

Brief Report

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Shifts in Food Acquisition and Consumption Habits During COVID-19: Insights from a Diverse Sample

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Abstract

Objectives: Shifts in food acquisition during the COVID-19 pandemic may have affected diet. Assessing changes in diet is needed to inform food assistance programs aimed at mitigating diet disparities during future crises. This longitudinal study assessed changes in diet among a low-income, racially diverse population from March–November 2020.

Methods: Survey data were collected from 291 adults living in Austin, TX. Multivariable ordinal logistic regression models assessed the relationship between changes in consumption of fresh, frozen, and canned fruits and vegetables (FV), and sugar-sweetened beverages (SSBs) and the following food acquisition factors: food security, difficulty finding food, food bank usage, and food shopping method.

Results: Adjusted models indicated individuals with consistent food insecurity had increased odds of reporting a higher category of consumption for frozen (aOR = 2.13, $P < 0.05$, CI:1.18–3.85) and canned (aOR = 4.04, $P < 0.01$, CI:2.27–7.20) FV and SSB (aOR = 3.01, $P < 0.01$, CI:1.65–5.51). Individuals who reported using a food bank were more likely to report increased consumption of frozen (aOR = 2.14, $P < 0.05$, CI:1.22–3.76) and canned FV (aOR = 2.91, $P < 0.01$, CI:1.69–4.99).

Conclusions: Shifts in food acquisition factors were associated with changes in diet. Findings demonstrate the need for more robust food assistance programs that specifically focus on all dimensions of food security.

The COVID-19 pandemic disrupted food systems internationally, altering food acquisition at the community-level.¹ Throughout the US, increased grocery store purchasing, known as “panic buying,” occurred in the early months of the pandemic.¹ This, alongside other pandemic-induced changes to the food system, such as increasing illnesses among workers in food processing facilities which caused farmers to dispose of foods requiring processing, strained the global food system.² Due to the tie between food security and income, other pandemic-related factors, like increased unemployment, worsened food security rates.^{2,3} Thus, there is reason to believe that pandemic-related changes in food acquisition may have affected the diet of individuals at heightened risk for experiencing food insecurity.

Research has documented inequities in food security during COVID-19.² One study found significant differences between food insecurity and race, with Black adults reporting the highest levels of food insecurity.⁴ However, research examining changes in food acquisition factors among low-income and racially minoritized population remains limited. Food security is comprised of 4 dimensions: availability, accessibility, utilization, and stability.⁵ For example, food aid, such as receipt of food from a food bank, is considered to play a role in the availability and stability dimensions of food security.⁵ Research examining diet during COVID-19 among individuals experiencing food insecurity seldom consider factors related to these dimensions, like food bank use or food shopping method.^{4,7} This study seeks to address these gaps by assessing changes in diet in relation to key food acquisition variables among a low-income, racially diverse sample of individuals living in Austin, TX. In addition to food security, this study included food bank usage, difficulty finding food, and food shopping methods as proxy measures for the following dimensions of food security: stability, availability, and accessibility.

Methods

Study Design and Setting

Data used in this study come from a larger longitudinal cohort study, the Food Retail: Evaluating Strategies for a Healthy Austin project. In 2020, 2 additional surveys were administered to understand how COVID-19 had impacted individuals' food access and diet. These surveys were administered online in June 2020 and November 2020 and offered in English and Spanish. Analyses in this study use data from the 291 participants who completed both surveys. Written informed consent for publication of their data was provided by all participants. All procedures were approved by the University of Texas Health Science Center's Committee for Protection of Human Subjects (HSC-SPH-18-0233).

Exposure variables were food security status, difficulty finding food, food shopping method, and food bank usage. These variables were selected based on the data available from the parent study. Food bank usage was treated as a binary variable, with individuals classified as "used" if they reported receiving food from a food bank on either survey. Food banks included food pantries and other charitable organizations that provide free food. Food security was measured by the valid and reliable Hunger Vital Sign.⁸ The measures for difficulty finding food and food shopping method were developed by the research team and, like food security, were derived from participants' responses from both surveys to assess changes between the first 3 months and 8 months of the pandemic. Each of these variables had 3 possible categories. Supplementary Table 1 displays original survey questions and variables generated for analyses. Relatedly, Supplementary Table 2 defines the 4 dimensions of food security and their alignment to the exposure variables.

