# Feeding Practices of Colombian Families with Minors Younger than 18 Years during the Initial Phase of COVID-19 Quarantine

Silvana Dadán[1] Michelle Higuera-Carrillo[1,2] Jhon Camacho-Cruz[2,3,4] Wilson Daza-Carreño[1]

[1] Unidad de Gastroenterología, Hepatología y Nutrición Pediátrica (Gastronutriped), Grupo de Investigación en Gastronutriped, Bogotá, D.C., Colombia
[2] Departamento de Pediatría, Universidad Nacional de Colombia (UNAL), Bogotá, D.C., Colombia
[3] Departamento de Pediatría, Clínica Reina Sofia Pediátrica y Mujer, Keralty – Facultad de Medicina, Fundación Universitaria Sanitas. Bogotá D.C., Colombia
[4] Departamento de Pediatría, Fundación Universitaria de Ciencias de la Salud (FUCS) – Sociedad de Cirugía de Bogotá, Hospital de San José, Bogotá, D.C., Colombia

**Address for correspondence** Wilson Daza-Carreño, Pediatric Gastroenterologist - Master in Clinical Nutrition, Unidad de Gastroenterología, Hepatología y Nutrición Pediátrica (Gastronutriped), Bogotá, D.C. 110131, Colombia (e-mail: daza_w@yahoo.com.co).

J Child Sci 2024;14:e33–e42.

## Abstract

The coronavirus disease 2019 (COVID-19) pandemic has raised concerns regarding food availability and access. The aim of this study is to describe feeding practices and associated factors in Colombian families with members younger than 18 years at the beginning of the 2020 quarantine. This is an observational, descriptive, cross-sectional study. An online survey was administered to parents or caregivers of minors younger than 18 years in Colombia, focusing on feeding practices. The analysis consisted of three steps: first, estimation of descriptive statistics; second, multiple correspondence analysis to derive an index for each main meal; and finally, generalized linear models were applied to each main meal index, incorporating predictors to explain changes in food consumption. A total of 1,419 participants were included. Among them, 654 (46%) indicated changes in their feeding practices during the quarantine due to reasons such as lack of funds, portion reduction to stretch food, difficulty in shopping, and perception of limited variety in the market. The perceived lack of variety while shopping significantly affected the breakfast index ($p = 0.037$), lunch index ($p = 0.037$), and dinner index ($p = 0.001$). Socioeconomic level influenced the breakfast index ($p = 0.012$) and lunch index ($p = 0.012$) but not the dinner index. Nearly half of the surveyed families perceived changes in their feeding practices during the COVID-19 pandemic, which were linked to socioeconomic status and the perceived lack of variety while shopping.

**Keywords**
- coronavirus
- nutrition
- surveys
- programs
- policies
- food security

## Introduction

The pandemic associated with the coronavirus disease 2019 (COVID-19) compelled numerous countries to implement emergency measures to mitigate the spread of the virus.[1] These measures included quarantines, isolations, and curfews aimed at curbing the escalation of infections and deaths. Such actions induced changes in family dynamics and lifestyles, impacting physical and psychological health, economic and job vulnerabilities, which could, in turn, affect

**received**
January 17, 2024
**accepted after revision**
March 21, 2024

**DOI** https://doi.org/10.1055/s-0044-1787740.
**ISSN** 2474-5871.



Georg Thieme Verlag KG, Rüdigerstraße 14, 70469 Stuttgart, Germany

dietary habits.[1] Natural disasters, wars, migrations, displacements, strikes, economic downturns, and job losses also influence food availability and feeding practices.[1] During the pandemic, the Colombian economy experienced significant repercussions; according to the National Administrative Department of Statistics of Colombia (DANE), the gross domestic product contracted by 6.8% in 2020.[2] Unemployment rose to 16.8% in May 2020, compared with 10.5% in the same month of the previous year.[3] In terms of nutrition, the cost of the basic food basket increased by 8.8% in 2020, as reported by DANE.[4] The COVID-19 quarantine potentially imposed barriers to food availability and access, which could have multifaceted effects on society and individuals, leading to changes in family dietary consumption, production and distribution of raw materials, availability, access to markets, squares, stores, online purchases, and food choices, including processed and ready-to-eat products or shifts in the consumption of fresh foods such as vegetables, fruits, meats, cereals, and grains, as a result of the confinement's impact.[1] This situation might have altered feeding practices, resulting in states of undernutrition or excess weight due to the ease or difficulty in sourcing different foods, influenced by the consequences of lockdown.[1] The current study aims to explore feeding practices and the associated determining factors among individuals younger than 18 years during the COVID-19 quarantine period in Colombia.

## Materials and Methods

An observational, descriptive, cross-sectional study was conducted using a survey aimed at families across Colombia. To determine the required sample size, the Colombian population census was utilized, which reported a total of 15,454,633 individuals younger than 18 years.[5] A margin of error of 4% and a confidence level of 99% were established, resulting in a sample size of 1,026. Given that participant selection occurred during the study months, a nonprobabilistic convenience sampling approach was employed. This method ensured the efficiency and feasibility of participant recruitment within the context of the COVID-19 pandemic.

