

The Impact of COVID-19 on the Nutritional Patterns of School-Aged U.S. Children

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KEYWORDS: COVID-19, school nutrition, children

ABSTRACT

PURPOSE/OBJECTIVES

This study evaluated the effects of the COVID-19 pandemic on children within the U.S. by assessing how parents' perceptions of children's nutritional patterns changed in relationship to school nutrition assistance program participation.

METHODS

A cross-sectional survey of American parents was used to evaluate changes to their children's nutritional patterns during the pandemic. Participants were recruited through Facebook advertisements and snowball sampling. Data was collected through an electronic survey. Descriptive statistics and Pearson correlation were calculated. Qualitative data was organized by question stem. Once organized, responses were summarized by topics and sub-topics.

RESULTS

There was not a significant change in the perceived intake of foods from the major food groups, however parents reported increased snacking behavior, including processed foods. Participation in school nutrition assistance programs, including free or reduced price meals did increase during the pandemic and parents perceived these programs as more important.

APPLICATIONS TO CHILD NUTRITION PROFESSIONALS

School nutrition programs were perceived as increasingly important as families navigated the fallout of the pandemic which was complicated by financial strain and food insecurity. The increase in snacking behavior raises concerns about the long term consequences of the pandemic. It is possible the change in snacking behavior was the product of food access concerns and children being at home during the pandemic. Administrators and policymakers should build upon what was learned during the pandemic to improve community infrastructure and capacity to support school nutrition assistance program participation.





INTRODUCTION:

Purpose

This project aimed to evaluate how children's nutritional intake changed during the COVID-19 pandemic and how school nutrition programs had impact, as reported by parents in the United States.

Literature Review

In late 2019, a novel coronavirus known as SARS-CoV-2 emerged and quickly spread, infecting millions of people across the globe and rapidly reaching pandemic status. A state of national emergency was declared in the United States (H. Doc. 116-108, 2020), spurring statewide lockdowns, that affected nearly every American, including school-aged children who rely on school meals and federally funded programs, such as the National School Lunch Program (NSLP) and School Breakfast Program (SBP).

Shifts to virtual learning disrupted school meal programs. While the United States Department of Agriculture (USDA) did not mandate schools to serve meals during closures or periods of extended dismissal, the agency encouraged schools to offer meals akin to the Seamless Summer Option or Summer Food Service Program (USDA, 2020). Prior to the pandemic, many schools lacked experience with summer feeding programs, making implementation a foreseeable challenge (Dunn et al., 2020). It was believed that schools might encounter difficulties connecting students with food during the pandemic (Turner, 2020). Despite the challenges, schools and communities adapted, innovated, and came together. Waivers related to non-congregate meal service, parent pick up, multiple meals, and free meals for all offered schools the flexibility they needed to meet community needs (USDA, 2022).

Households with children experienced higher rates of food insecurity during the earlier stages of the pandemic from 2019-2020 and at the same time, the number of school meals served decreased in 2020 (Lacko, 2022). Children were at risk for shifts in nutritional patterns, such as increased consumption of unhealthy foods and snacking (Ammar et al., 2020). The pandemic may have widened socioeconomic disparities related to dietary quality and food security among children who rely on school nutrition programs (Dunn et al., 2020). Given these concerns, we were interested in exploring changes in nutritional intake, parental perceptions, and how school nutrition programs may have contributed to nutrition intake.

METHODS

A cross sectional survey of parents was conducted to explore the nutritional impact of COVID-19 among school aged children in the U.S. The study was approved by the Institutional Review Board at Bowling Green State University.

Recruitment and Data Collection

Facebook advertisements were used to reach U.S. adults whose Facebook activity suggested that they were parents and had school-aged children. Snowball sampling was used as participants were asked to share the





study invitation with others. Consent was indicated if the participant proceeded with the online Qualtrics survey. Data was collected from February 22, 2021, through March 15, 2021.