Dietary variables were developed by the research team and were selected based on previous literature examining diet during the pandemic.^{4,5,7} Form of fruit and vegetables (FV) were considered to increase comparability to similar research that differentiated between FV type.⁷ Change in consumption of fresh, canned, and frozen FV, and sugar-sweetened beverages (SSBs) were the main outcomes of interest. Directionality of change was determined by comparing participants' responses based on the first 3 months of the pandemic to those from 8 months into the pandemic. Participants were classified as having a "net increase" in consumption if their answers on both surveys resulted in an overall increase (e.g., a participant reported "agree" on the first survey and "neither agree or disagree" on the second survey). This technique was also used to create the categories "net decrease" and "stayed the same." A "net decrease" included participants whose answers indicated an overall decrease in consumption and "stayed the same" was used to categorize participants whose answers fluctuated between the first and second survey (e.g., a participant reported "agree" to the first survey and "disagree" on the second).

Covariates were chosen based on previously identified correlates of food security.^{3,7} Covariates included age (years), sex, race/ethnicity, adults in household, children in household primary language spoken, and wage change. Wage change referred to change in wages from the first 3 months of the pandemic to 8 months into the pandemic.

Statistical Analysis

Descriptive statistics were generated as means and standard deviations for continuous variables and percentages for categorical variables. Ordinal logistic regression analyses were used to test associations between changes in diet and food acquisition factors

while controlling for covariates. Separate models were run for each combination of dietary consumption and food acquisition factors, and each controlled for all covariates. Models were conducted using a complete case approach. The proportion of missing data for all variables ranges from 0.003%–0.02%, suggesting a minimal impact on the complete case analysis for all models. The sample size of 284 individuals was consistent across all models. Brant-Wald tests were used to check the proportional odds assumption. All tests resulted in insignificant results, indicating the proportional odds assumptions were met. Odds ratios and 95% confidence intervals (95% CI) were estimated for each model. The significance level for the final models was set at 0.05. Analyses were conducted using Stata (version 17, StataCorp).

Results

Descriptive statistics for demographic, food acquisition, and dietary variables are displayed in Table 1. The sample was primarily (71.82%) individuals from a racial/ethnic minority. Most participants (65.64%) consistently shopped in person. A little over half (54.98%) remained food secure throughout the study period. Most participants (69.07%) reported consistently having difficulty finding the food items they purchased prior to the pandemic. Slightly over half of participants reported an increase in fresh (56.36%) and frozen (50.17%) FV consumption. Most participants (60.48%) reported an overall decrease in SSB consumption.

Results from the ordinal logistic regression models are shown in Table 2. The adjusted model examining changes in fresh FV consumption and food shopping method indicated that individuals whose food shopping method fluctuated were 72% (aOR = 0.28; 95% CI: 0.15–0.54) less likely to report a higher category of fresh FV consumption compared to individuals who primarily shopped for food in person. Results for changes in canned FV consumption and food security indicated that individuals who were consistently food insecure were 304% (aOR = 4.04; 95% CI: 2.27–7.20) more likely to report a higher category of canned FV consumption than their counterparts who were consistently food secure. The same model revealed that individuals who used food banks at any time during the pandemic were 191% (aOR = 2.91; 95% CI: 1.69–4.99) more likely to report a higher category of canned FV consumption. The model for changes in frozen FV consumption revealed that individuals who experienced fluctuating (aOR = 2.23; 95% CI: 1.20–4.20) and consistent food insecurity (aOR = 2.13; 95% CI: 1.18–3.85) were more likely to report a higher category of frozen FV consumption. Those who reported using a food bank were 114% (aOR = 2.14; 95% CI: 1.22–3.76) more likely to report a higher category of frozen FV consumption than those who did not. Adjusted odds ratios examining changes in SSB consumption and food availability indicated that individuals who experienced fluctuating (aOR = 3.31; 95% CI: 1.06–10.34) or consistent (aOR = 4.01; 95% CI: 1.10–9.50) difficulty finding food were more likely to report increased in SSB consumption than those who did not have difficulty finding food. Individuals experiencing fluctuating food security were more likely to report greater SSB consumption than those who were consistently food secure (aOR = 2.60; 95% CI: 1.40–4.90).

