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Abstract

The COVID-19 pandemic disrupted food availability and affordability and changed the daily food practices of New Yorkers. Eleven surveys of samples of 1,000 New York City adults from March 13 through June 28 illustrate three effects on food access and food insecurity: (1) closing restaurants, schools, and other sources of prepared foods reduced access and changed shopping patterns, food expenditures, and diets; (2) economic disruption exacerbated food insecurity and increased demand for food assistance; and (3) altered food practices affected diets and health. These impacts were disproportionately borne by vulnerable populations. This paper reports survey responses illustrating the effects of the pandemic and its aftermath on food access, food insecurity, nutrition, and food practices, and how these effects differed for specific populations. The results suggest opportunities to increase food system resilience by developing and expanding programs and policies tackling social determinants of food insecurity and malnourishment.

Key Words
COVID-19; food insecurity, public health, health disparities, food policy

Introduction

The COVID-19 pandemic, and efforts to contain its spread, affected New York City's food system in three critical ways. First, closing restaurants, schools, food pantries, congregate meal programs, and office cafeterias reduced the availability of prepared meals, groceries, and snacks, making acquiring food more challenging. Second, the economic fallout of policies curtailing business activity made it difficult for low income households to afford food, causing households to seek public and private food benefits or to adjust the quantity and quality of food they consumed. Third, increased home meal preparation changed shopping and cooking practices, with mixed consequences for diets, household expenditures, and the food retail sector. Preexisting social inequities and stratifications, and the lack of coherent policy responses,[1] have caused the adverse effects of COVID-19 to disproportionately burden those most vulnerable based on differences in food access and food security due to race/ethnicity, income, gender, and age.

To assess these effects, we analyze the results of 11 surveys of separately drawn representative samples of 1000 New York City residents conducted between March 11, when COVID-19 policies (listed in Table 1) began to affect daily life in New York City, and June 30, 2020. The survey questions measured the effects of the virus and the policies to contain its spread on physical and emotional health, household finances, and various coping behaviors. The surveys asked questions about food access, food insecurity, and diets. The data indicate in a longitudinal series of cross-sectional snapshots how the pandemic affected food at the household level, and how those effects varied by demographic and socioeconomic characteristics of the respondents.

Insert Table 1 here

Methods

The paper reports the results from New York City of a series of surveys administered in New York State by Emerson College Polling[2]. Surveys were conducted as shown in Table 2 with all surveys asking demographic and COVID-19 experience-related questions and periodically selected food questions as shown in the table. The survey instruments were developed by faculty at the CUNY Graduate School of Public Health and Health Policy (CUNY SPH). The survey sample was derived from a random sample of landline and mobile telephone numbers in a database provided by Aristotle, LLC, and an online sample from opt-in panels recruited by Mturk and SurveyMonkey. Each survey sample represents a unique set of respondents at a given time, not a single sample followed longitudinally. More information on the survey methodology and additional findings are posted on the CUNY SPH COVID-19 Tracking Survey website and methodology page[2]. After reviewing this project, the CUNY IRB determined that the datasets from the polls did not meet criteria for human subjects' research and did not require approval.

We present summary descriptive statistics and relevant crosstabulations, with Chi-square tests of independence. All associations reported below are statistically significant with $p<.01$.

Insert Table 2 here

Results

Food Access

By mid-March, 2020, as non-essential businesses in New York City began to close and social distancing requirements took effect, slightly more than half (52.5%) of the respondents reported

in Survey 2 that the virus and its consequences had reduced their household's ability to get the food they needed by "a lot" (19.5%) or "somewhat" (33%), as shown in Table 3. A month later, Survey 6 showed that the proportion reporting "a lot" or some difficulty in meeting their food needs had increased modestly to 56.6%. By itself, this question did not elucidate what role food availability, shopping logistics, cost, or other attributes played in these assessments of difficulty.

The responses to this question varied by race/ethnicity and socioeconomic status as Table 3 illustrates. In Survey 2, approximately a quarter of multiple races/other (26%) and Latinx (24.8%) respondents indicated the virus and the subsequent response reduced their ability to get the food they needed "a lot." Latinxs were 1.6 times more likely than whites to report their food access diminished by "a lot." Asian respondents also reported significantly reduced ability to get food, with 54.8% reporting reduced access by "a lot" or "somewhat." The percentage of African American/Black respondents reporting reduced access by "a lot" grew between Surveys 2 and 6, from 16.8% in Survey 2 to 23.2% in Survey 6.