Instrument

The survey included measures obtained from the COVID-19 resources available from the PhenX Toolkit (Hamilton, et al., 2011). Measures related to food security and dietary changes were obtained from The Household Pulse Survey (U.S. Census Bureau, 2021) and the Pennington Biomedical COVID-19 Survey (Flanagan, et al., 2021). Questions related to changes in food patterns and shopping were adapted from the "COVID-19 Documenting Challenges Faced by California Families with Children 0-5 Years Old on WIC Survey" (Ritchie et al., 2021). For example, participants were asked "Compared to before the COVID-19 pandemic, my child(ren)'s fruit (examples: apples, bananas, pears, kiwi, berries; not including fruit juice) consumption during the COVID-19 pandemic is" with options to select from much more, somewhat more, about the same, somewhat less, much less. Parents were asked to select what school nutrition assistance programs, if any their child participated in before and during the pandemic by selecting "yes" or "no" from a list of programs: school lunch, breakfast, snack, and free or reduced price meals/snacks. The survey collected data on perceptions, challenges, demographics, and zip codes to ascertain geographic location. Most questions were closed-ended using a Likert scale; however, there was also opportunity for qualitative comments. Parents had the option to enter a lottery for a chance to win one of four \$50 electronic gift cards.

Data Analyses

Incomplete (<100% complete) and duplicate responses based on IP address, as well as responses from those not meeting inclusion criteria (adult, parent of school-aged child) or those residing outside the U.S., were excluded. Descriptive statistics and Pearson correlation were calculated using IBM's Statistical Package for the Social Sciences (SPSS), Version 27.0. Qualitative comments were organized based on the question stem and data were used to articulate the quantitative findings.





RESULTS AND DISCUSSION:

Demographics and Background

Out of the 272 responses, 82 were excluded, resulting in a final sample of 190. Respondents hailed from all regions and varied in parental age, ethnicity, and annual household income (Table 1).

Children's Nutritional Intake

Overall, 69.5% of children consumed an average of three meals per day, compared to 84.2% before the pandemic. There was an increase in the number of children who typically ate two meals per day (11.1% vs. 4.7% before the pandemic) and more than 3 meals per day (18.8% vs. 10.9%). Most reported that their children's consumption of foods from major food groups was about the same; however, parents reported an increase in snacking from a bag or box and less fresh foods (Table 2). As children spent more time at home, sometimes without oversight of meals and snacks, this may have led to an increase in snacking (Figure 1). Keeping a regular meal schedule while working and managing remote school schedules were some of the challenges cited by parents (Figure 1).

An analysis of USDA School Nutrition and Meal Cost data estimated that as fewer school meals were prepared during the pandemic and families relied on more home prepared meals there was an increase in excess weekly caloric consumption (Hecht, et al., 2022). Snacking habits that children develop when they are young can significantly impact their future health and lifestyle (Au et al., 2018). Unintentional weight gain and dental problems due to snacking were reported by parents (Figure 1).

School Nutrition Program Participation

Most (89.1%) indicated that schools offered free or reduced-price meals throughout the pandemic. There were no significant correlations found between changes in food intake and school nutrition program participation (Table 2). More children participated in school nutrition programs, including a 34.4% increase in participation in free or reduced programs (Table 1); however, this may have been the product of expanded free meals for all, rather than standard eligibility. Parents commented on the benefits of expanded free meals by filling gaps in the home food supply and increasing fruit-vegetable intake (Figure 1).

Many schools utilized meal pick-up options (49.5%) or offered onsite meals (44.7%). Only 33.6% reported always being able to pick up school meals and 18% said they never could. While most parents indicated that the school had a designated pick up time and place, time was the most common barrier (Figure 1). Transportation has previously been cited as a challenge to summer programs (Sather, et al., 2021).

Food Security, Financial Limitations, and Access

Two thirds (67.7%) reported that their household had enough food they wanted to eat, 23.3% reported having enough but not always the kinds of foods they wanted to eat, 9.0% reported not having enough to eat, and 15.3% reported that their children were not eating enough due to finances. About a third (33.2%) were in a 'worse' financial situation, often due to job loss. In addition, 21% reported that financial changes limited their household food purchases at least half of the time. We did find that financial limitations correlated with





children eating fewer vegetables (r = -.25, p = .001) and fruits (r = -.20, p = .005). The findings are consistent with research linking food insecurity with reduced fruit and vegetable intake during the pandemic (Litton & Beavers, 2021).

When asked why there was not enough food or not always the kinds of food desired, 24.7% of parents indicated stores not having the foods they wanted. Most (89.5%) reported purchasing changes due to stock and about half (46.8%) purchased more shelf-stable foods and 28.4% purchased fewer fresh fruits and vegetables. Purchase of shelf-stable foods correlated with snacking on food from a bag or a box (r = .17, p = .02). The convenience and shelf life may have contributed to the reported changes in snacking behavior.