### Survey

A survey was designed by the researchers, taking into consideration information extracted from the literature. A standardized data collection instrument was constructed using Google Forms. The survey was electronically distributed through open invitations on social media during the months of March and April 2020. It was intended to be self-administered by the head of the household (parent/guardian) during the mandatory confinement period. Participation was voluntary, and participants provided informed consent before proceeding. The survey consisted of a combination of open-ended and closed-ended questions. Families residing outside of Colombia, participants younger than 18 years, and families without children younger than 18 years were excluded. The survey began with an informed consent section, followed by an introductory paragraph explaining the primary objective of the study. The subsequent sections contained questions pertaining to the variables of interest. Each question allowed for multiple-choice responses. The study questions encompassed demographic characteristics, age of the child (in cases where families had multiple children younger than 18 years, they were requested to select the youngest for data completion and assessment), meal-related aspects (breakfast, lunch, dinner, snacks), food intake for each mealtime, weekly frequency of food consumption within food groups (meats, eggs, dairy, vegetables, fruits, cereals and flours, legumes, sugars, fats, beverages), with the option to include any additional foods not covered in the list. Notably, the survey omitted precise weight or volume measurements of foods to mitigate respondent fatigue during confinement. Furthermore, a section assessed whether participants perceived changes in dietary habits compared with the prequarantine period. If affirmative, the reasons justifying these changes were analyzed. Finally, questions regarding the health status of the child younger than 18 years during the specified period were included. Open responses regarding food groups were categorized by an expert coauthor in nutrition and grouped for analysis.

### Statistical Analysis

The data from each questionnaire were tabulated in an Excel database for subsequent analysis using the statistical program IBM SPSS version 26. The analysis was conducted in three steps: the first step involved descriptive statistics. The second step comprised a multiple correspondence analysis, which included all types of foods for breakfast, lunch, dinner, and beverages. Selection criteria were applied: (1) foods chosen by more than 10% of the sample and (2) foods with a discrimination coefficient greater than 0.10. These criteria were used to construct indices that estimate a summarized rate of food consumption for each main meal. The breakfast index consisted of six foods (flours, eggs, dairy, fruit, processed meats, and juices). The lunch index included flours, meats (including chicken, beef, or pork), fish, cooked vegetables, raw vegetables, legumes, and healthy fats. The dinner index was constructed using seven food groups: fish, meats (chicken, beef, or pork), cooked vegetables, raw vegetables, legumes, grains, and healthy fats. To aid interpretation, these scores were rescaled into an index from 0 to 100, where 100 represented a higher score on the index. Specific foods for each age group (such as breast milk and formula) with consumption frequency below 10% of the sample were excluded from these index estimations. For the analysis of respondents who perceived changes in their diet, a series of Pearson's chi-square tests were performed, with results having a $p$-value of less than 0.05 considered statistically significant. For variables such as socioeconomic level and age group, post hoc tests were conducted for pairwise comparisons of group averages, using Bonferroni correction. In the third and final steps, to examine the relationship between the breakfast, lunch, and dinner indices and the reasons cited for dietary changes during quarantine, a generalized linear model was employed with each index as a dependent variable. This analysis was conducted exclusively with participants who confirmed changes in their diet during quarantine. An initial null model without independent variables was estimated to assess comparison parameters, followed by a model including

variables of interest. In the final model, the variables added were socioeconomic level, age in years, and the six reasons for dietary changes during quarantine (model with predictors). The relative reduction of goodness-of-fit criteria, such as corrected Akaike information criterion (AIC), Bayesian information criterion, and consistent AIC, between the null model and the model with predictors, was calculated as a percentage. Reductions in these parameters indicate a well-fitting model. Finally, the regression coefficients of each independent variable were evaluated using a statistical significance test.

### Ethical Considerations

Respondents willingly participated in the survey, and this study was classified as research without risk in accordance with Colombian Resolution 8430/1993. Data collection was conducted anonymously. The research was presented to and approved by the scientific committee board of Gastronutriped. This research adheres to international guidelines concerning recommendations for research involving human subjects as outlined in the Declaration of Helsinki.

## Results

The final sample consisted of 1,419 participants from Colombia, with the majority residing in the city of Bogotá (49.2%) and the remainder from various other parts of the country. The socioeconomic distribution was as follows: 28.1% had a low socioeconomic status (strata 1 and 2), 49.3% had a medium socioeconomic status (strata 3 and 4), and 11.5% had a high socioeconomic status (strata 5 and 6). In terms of the age of the surveyed child, the distribution was as follows: infants younger than 12 months accounted for 6.1%, infants aged 12 to 24 months accounted for 7.5%, preschoolers aged 2 to 5 years accounted for 30.8%, school-aged children aged 6 to 9 years accounted for 23.4%, teenagers aged 10 to 18 years accounted for 30.8%, and 1.3% did not respond. The majority of respondents indicated that their child did not have a diagnosed illness at the time of completing the survey (80.1%), and 80.6% reported adhering to regular meal schedules. Regarding changes in the health of children younger than 18 years during the initial phase of the COVID-19 quarantine, the following alterations were reported by parents: sleep disturbances were noted in 884 cases (62.3%), an increased need for groceries due to higher consumption was observed in 118 cases (8.3%), changes in schedules were reported by 97 cases (6.8%), alterations in eating behavior (selective eating, rejecting foods, or loss of appetite) were identified in 86 cases (6.1%), and other changes were reported by 234 cases (16.5%).