Insert Table 3 here

Diminished food access also varied by socioeconomic status. Lower income respondents reported decreases in food access to a greater extent than higher income respondents. Larger percentages of respondents employed in construction and manufacturing, or leisure and hospitality, two sectors hard-hit by the economic fallout of COVID-19, reported that their food access had been reduced by "a lot" compared to those employed in other sectors. Those unemployed when the survey was taken, and those unemployed *prior* to the pandemic, reported diminished food access in larger numbers than employed respondents.

New York City residents rely heavily on mass transit. Public transportation, which experienced significant service reductions due to ill workers and reduced ridership, was the most common travel mode among those reporting that the virus reduced their food access "a lot" (46.7%) or "somewhat" (46%) (Chi-Square=43.197; df=20; sig=.002). This suggests that reduced service or avoidance of transit may have contributed to reduced food access, or that those dependent on public transit because of lower income and the lack of car or taxi access were more likely to report diminished food access.

In Survey 9, respondents were asked whether the ease of getting the food their households need changed compared to the previous month. About 4 in ten (39%) respondents reported that it had gotten harder, and only 1 in 5 (20.7%) said it became easier. Another two in five (40.3%) reported no change. A significantly larger percentage (45.1%) of those earning less than $50,000 reported that access became harder compared to 28.6% of those earning more than $100,000, but differences in responses by race/ethnicity were not statistically significant.

Diet Healthfulness

Survey 4 asked, "Has the coronavirus changed how healthy you think you and your household's diet is?" As Table 4 shows, nearly one-fifth (19.3%) of all respondents reported that their household's diet had become "much more healthy," with 30.3% reporting that it had become "somewhat more healthy." Nine percent said that their diet had become "somewhat less healthy" and only 3.3% said that their diet had become "much less healthy." When this question was repeated in Survey 6, the percentage of respondents who felt their diet had become either somewhat or much less healthy increased from 12.3% to 22.2%. Given the wording of the question, however, it is not clear whether respondents assessed healthfulness based on nutrition, quantity consumed, or other attributes.

Responses varied by race/ethnicity. More than a quarter of Latinx respondents reported that the virus made their household's diet *much more healthy* in Survey 4, decreasing to 21.9% by Survey 6.

Insert Table 4 here

Of interest, more than a third (35.7%) of those reporting that the virus reduced their ability to get food by "a lot" also said that it had not changed the healthfulness of their household's diet, as Table 5 indicates. Moreover, more than one-quarter (28.1%) of those who reported that their food access was reduced by "a lot" also responded that the pandemic made their diet "much healthier." A quarter of the respondents who said that the virus had made it *easier* to get the food they needed responded that it also "made our diets much less healthy."

Insert Table 5 here

Food Insecurity

The surveys measured household food insecurity and levels of participation in various food assistance programs and asked open-ended questions about changes in the ability to get needed food. Surveys 8 and 10, completed approximately two and three months after the New York State Governor declared the pandemic emergency, asked modified versions of the Hunger Vital Sign two-question screening for food insecurity[3]. Survey 8 asked respondents, "Since March 1st, have those in your household worried whether your food would run out before you got money to buy more?" and "Since March 1st, the food we bought just didn't last and we didn't have money to get more." In Survey 10, the second question was "Since the start of the epidemic in March, were you ever actually unable to pay for the food you needed?"

By the second month of the pandemic, a significant percentage of survey respondents reported being food insecure, as measured by the screening questions. In Survey 8, 4 in 10 respondents

(44%) reported worrying whether their food would run out before they got money to buy more, while 3 in 10 (30.1%) reported that the food they bought "just didn't last and we didn't have money to get more." Four weeks later, the rates were virtually the same, as 43.5% of respondents to Survey 10 worried about food running out and 29.6% actually ran out of money to buy needed food. Table 6 shows that three months after the pandemic was declared in New York City, rates of food insecurity varied significantly by race and ethnicity. Nearly two thirds of the Latinx households and two-fifths of the Black and Other races households reported that they worried about running out of money for food, compared to less than a third of the white and Asian households.