Perception of School Nutrition Programs

Perception of school nutrition assistance programs improved during the COVID-19 pandemic, with most parents (60%) viewing these programs as more important. Public attention towards school nutrition programs during the pandemic (Whitesell & Fitch, 2022) may have positively influenced parental perceptions. Similarly, school nutrition employees reported an increase in the public's value and gratitude for school nutrition programs during the pandemic (Patten, et al., 2021). Parents commented on the emotional value of school meals, including social connection (Figure 1). It is possible that the shift in perception was driven by increased needs related to finances and access (Figure 1).

CONCLUSIONS AND APPLICATIONS: This study provides a glimpse into the nutritional impact of the pandemic on U.S. school-aged children and explores some of the factors that have influenced children's nutritional intake. These findings speak to the important role of school nutrition programs and underscores their position as safety nets for at-risk families and children. While this study adds valuable insight, it is based on a convenience sample and not without limitations. A higher proportion of responses were from the Midwest region. It is possible that this was influenced by snowball sampling and the Midwest having familiarity with the researchers' university. Responses were limited to parents with access to the internet and Facebook. However, evidence suggests that Facebook has remained one of the most widely used social media sites among U.S. adults (Pew Research Center, 2021). Parents provided a proxy report which may be subject to bias. The nutritional assessment was limited and did not capture the full understanding of how COVID-19 impacted nutritional intake among children. We did not assess frequency of participation in school nutrition assistance programs, nor did our data collection distinguish participation as a result of no cost waivers opposed to standard eligibility. We also did not examine other potential confounders, such as household participation in the Supplemental Nutrition Assistance Program. It is important to consider that our data was collected in February and March 2021. As schools reopened in the 2021-2022 school year and the no charge waivers continued there were more meals served compared to 2020-2021 (Lacko, 2022).

We did see a reported increase in snacking behavior and parents cited concerns related to the choice and amount selected by children at home. It is conceivable that the pandemic exacerbated a widespread issue related to snacking behavior among children in the U.S. (Wang, et al., 2021). Expansion of school snack programs is one strategy to consider.





Many parents reported that their children had regular access to school meals, yet others described challenges with pick up. Many parents perceived programs as more important which coincides with parental responses describing how school meals addressed gaps in food supply, social connection, and diet quality. While we did not observe significant changes in reported intake of major food groups, one possibility is that participation maintained the status quo for children. The impact of meals being served onsite vs. offsite is also not clear.

We saw an increase in participation in free or reduced-price school meal programs during the pandemic, which was likely the result of free meals for all, regardless of financial eligibility. School policies and long-term expansion of free school meals were cited as components of the White House's 2022 national strategy to end hunger (U.S. Department of Health and Human Service, 2022). Since the pandemic, several states including California, Maine, Connecticut among others have enacted legislation to make school meals for all a reality. At the time of this report, no legislation was passed to make snacks available at no cost; however, legislation that would also provide free after school snacks had been introduced (Council of the District of Columbia, 2023). Policymakers, schools, communities, and families should continue working together to build upon infrastructure and community capacity to champion school nutrition for all.

ACKNOWLEDGEMENTS:

This project was funded by the Bowling Green State University Center for Undergraduate Research and Scholarship.

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Table 1. Sample Characteristics of U.S. H	Parents Who Responded to a Cross-Sectional Survey Ab	out Their Children(s)'
Nutritional Patterns and COVID-19		

Background Variable	n	(%) ^a
US Region of Residence ^b		
Northeast	24	12.5%
Midwest	74	38.9%
South	53	27.9%
West	39	20.5%
Parental Age		
18–25	2	1.1%
26–30	10	5.3%
31–40	66	34.7%
41–50	91	47.9%
_50+	21	11.1%
Parental Ethnicity		
White	154	81.5%
Hispanic/Latino	17	9%
Black/African American	5	2.6%
Asian/Pacific Islander	6	3.2%
Native American	2	1.1%
Other	5	2.6%
Annual Household Income		
< \$30,000	43	22.9%
\$30,000–50,000	27	14.4%
\$50,000–70,000	26	13.8%
\$70,000–100,000	37	19.7%
\$100,000–150,000	37	19.7%
>\$150,000	18	9.6%

^a Valid percentage is reported; not all percentages will add to 100% as respondents could mark more than 1option for some items

^b Based on self-reported zip code and U.S. Census Bureau Geographic Regional Definition

^c Only respondents who indicated their child participated in a school meal or snack program were asked if their child received free or reduced-price meals or snacks.