### Feeding Practices

During breakfast, the most common foods are flours, cereals, eggs, dairy, and beverages (>60%). Breast milk was offered most frequently (61%) to infants younger than 12 months, followed by fruits (51%) and flours/cereals (43%). For infants aged 12 to 24 months, the most common foods were flours and cereals (81%), eggs (77%), and fruits (68%). As children grow older, hot beverages and juices become more common than in infants (►**Table 1**). At lunchtime, the most common foods are flours and cereals (95%), meats (93%), cooked vegetables (59%), and legumes and grains (66%). Regarding raw vegetables, their consumption increases significantly starting at 12 months of age (infants younger than 12 months = 8%, other ages = around 30%). In the school-aged and adolescent groups, flours, cereals, and meats were the most consumed foods. Only 21 participants across the entire sample (1.4%) reported offering any kind of beverage during this meal. Finally, for dinner, flours/cereals (88%) and meats (97%) are the most frequently provided foods. On the other hand, the consumption of legumes, grains, and vegetables (cooked and raw) is lower during dinner compared with lunch (19 and 66%, respectively) (►**Table 1**). For infants younger than 12 months, some type of meat is offered (60%), while foods such as soups (32%) and flours/cereals (36%) were observed to a lesser extent during dinner. Only 41 caregivers mentioned offering a beverage during dinner, with juice and chocolate being more common among adolescents than among preschool and school-aged children.

### Reasons for Changes in Diet

During the quarantine, 654 participants (46%) reported that their children's diet did change. Among this group, the most common reasons cited were lack of money (34%), portion restriction to make food last longer (32%), difficulty in shopping (32%), and perception of a lack of variety in the market (29%). Statistically significant differences were observed by age group and socioeconomic level. The reason "portion restriction to make food last longer" was more common among infants younger than 12 months and adolescents, while "lack of money" and "portion restriction to make food last longer" were more frequently cited in lower socioeconomic levels (►**Table 2**).

### Relationship between Dietary Practices and Reasons for Dietary Changes during the Pandemic

Lack of variety in shopping significantly predicted all three indices (breakfast, lunch, and dinner). For the breakfast index ($p = 0.037$), the lack of variety in shopping and its interactions with socioeconomic level/age were statistically significant (►**Fig. 1** and ►**Table 3**). The lack of variety in shopping seems to have a greater impact on higher socioeconomic levels compared with middle and lower levels. For the lunch index, the lack of variety also showed differences ($p = 0.037$), as it was positively associated with the index. This suggests that those who mentioned this reason had higher scores compared with those who did not cite it as an explanation for dietary changes. Finally, the lack of variety in shopping significantly predicted the dinner index ($p = 0.001$).

### Socioeconomic Level

The results presented in ►**Table 3** suggest that for lower socioeconomic levels, the breakfast index ($p = 0.012$) and lunch index ($p = 0.012$) are lower compared with higher levels, and these differences are statistically significant. However, no differences were found regarding the dinner index and socioeconomic level.

**Table 1** Foods offered to children younger than 18 years in Colombia during the initial phase of COVID-19 quarantine: Breakfast, lunch, dinner, and beverages

*Breakfast: proportion of responses*

| Foods | All ($N = 1,419$) | Infant younger ($n = 87$) | Infant older ($n = 107$) | Preschooler ($n = 437$) | School-aged (332) | Adolescent (437) |
|---|---|---|---|---|---|---|
| Cereals and grains | 0.89 | 0.43 | 0.81 | 0.90 | 0.93 | 0.95 |
| Eggs | 0.86 | 0.40 | 0.77 | 0.89 | 0.92 | 0.90 |
| Dairy products | 0.74 | 0.17 | 0.58 | 0.82 | 0.79 | 0.80 |
| Beverages | 0.60 | 0.22 | 0.51 | 0.62 | 0.62 | 0.68 |
| Fruits | 0.58 | 0.51 | 0.68 | 0.65 | 0.56 | 0.53 |
| Cold cuts | 0.39 | 0 | 0.15 | 0.43 | 0.45 | 0.46 |
| Soups or broth | 0.27 | 0.13 | 0.25 | 0.27 | 0.25 | 0.32 |
| Unhealthy fats | 0.14 | 0.00 | 0.08 | 0.14 | 0.18 | 0.16 |
| Sweets | 0.10 | 0.00 | 0.07 | 0.12 | 0.12 | 0.09 |
| Plant-based beverages | 0.04 | 0 | 0.08 | 0.04 | 0.02 | 0.03 |
| Meats | 0.01 | * | 0.03 | * | 0 | * |
| Vegetables | 0.01 | * | 0.05 | 0 | 0 | * |
| Others | 0.03 | * | 0.07 | 0.04 | 0.02 | 0.02 |

Note: The numbers represent proportions; multiply by 100 to obtain percentages. The 0 indicates that no participants in the age group offered the food. The asterisk (*) represents proportions less than 0.01. Additionally, the table do not add up to 100% because participants could choose more than one reason, and they were not mutually exclusive. Infant younger: younger than 12 months; infant older: younger than 24 months; preschooler: 2 to 5 years; school-aged: 5 to 12 years; adolescent: older than 12 years.

