necessities, such as bills and food, because of the COVID-19 pandemic.[37] This could be due to a variety of reasons, including added child care responsibilities and the lack of access to school meal programs. In addition, participants who were rated as likely having GAD based on the GAD-2 screener were at an increased risk for experiencing food insecurity. This finding was similarly found by Fitzpatrick et al,[39] in which those with higher levels of anxiety symptoms were also found to have higher food insecurity odds. Recent literature has documented that the effects of both natural and man-made disasters may have a negative impact on the mental health of individuals and communities.[40–49] Postdisaster social and economic losses, coupled with mental instability, can lead to posttraumatic stress disorder, anxiety, and depression, as well as psychiatric symptoms such as hopelessness, worthlessness, and helplessness.[40] In turn, poor mental health increases the risk of food insecurity. A recent review found that all 7 of the studies included that measured poor mental health at baseline showed positive associations with food insecurity at follow-up.[50]

At the individual socioeconomic position level, the participants who reported being a college student before the COVID-19 pandemic were almost 6 times more likely to be food insecure compared with those employed full-time salaried. College students may have limited financial resources, decreased buying power of federal aid, and high expenses associated with attending college.[51] In addition, one-third of college students nationwide report that they are routinely food insecure, and now because of the COVID-19 pandemic, college students may not be able to rely on subsidized meal plans or campus food services owing to school closures.[52] Other demographic characteristics usually associated with food insecurity, such as age, gender, race/ethnicity, education level, and household income, were not found to be significantly associated with food insecurity at this level.

In this sample, 38.5% of individuals were food insecure after the COVID-19 outbreak, compared with an estimated 11.1% of New Yorkers reporting food insecurity prepandemic based on Feeding America's Map the Meal Gap study.[9] A similar increase in food insecurity among individuals who did not struggle to access food before the pandemic has been documented in New York by the New York State Health Foundation (2020) and in other cities around the nation as well.[13,39,53] Morales et al[54] conducted a cross-sectional study using a nationally representative sample of US households (n = 74,413 households) and found that a significant portion of previously food-secure households are now facing food insecurity for the first time after the COVID-19 outbreak. Emergency food systems, such as food banks, pantries, and kitchens, have experienced a rapid increase in demand across the country and especially in New York at the epicenter of the pandemic. These systems are having to provide food for existing families as well as new families not previously food insecure but who are now seeking help because of the COVID-19 pandemic. In New York City alone, food pantries and kitchens have seen 65% more individuals in 2020 than the previous year, and the number of New Yorkers who have gone hungry this year because of the COVID-19 pandemic is

estimated to be double that seen in 2019.[55]

Recent studies have documented the impact of disasters on local food system functioning and food security.[56–58] In the past, response and recovery efforts have focused on alleviating limited access to food in response to disasters through emergency food response and assistance programs, however, there is limited research on program effectiveness and impact of programs and policies for meeting postdisaster food needs.[59,60] For example, modifications were made to SNAP for current recipients after Superstorm Sandy, however, these modifications did not meet the needs of those who may have been pushed into food insecurity after the storm but were not previously eligible or using federal nutrition assistance.[57] In response to the COVID-19 pandemic, new programs such as *Pandemic Electronic Benefit Transfer* (P-EBT) and modifications to school meal programs remain similarly unevaluated.

Regarding the findings, there are several strategies that could be explored to address COVID-19 –related food insecurity outcomes. Mass media campaigns could aid in increasing awareness of where to find help acquiring food and food assistance program benefits. Mass media campaigns have proven successful for increasing awareness of hunger and food insecurity in recent years. An example of this is Feeding America's public service advertisement campaign, "Stories of Hidden Hunger," which was launched in February 2018 to increase awareness of and empathy toward hunger.[61] In addition, policies could be implemented to extend the reach of food assistance program benefits to meet the growing needs of those affected by the pandemic. For example, P-EBT only benefits households with children who were already eligible to receive free school lunches under the National School Lunch Act, thus failing to meet the needs of families not previously eligible for food assistance but who have since been pushed into food insecurity because of the COVID-19 pandemic.[62] Moreover, tax breaks could be offered to workers considered to be essential to help

alleviate the financial burden of food purchasing, such as the tax break proposed by lawmaker Roy Freiman in December 2020.[63] Finally, food pantries could be established on college campuses to make food and ready-made meals more accessible to college students. In recent years, food pantries have shown to be successful in decreasing hunger on college campuses.[64] Several colleges across the nation have pioneered adaptations in response to the COVID-19 outbreak, such as offering "grab-and-go bags," online deliveries, and alternative distribution sites.

The present study had several limitations. First, a cross-sectional design was used, making it impossible to discern temporal or causal relationships. The present cross-sectional analysis was used to provide information on the experience of food insecurity among individuals in a state that was heavily affected by the COVID-19 pandemic. This information is important for advancing understanding of the prevalence of food insecurity after the COVID-19 outbreak and the potential factors contributing to it, therefore outweighing the limitations of the study design. Second, the present study was limited by its use of online recruitment and online survey data. By using this approach, only individuals with access to Internet connection were able to participate. However, an estimated 9 in 10 Americans regularly use the Internet. According to the Pew Research Center (2019), 89% of White Americans, 88% of Hispanic Americans, and 87% of African Americans use the Internet, and regardless of race, 81% of people with an annual income of less than $30,000 use the Internet.[65] Third, it is possible that more politically and civically engaged individuals were attracted to participate in the online, opt-in survey, which may have biased the study results.[66,67] Fourth, the quota-based survey design used in the present study relies on a nonprobability sampling frame. Nonprobability samples do not allow for the calculation of margins of error, which can lead to the introduction of unknown sampling biases into the survey estimates.[68]

## IMPLICATIONS FOR RESEARCH AND PRACTICE

The present study examined factors at the socioeconomic and political context level, intermediary determinants level, and individual socioeconomic status level of an adapted CSDH conceptual framework for action on the SDH to determine associations between food-seeking behaviors and food insecurity risk among a quota-based sample of New York residents. This study fills an important gap in the literature on food-seeking behaviors and food insecurity outcomes after the COVID-19 outbreak in a heavily affected state. Future research is needed to better understand the long-term impact of the COVID-19 pandemic on food insecurity among various groups of people across diverse settings and effective strategies for mitigating. At the government level, it is important that programs and policies include food security in disaster planning and postevent rapid assessment to help reduce food insecurity among vulnerable groups, as well as to meet the needs of those who may have been pushed into food insecurity after a disaster but were not previously eligible or using federal nutrition assistance. Finally, new programs that target food insecurity introduced in response to the COVID-19 pandemic, such as P-EBT, require evaluation for future use. It is the authors' opinion that it is crucial to ensure that the short- and long-term food security needs of all individuals are met as COVID-19 continues to affect the country.

## ACKNOWLEDGMENTS

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