Table 1. Sample Characteristics of U.S.	Parents Who Responded to a Cross-See	ctional Survey About Their Children(s)'
Nutritional Patterns and COVID-19		

Number of Children in Household		
1	72	37.9%
2	76	40%
3	24	12.6%
4	12	6.3%
5	4	2.1%
6	2	1.1%
Ages of Children		
5–7	84	23.4%
8–10	111	30.9%
11–13	85	23.7%
14–16	59	16.4%
17–18	20	5.6%
Grade Levels of Children		
Pre-Kindergarten – 1 st	78	21.4%
2 nd – 5 th Grade	138	37.9%
6 th – 8 th Grade	81	22.3%
9 th – 12 th Grade	67	18.4%
Educational Institution		
Educational Institution Public School	162	85.3%
Educational Institution Public School Private School	162 15	85.3% 7.9%
Educational Institution Public School Private School Homeschool	162 15 23	85.3% 7.9% 12.1%
Educational Institution Public School Private School Homeschool Other	162 15 23 7	85.3% 7.9% 12.1% 3.7%
Educational Institution Public School Private School Homeschool Other Learning Experience	162 15 23 7	85.3% 7.9% 12.1% 3.7%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person	162 15 23 7 76	85.3% 7.9% 12.1% 3.7% 40.0%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual	162 15 23 7 7 76 82	85.3% 7.9% 12.1% 3.7% 40.0% 43.2%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid	162 15 23 7 7 76 82 68	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs	162 15 23 7 7 76 82 68	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs Breakfast, before	162 15 23 7 7 76 82 68 68	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8% 34.7%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs Breakfast, before Breakfast, after	162 15 23 7 76 82 68 66 76	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8% 34.7% 40%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs Breakfast, before Breakfast, after Lunch, before	162 15 23 7 76 82 68 66 76 123	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8% 34.7% 40% 64.7%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs Breakfast, before Breakfast, after Lunch, before Lunch, during	162 15 23 7 76 82 68 66 76 123 123 128	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8% 34.7% 40% 64.7% 67.4%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs Breakfast, before Breakfast, after Lunch, before Lunch, during Before or afterschool snack, before	162 15 23 7 76 82 68 66 76 123 128 17	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8% 34.7% 40% 64.7% 67.4% 8.9%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs Breakfast, before Breakfast, after Lunch, before Lunch, during Before or afterschool snack, before Before or afterschool snack, during	162 15 23 7 76 82 68 66 76 123 128 17 20	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8% 35.8% 34.7% 40% 64.7% 67.4% 8.9% 10.5%
Educational Institution Public School Private School Homeschool Other Learning Experience Fully In-Person Fully Online/Virtual Hybrid Participation in School Nutrition Programs Breakfast, before Breakfast, after Lunch, before Lunch, during Before or afterschool snack, before Before or afterschool snack, during Free or reduced price, before ^c	162 15 23 7 76 82 68 66 76 123 128 17 20 76	85.3% 7.9% 12.1% 3.7% 40.0% 43.2% 35.8% 34.7% 40% 64.7% 67.4% 8.9% 10.5% 58.9%





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Educational Institution		
Public School	162	85.3%
Private School	15	7.9%
Homeschool	23	12.1%
Other	7	3.7%

^a Valid percentage is reported; not all percentages will add to 100% as respondents could mark more than 1option for some items

^b Based on self-reported zip code and U.S. Census Bureau Geographic Regional Definition

^cOnly respondents who indicated their child participated in a school meal or snack program were asked if their child received free or reduced-price meals or snacks.





Table 1. Sample Characteristics of U.S. Parents Who Responded to a Cross-Sectional Survey About Their Children(s)' Nutritional Patterns and COVID-19

Learning Experience						
Fully In-Person	76	40.0%				
Fully Online/Virtual	82	43.2%				
Hybrid	68	35.8%				
Participation in School Nutrition Programs						
Breakfast, before	66	34.7%				
Breakfast, after	76	40%				
Lunch, before	123	64.7%				
Lunch, during	128	67.4%				
Before or afterschool snack, before	17	8.9%				
Before or afterschool snack, during	20	10.5%				
Free or reduced price, before ^c	76	58.9%				
Free or reduced price, during ^c	125	93.3%				

^a Valid percentage is reported; not all percentages will add to 100% as respondents could mark more than 1option for some items

^b Based on self-reported zip code and U.S. Census Bureau Geographic Regional Definition

^c Only respondents who indicated their child participated in a school meal or snack program were asked if their child received free or reduced-price meals or snacks.