Discussion

Food system disruptions during the COVID-19 pandemic had significant effects on individuals' food acquisition and diet.^{1–4,6,7,10} Approximately 34.36% of study participants shopped for food online

Table 1. Descriptive statistics for demographic, food acquisition, and dietary consumption variables (*n* = 291)

	<i>n</i>	% (Unweighted)
Age		
M (SD)	42.7 (12.12)	
Gender		
Female	243	83.79%
Male	47	16.21%
Race/ethnicity		
Non-Hispanic White	82	28.18%
Racial/Ethnic Minority	209	71.82%
Primary language		
Only or mostly English	160	54.98%
Only or mostly Spanish	69	23.71%
Other (including English and Spanish equally)	62	21.31%
Adults in household		
1 Adult	56	19.24%
2 Adults	143	49.14%
3 or more adults	92	31.62%
Children in household		
No children in household	109	37.46%
Children in household	182	62.54%
Employment/wage change during COVID		
No change in wage	128	43.99%
Decrease in wage	96	32.99%
Temporary decrease in wage	41	14.09%
Other (including increase in wage)	26	8.93%
Food insecurity during Covid		
Food secure before and during	160	54.98%
Food insecurity fluctuated	55	18.90%
Food insecurity before and during	76	26.12%
Difficulty finding food		
Never difficult	25	8.59%
Consistently had issues	201	69.07%
Fluctuating Issues	65	22.34%
Shopping method		
Consistently shopped in person	191	65.64%
Consistently shopped via curbside, home delivery, etc.	48	16.49%
Fluctuated	52	17.87%
Food bank usage		
Never used	104	64.26%
Used	187	35.74%

(Continued)

Table 1. (Continued)

	<i>n</i>	% (Unweighted)
Fresh fruit and vegetable consumption		
Net increase	164	56.36%
Net stayed the same	67	23.02%
Net decrease	60	20.62%
Canned fruit and vegetable consumption		
Net increase	95	32.65%
Net stayed the same	81	27.84%
Net decrease	115	39.52%
Frozen fruit and vegetable consumption		
Net increase	146	50.17%
Net stayed the same	70	24.05%
Net decrease	75	25.17%
SSB consumption		
Net increase	60	20.62%
Net stayed the same	55	18.90%
Net decrease	176	60.48%

Note: Cells may not sum to total due to missing values.

at least once during the study period, which aligns with national trends in food shopping during the pandemic.¹⁰ Changes in food acquisition had notable effects on diet, with our findings indicating positive associations between experiencing fluctuating or consistent food insecurity and increased consumption of canned and frozen FV consumption. Although these results contrast with previous research showing declines in FV consumption among food-insecure individuals,^{4,7} this discrepancy may be explained by shifts in food shopping behaviors and use of food banks. For example, Kassas et al. found that individuals prioritized panic-buying non-perishable items, such as canned and frozen foods, early in the pandemic.¹ Individuals who reported using a food bank during our study were more likely to report increased consumption of frozen and canned FV. This is likely because food banks rely on self-stable foods as they require less complex storage and distribution plans than perishable foods.⁹ As a result of pandemic-related social distancing requirements, many food banks transitioned from operating like a traditional grocery store to providing pre-prepared food boxes, which may have further increased the reliance on shelf-stable, non-perishable foods.⁶ Like our findings, research by Bertmann et al. found that food insecure individuals who did not report using a food bank were more likely to report a reduction in FV consumption.⁶ These findings underscore the important role charitable community organizations, such as food banks, food pantries, and congregate meal sites, have in mitigating dietary disparities during disasters.^{6,9}

Results provide needed insight into how pandemic-related changes in the accessibility, availability, and stability dimensions of food security affect diet. Specifically, the association between difficulty finding food and an increase in SSB consumption speaks to the availability component of food security, highlighting the potential negative effects changes to the food supply system have on diet quality. Our results indicate increased fresh FV among

Table 2. Logistic regression models examining associations between changes in dietary consumption and food acquisition factors^a (*n* = 284)