*Lunch: proportion of responses*

| Foods | All ($N = 1,419$) | Infant younger ($n = 87$) | Infant older ($n = 107$) | Preschooler ($n = 437$) | School-aged (332) | Adolescent (437) |
|---|---|---|---|---|---|---|
| Cereals and grains | 0.95 | 0.54 | 0.94 | 0.98 | 0.99 | 0.99 |
| Meats[1] | 0.93 | 0.58 | 0.90 | 0.98 | 0.96 | 0.96 |
| Fish | 0.56 | 0.31 | 0.49 | 0.65 | 0.53 | 0.55 |
| Cooked vegetables | 0.59 | 0.44 | 0.70 | 0.67 | 0.55 | 0.56 |
| Raw vegetables | 0.35 | 0.08 | 0.33 | 0.35 | 0.35 | 0.39 |
| Legumes and grains | 0.66 | 0.32 | 0.69 | 0.66 | 0.68 | 0.69 |
| Healthy fats | 0.52 | 0.33 | 0.56 | 0.53 | 0.53 | 0.55 |
| Soup | 0.50 | 0.48 | 0.65 | 0.57 | 0.48 | 0.41 |
| Breast milk | 0.02 | 0.20 | 0.03 | 0 | 0 | 0 |
| Beverages | 0.01 | 0.03 | 0.04 | 0.02 | * | * |
| Infant formula | * | 0.06 | 0 | 0 | 0 | 0 |
| Others | 0.09 | * | 0 | 0.02 | 0 | * |

Notes: [1]does not include fish. The numbers represent proportions; multiply by 100 to obtain percentages. The 0 indicates that no participants in the age group offer the food. The asterisk (*) represents proportions less than 0.01. Additionally, the table do not add up to 100% because participants could choose more than one reason and they were not mutually exclusive.

*Dinner: proportion of responses*

| Foods | All ($N = 1,419$) | Infant younger ($n = 87$) | Infant older ($n = 107$) | Preschooler ($n = 437$) | School-aged (332) | Adolescent (437) |
|---|---|---|---|---|---|---|
| Cereals and grains | 0.88 | 0.36 | 0.82 | 0.92 | 0.94 | 0.92 |
| Meat[1] | 0.97 | 0.60 | 0.96 | 0.99 | 1.00 | 1.00 |
| Fish | 0.17 | 0.16 | 0.27 | 0.22 | 0.14 | 0.12 |

(*Continued*)

| Foods | All ($N = 1,419$) | Infant younger ($n = 87$) | Infant older ($n = 107$) | Preschooler ($n = 437$) | School-aged (332) | Adolescent (437) |
|---|---|---|---|---|---|---|
| Cooked vegetables | 0.22 | 0.25 | 0.39 | 0.26 | 0.17 | 0.18 |
| Raw vegetables | 0.15 | 0.15 | 0.27 | 0.18 | 0.13 | 0.12 |
| Eggs | 0.34 | 0.05 | 0.31 | 0.38 | 0.36 | 0.35 |
| Soup | 0.29 | 0.32 | 0.49 | 0.36 | 0.24 | 0.21 |
| Dairy | 0.22 | 0.02 | 0.14 | 0.23 | 0.29 | 0.22 |
| Cold cuts/deli meats | 0.22 | 0.01 | 0.08 | 0.25 | 0.25 | 0.25 |
| Legumes and grains | 0.19 | 0.14 | 0.22 | 0.20 | 0.17 | 0.19 |
| Healthy fats | 0.13 | 0.10 | 0.29 | 0.13 | 0.11 | 0.09 |
| Beverages | 0.03 | 0.01 | 0.03 | 0.03 | 0.02 | 0.04 |

Note: [1]includes fish. The numbers represent proportions; multiply by 100 to obtain percentages. 0 indicates that no participants in the age group offer the food. The asterisk (*) represents proportions less than 0.01. Additionally, the table do not sum up to 100% because participants could choose more than one reason, and they were not mutually exclusive.