Insert Table 6 here

The surveys also show that a higher percentage of respondents of low socioeconomic status reported food insecurity. For example, in Survey 10, 58.5% of those households with incomes less than $50,000 reported worrying about running out of food, with 42.8% unable to pay for needed food at some point since March. A larger percentage of self-defined essential workers (55.8%) reported worrying about running out of food than those not in an essential worker position (38%), and 4 in 10 essential workers (40.5%) said that the food they bought didn't last and they didn't have money to get more, compared to 25% in other job categories. Almost three in five (56.9%) respondents without college reported worrying about running out of food compared to only 34.2% of those with a college degree. Nearly double the proportion of those without college (41.4%) reported being unable to pay for needed food compared to 22.4% of those with a college degree.

Malnourishment

Food insecurity may lead to malnourishment and hunger. Survey 10 asked respondents with children under age 18 in their household whether any of their children have been hungry since the start of the epidemic. More than 1 in 5 households with children (22.5%) reported that their children had been hungry "a few" or "several" times because they couldn't get enough food to feed them. Nearly one-third (32.7%) of the 32% of respondents who had children said that one or more had lost weight since the start of the epidemic. A significantly higher percentage of those households in which children lost weight during the pandemic also were food insecure. Parents of children who lost weight were 1.8 times more likely to report that they worried about running out of food and 2.4 times more likely to have been unable to pay for food than parents who did not report that any children had lost weight.

Participation in Food Assistance Programs

Public agencies, non-profit organizations, and the Supplemental Nutrition Assistance Program (SNAP), the federal government's largest food subsidy program, have been safety nets for households facing food insecurity and malnourishment. As a result of the pandemic, however, many programs providing free food were disrupted because their facilities had to close, or the virus prevented volunteers and staff from working. Several questions, beginning with Survey 7, asked about participation in school meals, other food assistance programs of city agencies, nonprofits and religious organizations, and SNAP.

In Survey 7, 13.4% of respondents reported receiving food or meals from an emergency school meal program launched after the school system cancelled in-person instruction and therefore had to suspend the in-school breakfast and lunch programs. At approximately 400 school sites across the city, from Monday through Friday, the Department of Education distributed packaged "grab and go" meals to adults with schoolchildren. Because the city has not required identification or

even proof of children in school, the meals are effectively available to all. Nearly 16% of respondents said that they received food or meals from other city programs, non-profits, or religious organizations.

About one in five respondents (18.2%) reported receiving SNAP benefits (currently or before COVID-19 began), a figure comparable to the 18.5% of the city's population receiving SNAP between March and May 2020[4]. Studies of SNAP enrollment in New York City show that after steadily declining since 2016, enrollment sharply increased in April 2020[4].

Survey data did not show statistically significant differences in participation in food benefit programs by race/ethnicity, but there were differences by socioeconomic status. Somewhat surprisingly, a higher percentage of respondents with incomes between $50,000 and $100,000 used school meals (18.2%) than those with incomes below $50,000 (13.1%). Approximately the same percentages (17.7% and 17.9%) of these two groups used other public food or food from non-profits or religious organizations.

Participating in food assistance programs varied among full and part-time and essential and non-essential workers. About one in five (18.2%) full-time essential workers and part-time non-essential workers (23%), and one in three (34.8%) part-time essential workers, reported receiving food or meals from the emergency school meal program. Among essential workers, about one in five (18.8%) full-time workers and three in ten (28.8) part-timers received food from other public programs, non-profits, and religious organizations. By comparison, only 15% of part-time non-essential workers received food from these sources. Nearly half of part-time essential workers (45.5%) reported participating in SNAP, about 2.5 times higher than the overall participation rate.

In Survey 11, four months after responses to the pandemic began in New York City, respondents were asked about their use of food support programs overall. Nearly one-third (31.9%) reported that they were receiving some form of food support, including SNAP or local non-profit services. The use of these programs was more prevalent among Latinx (47.9%) and Black (34.1%) respondents than Asian (10.4%) or White (25.2%) respondents.