Intake	Much	Somewhat	About	Somewhat	Much	School	School	School	Free/Reduced
	more	more	same	less	less	Breakfast	Lunch	Snack	Program
	(%)	(%)	(%)	(%)	(%)	rc	rc	rc	r ^c
Food Group									
Intake									
Vegetables	5.8	11.6	60	16.8	5.8	.08	.11	03	14
Fruits	6.3	21.2	54.5	12.7	5.3	06	.03	06	07
Whole Grains	5.8	16.3	60	13.7	4.2	.08	.08	004	14
Protein	4.2	18.4	65.3	10	2.1	.02	.07	.06	09
Dairy	7.9	22.6	52.1	12.1	5.3	.04	09	0004	13
Snacking									
Intake ^d									
From bag/box	24.7	44.7	19.5	6.8	4.2	07	12	003	05
Fresh foods	6.3	25.8	47.4	13.2	7.4	.05	.13	04	03

Table 2. Impact of COVID-19 on Nutritional Intake^a and Relationship to Participation in School Nutrition Programs During the Pandemic^b

^a Parents were asked to report their perception of their child(ren)'s changes in nutritional patterns as compared to before the pandemic. For example, "Compared to before the COVID-19 pandemic, my child(ren)'s vegetable consumption (examples: broccoli, carrots, string beans) during the COVID-19 pandemic is now..."

^b Participation in school breakfast, school lunch, school snack program, or free or reduced meal/snack program during the pandemic

^c Pearson correlation test results, no correlation results were statistically significant

^d Snacking from foods from a bag or box; snacking from fresh foods (fruits, vegetables)





VOLUME 47 | ISSUE 1 | FALL 2023

Published by the School Nutrition Association

Figure 1. Examples of Qualitative Responses Shared by Parents

Snacking Frequency	Food Choices	Consequences	Barriers to Pick Up	Financial Constraints and Food Security	Benefits	Parental Perception
 My children snack much more frequently when doing remote learning. When they are doing school at home, they want to snack all day long My child eats constantly because she is home all day My kids are snacking too much and not getting enough exercise. Being at home, they will eat out of boredom. 	 Although I have healthy snacks in addition to unhealthy snacks, they run through the chips, cookiesit is hard to limit the consumption. Child is home more now for virtual school and consumes much more to eat and often non-nutritious choices as both parents work, and he is home alone. With no hot lunch program at school, we have been doing cold/home lunches and struggle with providing similar options. If I wasn't home or didn't remind them to eat fruits or veggies, they would fill up on junk. 	 She now overeats and has gained 30 pounds in six monthsI am not at home with her to monitor eating. When [my] kids weren't in school, they ate more candy and sugary snacks; [this] led to more cavities being discovered. 	 [My] child is eligible for school breakfast but the way the school has set up when you can arrive at the school and all that needs to be completed prior to going to first class there is no time for school breakfast pickup and son is missing this meal every school day. Love that our schools provide free meal pickup but often not during feasible times. My children have online school at pick up time. Pick up times not convenient for working parents. Not in walking distance. Cancelled due to weather. Stigma. 	 Months off due to COVID closures and less well-paying gigs [I] had to quit [my] job to facilitate virtual school and provide childcare. More of my family's budget has gone to food than ever before. Purchasing less fresh foods and eating less fresh foods due to less income, fewer trips to fresh veggie food pantry. Gas in car. Prices have gone way up on fresh foods and meat. My family has depended on the [school] meals to supplement. 	 Our school is offering free breakfast and lunch to everyone. My son didn't used to get the meals, but he is getting salads and fruit at school that he would not normally take the time to pack in his school lunch My family has depended on the meals to supplement our purchased food. At home I can cut up the apples, peel the orangessince preparing the meals at home, we don't waste any food. Before COVID my children packed their lunches because we did not qualify for free lunchschool lunch prices were too costly for us to afford daily. The school lunches are more nutritious with fresh fruits vegetables and milk provided daily along with grains and meats. 	 Children have enjoyed the free meals at schools. I am very thankful to the schools for organizing lunches for every child. Our family is fortunatewe didn't technically "need" the food, but he liked being able to connect with people from his school, even if it was only for a few minutes as they dropped off the food. Thankful for school food pick ups, sometimes food provided is not what my kids likevery processed options. The school has done a fantastic job of providing food to students, just not in the same way as pre- COVID, he doesn't enjoy the pre- packaged food. We don't necessarily struggle to feed our children, but the helphas been nice.