*Beverages for breakfast and dinner: proportion of responses*

Breakfast

| Beverage—breakfast | Age group | | | | | | Socioeconomic level | | |
|---|---|---|---|---|---|---|---|---|---|
| | All ($N = 1419$) | Infant younger ($n = 87$) | Infant older ($n = 107$) | Preschooler ($n = 437$) | School-aged (332) | Adolescent (437) | Low ($n = 399$) | Middle ($n = 700$) | High ($n = 163$) |
| Breast milk | 0.08 | 0.61 | 0.36 | 0.05 | 0.01 | 0.00 | 0.08 | 0.09 | 0.07 |
| Infant formula | 0.07 | 0.32 | 0.26 | 0.09 | 0.00 | 0.00 | 0.03 | 0.08 | 0.07 |
| Juice | 0.32 | 0.08 | 0.23 | 0.38 | 0.29 | 0.36 | 0.26 | 0.35 | 0.37 |
| Water | 0.10 | 0.14 | 0.24 | 0.14 | 0.05 | 0.05 | 0.04 | 0.12 | 0.15 |
| Hot beverage | 0.32 | 0.02 | 0.12 | 0.23 | 0.39 | 0.45 | 0.41 | 0.31 | 0.15 |
| Breast milk | 0.08 | 0.61 | 0.36 | 0.05 | 0.01 | 0.00 | 0.08 | 0.09 | 0.07 |

Dinner

| Beverage—dinner | All ($N = 41$) | Age group | | Socioeconomic level | | |
|---|---|---|---|---|---|---|
| | | Preschooler and school-aged ($n = 18$) | Adolescent ($n = 19$) | Low ($n = 9$) | Middle ($n = 25$) | High ($n = 4$) |
| Coffee | 0.54 | 0.50 | 0.53 | 0.44 | 0.60 | 0.50 |
| Juice | 0.17 | 0.11 | 0.26 | 0.22 | 0.16 | 0 |
| Hot chocolate | 0.15 | 0.11 | 0.21 | 0.11 | 0.12 | 0.25 |
| Hot beverages or panela water | 0.24 | 0.28 | 0.26 | 0.33 | 0.28 | 0 |
| Water | 0 | 0 | 0 | 0 | 0 | 0.25 |

Notes: The numbers represent proportions; multiply by 100 to obtain percentages. 0 indicates that no participants in the age group/socioeconomic level offer the food item. The asterisk (*) represents proportions less than 0.01.

## Discussion

Upon evaluating dietary practices in Colombia during the initial COVID-19 lockdown period, it was found that nearly half of Colombian families experienced changes in their eating habits. These changes were related to limited variety in grocery shopping and socioeconomic status, likely influenced by government directives to restrict market outings and purchases. The World Health Organization (WHO) implemented various measures to control COVID-19 transmission, including public transportation suspension, restricted community access, and space closures. More than 40 countries and regions, including

**Table 2** Reasons for changes in feeding practices in children younger than 18 years in Colombia during the first phase of COVID-19 quarantine

| Reason | All ($N = 654$) | Age group | | | | | Socioeconomic level | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Infant younger ($n = 33$) | Infant older ($n = 55$) | Preschooler ($n = 188$) | School-aged ($n = 170$) | Adolescent (242) | Low ($n = 267$) | Medium ($n = 312$) | High ($n = 45$) |
| Lack of money | 0.34 | 0.46 | 0.27 | 0.28 | 0.36 | 0.36 | 0.57 | 0.21 | 0.07 |
| | $\chi^2$ (4, 688) = 6.84, $p = 0.14$ | | | | | | **$\chi^2$ (2, 624) = 99.71, $p = < 0.001$** | | |
| Lack of variety when shopping | 0.29 | 0.27 | 0.4 | 0.30 | 0.29 | 0.26 | 0.27 | 0.32 | 0.18 |
| | $\chi^2$ (4, 688) = 4.10, $p = 0.39$ | | | | | | $\chi^2$ (2, 624) = 4.70, $p = 0.09$ | | |
| Difficulty in going shopping | 0.32 | 0.52 | 0.29 | 0.30 | 0.34 | 0.29 | 0.30 | 0.36 | 0.20 |
| | $\chi^2$ (4, 688) = 7.87, $p = 0.10$ | | | | | | $\chi^2$ (2, 624) = 4.70, $p = 0.09$ | | |
| Difficulty in cooking/we do not like cooking | 0.06 | 0.09 | 0.04 | 0.10 | 0.04 | 0.04 | 0 | 0.09 | 8.9 |
| | – | | | | | | – | | |
| **We try to restrict portions to make our food last** | 0.32 | **0.45** | 0.2 | 0.26 | 0.27 | **0.43** | **0.46** | 0.26 | 0.11 |
| | **$\chi^2$ (4, 688) = 24.66, $p = < 0.001$** | | | | | | **$\chi^2$ (2, 624) = 35.99, $p < 0.001$** | | |
| Fear of leaving the house | 0.20 | 0.30 | 0.20 | 0.17 | 0.20 | 0.20 | 0.20 | 0.21 | 0.20 |
| | $\chi^2$ (4, 688) = 3.24, $p = 0.52$ | | | | | | $\chi^2$ (2, 624) = 0.17, $p = 0.92$ | | |

Notes: The table shows the distribution of responses, and below each row is a nonparametric chi-square test to estimate differences by age and socioeconomic level. Due to the low proportion of responses for the "difficulty in cooking/we do not like cooking" reason (less than 5% in some cells), it was not possible to estimate differences by age and socioeconomic level using a nonparametric chi-square test. The survey allowed marking more than two options, which is why the percentages do not add up to 100%.