Food Practices

COVID-19 and efforts to stop its spread have significantly changed everyday food practices, from grocery shopping frequency, mode, and spending to the prevalence and methods of meal preparation. These altered practices are likely to affect budgets, food security, diets, and health, and may last beyond the pandemic. Surveys 10 and 11 asked questions about food acquisition and preparation, and several open-ended questions provide additional insights about changed food practices.

More than two-thirds of households (69.7%) reported that they have been "spending more each week for food." Nearly two-thirds (63.8%) indicated that since the start of the pandemic they go shopping for food less frequently. Nearly half (48.8%) are ordering more food online than before the pandemic. While nearly half (46%) report that their "diet is healthier now than it was before" the pandemic, 48.6% also report eating more packaged foods now compared to before the pandemic. A significantly larger percentage of Latinx, Black, and Asian respondents than White and Other reported eating more packaged foods, as did respondents with household incomes less than $50,000 compared to more affluent households, as Table 7 shows.

Insert Table 7 here

Restaurants have begun to serve food outdoors and in September 2020 were permitted to resume indoor dining at reduced capacity. In Survey 11 we asked respondents when they would be

comfortable going back to eating at a restaurant. One-fifth (20.2%) indicated immediately (July 1, prior to resumption of indoor dining) but more than one-third (34.1%) said not until a vaccine is available.

To elicit additional insights into how the epidemic affected respondents' food practices, open-ended questions in Surveys 4 and 10 asked in "what ways has the coronavirus epidemic and its response changed how you purchase and consume food?" A review of 533 responses identified reports of changes in three inter-related domains: (1) shopping for food; (2) spending on food; and (3) diet, cooking and eating. In each domain, respondents reported making numerous changes, although in some cases they chose divergent paths, e.g., shopping more or shopping less, or eating healthier or unhealthier.

Their responses also showed the cascade of changes related to COVID-19 that disrupted previous patterns of food purchasing and consumption. Fear of exposure to the virus while shopping and stay-at-home directives limited how often people shopped. Hoarding at the start of the pandemic reduced the supply of certain products, and unemployment and lost wages reduced food budgets. Some reported changes might explain why 50% of respondents in one survey reported eating healthier, including eating out less frequently and cooking at home more, and eating more fruits and vegetables.

Selected quotes from respondents in Table 8 illustrate some ways food practices have changed in response to the pandemic. People changed where and when they shopped. They bought different food, both in response to changing prices and availability for some products and reduced income. Respondents reported both positive and negative changes in the healthfulness of their diets, based in part on income, food availability, stresses, and the perceived need to find comfort in food. The multiple influences and rationales for these changes that respondents noted point to the

many ways that the pandemic altered the food environment and the complex pathways by which Covid-19 has affected diet and health.

Insert Table 8 here

Discussion and Conclusions

Before the pandemic struck, New York City faced significant problems related to food access, food security, and food affordability [5]. The survey results show that, like a spotlight, the pandemic and policies to curb its transmission illuminated these existing challenges. During the pandemic, New Yorkers have faced substantial logistical challenges in getting the food that their households need. People were forced to shift from food-away-from-home purchases to groceries prepared and eaten at home. Supermarkets faced a spike in sales early in the pandemic, making it difficult for some consumers to stock up on food. Hoarding subsided, but social distancing requirements have made grocery shopping more time consuming and potentially risky, leading many to begin shopping online. Self-quarantining and social distancing restrictions have limited movement throughout the city, decreasing opportunities for people to buy food on the way to and from work, school, and other places they would typically frequent. A reduction in transit service [6] compounded the inconvenience of buying groceries for those who depend on buses and subways to get to and from the supermarket.