	Fresh Adjusted OR ^b (95% CI)	Canned Adjusted OR ^b (95% CI)	Frozen Adjusted OR ^b (95% CI)	SSB Adjusted OR ^b (95% CI)
Difficulty finding food ^c				
Fluctuated	1.69 (0.65–4.41)	1.12 (0.49–2.98)	1.65 (0.69–3.94)	3.31 (1.06–10.34)*
Consistently had issues	0.90 (0.38–2.10)	1.66 (0.73–3.77)	1.92 (0.87–4.23)	4.01 (1.37–11.77)*
Food insecurity status ^d				
Food insecurity fluctuated	0.90 (0.48–1.68)	2.02 (1.10–3.68)*	2.23 (1.20–4.20)*	2.17 (1.12–4.21)*
Food insecure before and during COVID	1.45 (0.78–2.69)	4.04 (2.27–7.20)**	2.13 (1.18–3.85)*	3.01 (1.65–5.51)**
Food shopping method ^e				
Fluctuated	0.28 (0.15–0.54)**	0.80 (0.43–1.49)	1.11 (0.59–2.07)	1.66 (0.86–3.20)
Consistently shopping not in person	0.72 (0.37–1.38)	1.24 (0.67–2.29)	1.53 (0.81–2.90)	1.23 (0.62–2.43)
Food bank usage ^f				
Used	1.22 (0.68–2.17)	2.91 (1.69–4.99)**	2.14 (1.22–3.76)*	1.66 (0.93–2.94)

P* < 0.05, *P* < 0.001.^aSeparate models were run for each combination of dietary consumption and food acquisition factors.^bAll models adjusted for age, sex, race/ethnicity, language, adults in household, children in household, and changes in wages.^cReference group is no difficulty finding food.^dReference group is food secure before and during COVID.^eReference group is consistently shopping in person.^fReference group is never used.

individuals who consistently shopped in person. However, previous research has identified disparities in food shopping behaviors during the pandemic.³ Morales *et al.* found that Asian and Hispanic food-insecure households were more likely to report being afraid to go out to buy food than White households.³ To effectively prevent disparities in diet quality during disasters, federal food assistance programs must consider all dimensions of food security and provide individuals with the flexibility to procure food in ways that align with their preferences. The level of attention given to each dimension may vary depending on the community context and impact of a given disaster. For instance, our findings indicating disparities in fresh fruit and vegetable consumption by food shopping method suggest that interventions aimed at supporting healthy food access amid the pandemic may have helped prevent these disparities. Ultimately, our findings support the call made by Litton *et al.* for more robust food assistance efforts to support the health and well-being of at-risk individuals during future disasters.⁷

This research used data from a study that intentionally sampled low-income and racially diverse Central Texans. Most of the sample reported owning a car and a requirement to participate was having a home address. As a result, this sample is not representative of the state or country and may not be generalizable to economically and racially similar groups. The lack of variation in car access and home ownership prevented us from including additional factors related to the utilization and accessibility dimension of food security, such as kitchen and geographic access. Furthermore, other factors related to utilization, such as cooking skills, were outside the scope of the parent study. Analyses rely on self-reported dietary habits and could be impacted by recall bias. While directionality of change in dietary consumption is measured, the degree of the change is not. Therefore, we are unable to determine if these are meaningful differences in dietary habits. Despite these limitations, the associations examined in this study provide vital information on a variety of dietary habits during the COVID-19 pandemic among a unique population.

Conclusion

This research advances understanding on how changes in food acquisition affect diet among a low-income and racially diverse sample. Findings suggest that strategies focusing solely on improving economic food access may overlook other determinants of diet, such as food stability. Results underscore the importance of developing safety net programs and policies that consider all dimensions of food security.

Supplementary material. The supplementary material for this article can be found at <http://doi.org/10.1017/dmp.2025.10138>.

Data availability statement. All data and instruments utilized in this study can be shared by request and contacting the author.

Author contribution. Conceptualization: D.J.G.; methodology: D.J.G., K.M.J., A.E.v.d.B., and A.N.; data analysis: D.J.G.; data collection and management: A.N.; writing original draft: D.J.G.; reviewing and editing drafts: K.M.J., A.E.v.d.B., A.N., and B.C.; supervision: A.E.v.d.B.; project administration: A.N.; funding acquisition: A.E.v.d.B. All authors have read and agreed to the published version of the manuscript. All authors reviewed the study.

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Competing interests. The authors have no conflicts of interest to declare.

Ethical standard. The study procedure was performed in accordance with the ethical principles of the Declaration of Helsinki and were approved by the University of Texas Health Science Center's Committee for Protection of Human Subjects (HSC-SPH-18-0233). Informed consent was obtained from all study participants.

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