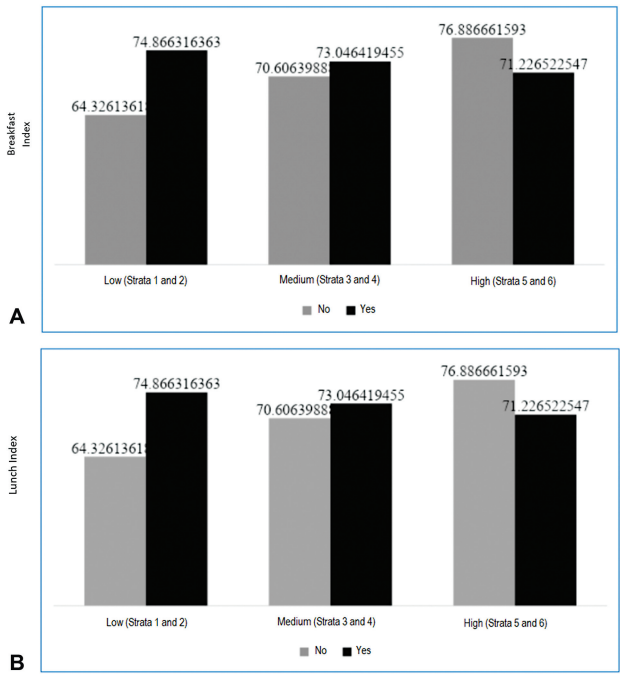


**Fig. 1** Perception of lack of variety when shopping, socioeconomic level, and breakfast and lunch intake in children younger than 18 years in Colombia during the initial phase of the COVID-19 quarantine. Note: The graph displays the expected scores on the breakfast index (A) and lunch index (B) among those who reported perceiving a lack of variety when shopping and those who did not, differentiated by socioeconomic level. Scores are calculated based on the calculation obtained using the coefficients from the linear regression model, including the intercept and corresponding interaction terms.

Italy, some parts of the United States, and Latin America, implemented lockdown and shelter-in-place measures similar to China's early 2020 approach.[1]

Although most supermarkets and grocery stores remained open during the isolation period, concerns arose regarding the supply and safe access to adequate food.[6,7] Foods contain essential nutrients and important phytochemicals that support biological functions, exert protective and complementary effects to prevent and treat diseases, including infections.[8] Significant dietary changes occur during the first year of life, and dietary patterns solidify by the age of 2 years. Survey results revealed that infants younger than 2 years primarily consumed flour and cereals, followed by proteins, which contributed important nutrients, vitamins, and trace elements crucial for growth and development at this age. This critical period provides an opportunity for parents, caregivers, and health care personnel to establish lifelong healthy eating habits.[9–11] According to the Food and Agriculture Organization (FAO), departments such as La Guajira, Boyacá, and Nariño display elevated rates of malnutrition, deficient protein intake, and excessive consumption of saturated fats.[12] Analyzing the survey, about 50% lived in Bogotá with a medium socioeconomic status (strata 3 and 4), possibly explaining the frequent consumption of various food groups. Most respondents did not have a diagnosed illness at the time of the survey and adhered to meal schedules. The World Food Programme designed diverse strategies to enhance nutrition, including school feeding programs, food security networks, technological innovations, and a focus on the first thousand days of life.[12] A Latin American survey of older individuals during the initial phase of the COVID-19 pandemic concluded that women exhibited healthier dietary habits than men, with greater contributions of fruits and vegetables. However, there was an observable increase in obesity among women, potentially linked to increased intake.[13] COVID-19 continues to devastate global economic and health indicators, including child nutrition, due to increased maternal and infant inequality gaps. This is directly and indirectly related to the impact of poverty and reasons for dietary changes, such as limited variety in shopping, affecting families differently based on their socioeconomic status.[14–20] Furthermore, access to nutritious foods appears compromised,[21,22] and critical sectors at risk of collapse include food systems, education, health care services for women and children, and access to clean water and sanitation.[23–26] Resilient food systems are proposed during the COVID-19 pandemic, featuring innovative context-specific supply-demand initiatives and supported food supply chains, such as community-supported agriculture (CSAs). CSAs, which provide 80% of food consumption in Africa and Asia, now depend on these markets, necessitating exemption from lockdowns and taxes.[27,28] Identified risks include CSA closures, restaurant shutdowns, urban food system disruptions, unemployment, reduced income for farmers and industry workers, production and delivery restrictions, increased food and staple costs, reduced family income, vulnerability to price spikes and food shortages, low agricultural productivity, and disruptions in food import and export systems.[29,30] Limited access to fresh produce may lead to increased consumption of processed and packaged, yet less nutritious, affordable foods, with adverse health consequences.[31,32] Various countries globally have demonstrated dietary changes, such as a Spanish study that analyzed shifts in eating habits and lifestyles during confinement.[33] The study found increased consumption of fruits (27%), eggs (25.4%), legumes (22.5%), vegetables (21%), and fish (20%), alongside reduced intake of processed meats (35.5%), lamb or rabbit (32%), pizza (32.6%), distilled alcoholic beverages (44.2%), sugary drinks (32.8%), and chocolate (25.8%), with age-related variations.[33] This indicates greater consumption of healthy foods, reduced intake of low-nutrient foods, and increased homemade preparations. Quarantine may also condition the consumption of low-nutrient and ultra-processed foods.[34] Coupled with reduced physical activity, these factors may lead to positive energy balance, resulting in overweight or weight gain. The FAO highlighted COVID-19's disruptions to CSAs worldwide, impacting both supply and demand. These disruptions exacerbate inequalities, disproportionately affecting poorer families.[8] Following the WHO's declaration of the end of the health emergency in May 2023, establishing policies ensuring favorable nutritional status in all individuals and preparing for future public health emergencies is crucial. Ensuring affordable food access for vulnerable communities is vital. The FAO, International Fund for Agricultural Development, and World Bank have urged exporting countries to reduce taxes, prevent trade interruptions, and ensure smooth food and agricultural input flow across