While these disruptions made food acquisition more difficult for everyone, the surveys show the effects were disproportionately experienced by Latinx and Black households and households with low income. Diminished access to prepared food, a large and growing source of daily calories in the US [7], required households to cook and eat most meals at home, requiring more grocery shopping and food preparation time. Meal preparation was likely less burdensome for those able to work from home than for front-line workers with commutes, and for households

with more space compared to those in cramped quarters. Despite significant efforts by city government and non-profits to provide new ways to address the rising toll of food insecurity precipitated by the pandemic, these alternatives have been logistically complex or geographically limited, potentially constraining their reach. Some emergency meal programs have shut down due to fewer volunteers or being located in a closed facility[8]. City agencies responded to the closure of the school food program by setting up approximately 400 emergency grab and go distribution sites compared to the 1,700 schools that served school food before the pandemic. Prior to COVID-19, an estimated 1.2 million New Yorkers were food insecure, relying on a patchwork of free meals in school cafeterias and other public agency feeding programs, non-profit congregate meal programs, volunteer soup kitchens, and neighborhood food pantries, and financial support from federal programs like SNAP[5, 9]. The economic fallout of the pandemic has exacerbated food insecurity and actual hunger. For households with limited incomes and precarious employment, the economic disruption of the pandemic has increased food insecurity and hunger to levels not seen in recent history. The survey results show that food insecurity since the beginning of the pandemic has remained at an extraordinarily high rate of 30-40% or more compared to a baseline rate of approximately 14% of the population prior to the pandemic[10]. By one forecast, 1.25 million jobs will be lost in New York City as a result of the pandemic[10]. If this estimate proves accurate, the most economically vulnerable households, particularly people of color, young adults, those without a college education, and undocumented immigrants, will face formidable burdens feeding their families. Financial stresses may be compounded by the emotional stress, anxiety, and isolation caused by social distancing requirements, making it even more difficult for those with limited financial and social resources to sustain healthy eating patterns.

A few silver linings offer some guidance for future policy. Many respondents perceived that their diets were healthier than before the epidemic, perhaps because of less dining out and changes in shopping choices. In a less constrained environment, public policies can be directed to sustaining such changes. In some cases, public food programs moved beyond the charitable framework that characterizes much emergency food assistance in New York City and the United States[11]. School food programs fed children, families, and communities with few checks on documentation or income eligibility thresholds. This approach might speed the transition from a system where food is a commodity or charity to one where access to healthy food is a basic human right.

There are several limitations to our survey methods. Response rates to our survey varied across the three modalities of online, landline and mobile phone, 93%, 2.6% and .6%, respectively, with the possibility that some vulnerable populations may have been less likely to be sampled, e.g., homeless, or unstably housed populations. This could lead to underestimates of problems of interest.

Despite these limitations, our findings are valuable as city officials undertake food policy changes in the wake of the pandemic[12]. The data show that overall, the disruptions caused by the pandemic are likely to have made food access more difficult, increased food insecurity and hunger and malnourishment, and changed shopping, cooking, and eating practices in ways that may affect diets and nutrition for some time after the pandemic ends. In the course of its first six months, the pandemic has exposed vulnerabilities in the food system that have been the subject of dozens of plans, reports, and policy proposals for the past decade[5]. More broadly, the pandemic has revealed the persistent inequitable distribution of the social determinants of health in New York City, including food, health care, employment, and housing[13].

As New York and other cities work to combine their efforts to contain the spread of the epidemic and treat those affected with efforts to restore the economy, it will be necessary to address the multiple determinants of reduced food access and healthy diets. The scale of economic and social restoration needed offers policy makers and advocates the opportunity to develop programs and policies that tackle the deeper social determinants of food security and healthy diets, influences that existed before the covid epidemic and, if unaddressed, will continue to undermine health.

References

1. Kinsey, E. W., Kinsey, D., Rundle, A. G. (2020). COVID-19 and food insecurity: An uneven patchwork of responses. *J Urban Health*, 97(3), 332-335. doi:10.1007/s11524-020-00455-5

2. El-Mohandes, A., Lee, B.Y., Nash, D., Palmedo, C., Joshi, A., Freudenberg, N., Ngo, V. et al. COVID-19 Tracking Survey – School of Public Health. CUNY Graduate School of Public Health and Health Policy. https://sph.cuny.edu/research/covid-19-tracking-survey/. Published March 2020.

3. Cutts, D., Cook, J. (2017). Screening for food insecurity: Short-term alleviation and long-term prevention. American Journal of Public Health. 107(11):1699-1700. doi:10.2105/ajph.2017.304082.

4. NYC Human Resources Administration. (2020, June 29). *Human resources administration SNAP recipients 2016-2020.* NYC Human Resources Administration Department of Social Services. https://www1.nyc.gov/assets/hra/downloads/pdf/snap_recipients.pdf

5. Freudenberg, N., Cohen, N., Poppendieck, J., Willingham, C. (2018). Ten years of food policy governance in New York City: Lessons for the next decade. Fordham Urban Law Journal. 45:951-994.

6. Goldbaum, C. (2020, March 24). Subway service is cut by a quarter because of coronavirus. The New York Times. https://www.nytimes.com/2020/03/24/nyregion/coronavirus-nyc-mta-cuts-.html.

7. Saksena, M.J., Okrent, A.M., Anekwe, T.D., et al. (2018). America's eating habits: Food away from home. (Saksena, M.J., Okrent, A.M., Hamrick, K.S., Eds.). USDA Economic Research Service. https://www.ers.usda.gov/webdocs/publications/90228/eib-196.pdf?v=2083.4

8. Aridi, S. (2020, April 10). Facing food insecurity on the front lines. The New York Times. https://www.nytimes.com/2020/04/10/neediest-cases/feeding-america-food-banks-coronavirus.html.

9. Mayor's Office of Food Policy. (2019). Food metrics report 2019. Nyc.gov. Retrieved April 8, 2020. https://www1.nyc.gov/assets/foodpolicy/downloads/pdf/Food-Policy-Report-2019.pdf.

10. Parrott, J.A., Moe, L. (2020, June 29). The Covid-19 New York City economy three months in: Reopening, and a continuing low-wage worker recession. Center for New York City Affairs. http://www.centernyc.org/reports-briefs/2020/6/29/the-covid-19-new-york-city-economy-three-months-in-reopening-and-a-continuing-low-wage-worker-recession.

11. Poppendieck, J. (1999). Sweet charity?: Emergency food and the end of entitlement. New York, NY: Penguin.

12. City of New York, Department of Sanitation. (2020, April 15). Feeding New York: The plan for keeping our city fed during the Covid-19 public health crisis. https://www1.nyc.gov/assets/home/downloads/pdf/reports/2020/Feeding-New-York.pdf.

13. El-Mohandes, A., Ratzan, S.C., Rauh, L., Ngo, V., Rabin, K., Kimball, S., Aaron, B., Freudenberg, N. (2020, October). COVID-19: A Barometer for Social Justice in New York City American Journal of Public Health e1-_e3, https://doi.org/10.2105/AJPH.2020.305939

Tables

Table 1. Selected New York Policy Responses to COVID-19, March 2020

March 7	Governor declares a disaster emergency in New York State[1].
March 16	Governor bans gatherings of more than 50 people and restricts restaurants to take-out/delivery[2]. Mayor closes all 1,800 New York City public schools[3] and opens 435 sites for "grab-and-go" school meals[4].
March 18	Governor closes schools statewide[5] and halts in-person classes at CUNY and SUNY, the state's two public university systems.
March 20	Governor requires all non-essential businesses in NYS to close and bans non-essential gatherings. Governor enacts "Mathilda's Law," an executive order requiring those 70 and older to remain indoors[6].
March 22	City-run senior centers close and transition food services to home delivery.
March 24	New York City Transit Authority (TA) reduces bus and subway service by approximately 25% to accommodate smaller workforce and fewer riders[7].

References for Table 1

1.State of New York. Declaring a Disaster Emergency in the State of New York. Executive Chamber. Executive Order No. 202. https://www.governor.ny.gov/news/no-202-declaring-disaster-emergency-state-new-york. Published March 7, 2020.
2. State of New York. Continuing Temporary Suspension and Modification of Laws Relating to the Disaster Emergency. Executive Chamber. Executive Order No. 202.3. https://www.governor.ny.gov/sites/governor.ny.gov/files/atoms/files/EO_202.3.pdf. Published March 7, 2020.
3. Shapiro E. New York City Public Schools to Close to Slow Spread of Coronavirus. *The New York Times*. https://www.nytimes.com/2020/03/15/nyregion/nyc-schools-closed.html. Published March 15, 2020.
4. City of New York, Department of Sanitation. Feeding New York: The Plan for Keeping Our City Fed During the COVID-19 Public Health Crisis. https://www1.nyc.gov/assets/home/downloads/pdf/reports/2020/Feeding-New-York.pdf. Published April 15, 2020.
5. State of New York. Continuing Temporary Suspension and Modification of Laws Relating to the Disaster Emergency. Executive Chamber. Executive Order No. 202.4.