**Table 3** General linear model for predicting food indices and interaction terms during the COVID-19 quarantine in Colombia in families with children younger than 18 years

| **Breakfast index and interaction terms** | | | | |
|---|---|---|---|---|
| **Predictor variable** | **B** | **95% Wald confidence interval** | | **Statistical significance test** |
| | | **Lower 3** | **Upper 3** | ***p*-Value 2** |
| (Intercept) | 39.48 | 12.06 | 66.90 | 0.005 |
| **Socioeconomic level** | **16.87** | **3.73** | **30.01** | **0.012** |
| Age (y) | −0.60 | −2.19 | 1.00 | 0.462 |
| Lack of money | −7.99 | −20.78 | 4.79 | 0.220 |
| **Lack of variety when shopping** | **15.27** | **0.90** | **29.64** | **0.037** |
| Socioeconomic level and lack of money | 2.28 | −4.88 | 9.44 | 0.533 |
| **Socioeconomic level and lack of variety** | **−9.52** | **−16.49** | **−2.54** | **0.008** |
| Age and lack of money | 0.07 | 0-67 | 0.82 | 0.849 |
| **Age and lack of variety** | **0.88** | **0.04** | **1.72** | **0.039** |
| **Lunch index and interaction terms** | | | | |
| **Predictor variable** | **B** | **95% Wald confidence interval** | | **Statistical significance test** |
| | | **Lower** | **Upper** | ***p*-Value** |
| (Intercept) | 39.480 | 12.062 | 66.898 | 0.005 |
| **Socioeconomic level** | **16.871** | **3.733** | **30.008** | **0.012** |
| Age of child/children being responded about (y) | −0.598 | −2.193 | 0.997 | 0.462 |
| Lack of money | −7.993 | −20.779 | 4.793 | 0.220 |
| **Lack of variety when shopping** | **15.272** | **0.903** | **29.641** | **0.037** |
| Socioeconomic level and lack of money | 2.277 | −4.882 | 9.437 | 0.533 |
| **Socioeconomic level and lack of variety when shopping** | **−9.515** | **−16.494** | **−2.535** | **0.008** |
| Age of child/children being responded about (y) and lack of money | 0.072 | −0.674 | 0.819 | 0.849 |
| **Age of child/children being responded about (y) and lack of variety when shopping** | **0.882** | **0.044** | **1.721** | **0.039** |
| **Dinner index and interaction terms** | | | | |
| **Predictor variable** | **B** | **95% Wald confidence interval** | | **Statistical significance test** |
| | | **Lower** | **Upper** | ***p*-Value** |
| (Intercept) | 11.971 | −3.231 | 27.174 | 0.123 |
| Socioeconomic level 1 | −6.958 | −14.636 | 0.719 | 0.076 |
| Socioeconomic level 2 | 0.474 | −6.797 | 7.744 | 0.898 |
| Socioeconomic level 3 | 0[a] | | | |
| Age of child/children being responded about (y) | −0.350 | −0.712 | 0.012 | 0.058 |
| Lack of money | 0.885 | −3.326 | 5.096 | 0.680 |
| **Lack of variety when shopping** | **6.793** | **2.608** | **10.978** | **0.001** |
| Difficulty in going shopping | 3.144 | −0.899 | 7.187 | 0.127 |
| Difficulty in cooking/we do not like cooking | −1.966 | −10.363 | 6.431 | 0.646 |
| We try to restrict portions to make our food last | −1.405 | −5.491 | 2.681 | 0.500 |
| Fear of leaving the house | 1.338 | −3.348 | 6.023 | 0.576 |