https://www.governor.ny.gov/news/no-2024-continuing-temporary-suspension-and-modification-laws-relating-disaster-emergency. Published March 16, 2020.
6.Governor Cuomo Signs the 'New York State on PAUSE' Executive Order. *governornygov*. https://www.governor.ny.gov/news/governor-cuomo-signs-new-york-state-pause-executive-order. Published March 20, 2020.
7.Goldbaum C. Subway Service Is Cut by a Quarter Because of Coronavirus. *The New York Times*. https://www.nytimes.com/2020/03/24/nyregion/coronavirus-nyc-mta-cuts-.html. Published March 24, 2020.

Table 2 Schedule and Topics for Surveys

Survey # and Dates	Topics Included in Survey			
	Food security	Food practices (shopping, cooking, eating out)	Use of food benefits and other support	Dietary health
Survey 1 -- March 13-15	x	x		
Survey 2 – March 20-22	x	x		
Survey 3 – March 27-29				
Survey 4 – April 3-5	x	x		x
Survey 5 – April 10-11				
Survey 6 – April 17-19				x
Survey 7 – April 24-26			x	
Survey 8 – May 1-3				
Survey 9 – May 15-17				
Survey 10 – May 29-30	x	x		x
Survey 11 – June 26-28	x	x	x	x

Table 3. Percent of Respondents Reporting Diminished Food Access by Race/Ethnicity, Surveys 2* and 6**

	Reduced ability a lot		Reduced ability somewhat		Reduced ability only a little		Not reduced ability at all		Made it easier to get the food we need	
Survey Number	2	6	2	6	2	6	2	6	2	6
All	19.5	20.9	33.0	35.7	27.0	24.8	13.6	12.8	6.9	5.7
Latinx	24.8	24.7	30.8	36.0	26.6	26.4	8.4	7.2	9.5	5.8
Black	16.8	23.2	29.7	34.1	23.9	21.1	19.0	13.4	10.5	8.1
Asian	21.7	17.2	33.1	35.1	26.8	25.4	14.3	12.7	4.1	9.7
White	15.1	16.4	38.4	37.7	29.6	25.9	14.0	18	2.9	2
Other	26.0	36.4	24.3	22.7	32.1	27.3	10.7	9.1	7.0	4.5

*Chi-Square= 43.453; df=16, sig.<.001 **Chi-Square= 40.114; df=16, sig.<.001

Table 4. Percent of respondents reporting changes in healthfulness of diet, by race/ethnicity, Survey 4 * and Survey 6**

	Made our diet much more healthy		Made our diet somewhat more healthy		Not changed how healthy our diet is		Made our diet somewhat less healthy		Made our diet much less healthy	
Survey Number	4	6	4	6	4	6	4	6	4	6
All	19.2	15.1	30.3	28.5	38.2	34.2	9.0	15.5	3.3	6.8
Latinx	26.1	21.9	26.1	36.3	24.7	34.7	7.6	11.6	5.5	5.5
Black	20.6	13.0	29.1	27.5	33.6	41.3	7.7	17.4	1.2	8.5
Asian	12.7	10.4	29.9	26.1	38.8	41.8	12.7	16.4	3.0	8.2
White	14.7	13.1	35.2	22.9	42.2	37.5	10.1	16.3	2.6	5.6
Other	14.3	4.5	33.3	27.3	31.8	38.1	4.8	22.7	9.5	13.6

Survey 4: Chi Square=34.826; df=16; Sig.=.004 Survey 6: Chi Square= 47.202; df=16; Sig.<.001

Table 5. Percentage of respondents reporting changes in food access and changes in healthfulness of diet, Survey 4

	Made our diet much healthier	Made our diet somewhat healthier	Not changed how healthy our diet is	Made our diet somewhat less healthy	Made our diet much less healthy
Reduced ability a lot	28.1	20.4	35.7	10.9	5.0
Reduced ability somewhat	20.4	41.2	29.3	7.5	1.7
Reduced ability only a little	11.4	29.3	47.5	10.3	1.5
Not reduced ability at all	20.6	19.8	50.0	6.3	3.2
Made it easier to get the food we need	3.6	25.0	32.1	14.3	25.0

Chi-Square=119.048; df=16; sig.<.001

Table 6. Percentage of respondents to food insecurity questions by Race/Ethnicity, Survey 12

	"Since the start of the epidemic in March, have those in your household worried whether your food would run out before you got money to buy more?"*	"Since the start of the epidemic in March, we were actually unable to pay for the food we needed."**
All	43.5	29.6
Latinx	65.8	38.7
Black	42.7	39.4
Asian	32.1	19.4
White	28.1	17.6
Other	40.9	27.3

*Chi Square=95.571; df=4; Sig.<.001 **Chi Square=50.733; df=4; Sig.<.001

Table 7. Percentage reporting eating more packaged foods now than before the epidemic by race/ethnicity and household income (Survey 10)

	Agree %
All	48.6
Race/Ethnicity*	
Latinx	55.5
Black	57.3
Asian	52.2
White	34.3
Other	36.4
Total	48.6
Household Income**	
Less than $50,000	56.8
$50,000-$100,000	44.8
More than $100,000	26.5
Refused	40
Total	48.6

* Chi Square=40.045; df=4; Sig.<.001

**Chi Square=42.697; df=3; Sig.<.001

Table 8. Examples of changed food practices during pandemic

Domain	Response Categories
Food acquisition and shopping	***Changes in online purchases and home delivery*** "We have ordered supplies online and it's not as good as going for grocery shopping" "Everything is from online delivery now" "No delivery slots available for online orders- go to market once a week- buying whatever is in stock" "I am now ordering groceries for delivery, ordering in larger quantities than usual in order to make the supply last longer" "I don't want to go to the store, some things are harder to get, using delivery services are near impossible to schedule"
	Changes in shopping frequency and outlets "We hardly go out to shop; supermarkets are filled with irresponsible people who don't take precautions and besides there are shortages [at] supermarkets" "The availability is not there and shopping much less frequently" "I am not supposed to leave my house and so I can only go shopping once a week at most" "I avoid supermarkets at all costs" "The supermarkets are much more crowded, and many food items are out of stock"
	Changes in shopping volume and products "I buy more in bulk at the supermarket"

	"I buy more food and eat less" "I buy much more food every time" "We've been buying a few more frozen and canned foods." "I purchased more nonperishable foods in case of an emergency and now buy a little extra in terms of regular grocery shopping" "I can't purchase diet staples like rice"
Spending	***Changes in amount paid and products purchased*** "I am unable to purchase the items I like or since I am unable to go to certain stores, I usually have to pay more money" "I have spent more money on food in the last week than I have in the last month" "I budget my money for food and try to get more healthy products"
Diet, Cooking and Eating	***Eating healthier foods or more home-prepared meals*** "I now tend to have healthier meals in an effort to stay healthy" "We purchase healthier options such as fruits and vegetables" "I eat healthy fruits" "I eat home 7 days a week" "I purchase and cook all my own food"
	Eating less healthy food "I am purchasing unhealthy food and eating more so spending more on food than I need to" "A lot of stress eating snacks as well"

	"Dining in a restaurant is not possible, so I rely on take-out food. I am not certain that the fresh food, such as salads, is all that fresh. Consequently I ensure than any food I order is cooked. From a dietary point of view this approach is not optimum."
	Being less selective about food "We tend to ration our food a bit more in the sense that we are not as picky as we used to be" "While my family may not love everything I make for dinner we eat it regardless because we know it is a bit more difficult to obtain food now with long wait lines, exposure to many more people out shopping as well as the stock a grocery store will have at any given moment because of the current epidemic"
	Avoiding food waste "We now plan our meals more carefully, so we do not waste anything" "I try to make sure not to waste any food. I try not to let anything spoil, and we try to make sure we don't leave food on our plate"