Model: (Intercept), socioeconomic level, age of child/children being responded about (years), lack of money, lack of variety when shopping, difficulty in going shopping, difficulty in cooking/we do not like cooking, we try to restrict portions to make our food last, fear of leaving the house.
Note: In order to facilitate the estimation and interpretation of interaction terms, socioeconomic level was included as a continuous variable in this model.

borders.[5,8] These institutions recommend facilitating investment in agriculture to maintain primary food production despite restrictions. Social support programs for families with lost income or limited food purchasing capability are necessary. Promoting optimal nutrition through increased consumption of high-nutrient foods, addressing comorbidity risks, promoting local agriculture, reinforcing food safety policies, nutritional counseling, breastfeeding promotion, and campaigns for high-nutrient, low-cost food consumption against COVID-19 and diet-related diseases are essential strategies.[13–15] Public nutrition investment, with government support for small-scale farmers, is crucial to guarantee basic food availability, reduce vegetable and fruit costs, and manage healthy and unhealthy food taxation and regulation.[13,22] Finally, sponsoring and strengthening CSAs would aid populations at risk of food scarcity, requiring public social programs to support the vulnerable, marginalized households, rural communities, and underserved neighborhoods through community health worker interventions.[28] Limitations of the present study include the absence of prequarantine period characterization for dietary change comparison. Additionally, the assessment of reasons behind dietary changes relied solely on caregiver responses. Finally, quantitative consumption frequency questionnaires and portion size parameters (sizes, grams, or milliliters) were not used. Qualitative food element inquiries were preferred due to the potential impact of a more extensive survey on response rates.

## Conclusion

This study delineates dietary practices during the COVID-19 pandemic in Colombian families. It was observed that nearly half of the families experienced alterations in their eating habits, which were linked to socioeconomic status and limited variety in grocery shopping. This reality underscores the necessity for well-defined strategies ensuring food availability during times of disaster and the implementation of a nutritional education system for the population to effectively navigate risk situations.

### Funding

This research was partially funded by Gastronutriped and the remaining funding was provided by Clínica Colsanitas, Keralty Group, covering 50% of the publication costs.

### Conflict of Interest

Wilson Daza is the Regional Medical Director of Nestlé, Colombia. The other authors declare that there are no conflicts of interest to disclose. The authors declare that participants were informed, willingly participated in the survey, and agreed to the publication of these cases for strictly academic purposes.

### Acknowledgments

We extend our sincere gratitude to Carlos Arturo Alvarez, MD, MSc, PhD, FIDSA, Vice President of Innovation and Scientific Development at Clínica Colsanitas, Keralty Group, for generously assuming of the publication costs. We also thank Clínica Colsanitas, Keralty Group, for their support.

## References

1 Yang CC, Chen YS, Chen J. The impact of the COVID-19 pandemic on food consumption behavior: based on the perspective of accounting data of Chinese Food Enterprises and Economic Theory. Nutrients 2022;14(06):1206
2 Departamento Nacional de Estadísticas de Colombia. Producto Interno Bruto - PIB [Internet]. Bogotá: DANE; 2021 [cited May 7, 2023]. Available at: https://www.dane.gov.co/files/investigaciones/boletines/pib/cp_PIB_IVtrim20.pdf
3 Departamento Nacional de Estadísticas de Colombia. Mercado Laboral [Internet]. Bogotá: DANE; 2020 [cited May 7, 2023]. Available at: https://www.dane.gov.co/files/investigaciones/boletines/ech/ech/bol_empleo_dic_20.pdf
4 Departamento Nacional de Estadísticas de Colombia. Índice de Precios al Consumidor - IPC [Internet]. Bogotá: DANE; 2021 [cited May 7, 2023]. Available at: https://www.dane.gov.co/files/investigaciones/boletines/ipc/cp_ipc_dic20.pdf
5 National Census of Population and Housing 2018. [Internet]. Bogotá: Departamento Nacional de Estadística (DANE) de Colombia; 2020. [Consulted November 20, 2022]. Available at: https://www.dane.gov.co/files/dane-para-ninos/sabias-que.html
6 Zhou F, Yu T, Du R, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. Lancet 2020;395(10229): 1054–1062
7 Akseer N, Kandru G, Keats EC, Bhutta ZA. COVID-19 pandemic and mitigation strategies: implications for maternal and child health and nutrition. Am J Clin Nutr 2020;112(02):251–256
8 United Nations, Food and Agriculture Organization (FAO), the impact of COVID-19 on food security and nutrition. [Internet]. Rome;2020. [Consulted October 8, 2022]. Available at: https://unsdg.un.org/sites/default/files/2020-06/SG-Policy-Brief-on-COVID-Impact-on-Food-Security.pdf
9 Daza W, Dadán S. Alimentación complementaria en el primer año de vida. Programa de educación continuada en Pediatría 2009;8 (04):18–27
10 Alvarado B. Creencias maternas, prácticas de alimentación y estado nutricional en niños Afro-Colombianos. ALAN 2005;55 (01):55–63
11 Agostoni C, Decsi T, Fewtrell M, et al; ESPGHAN Committee on Nutrition. Complementary feeding: a commentary by the ESPGHAN Committee on Nutrition. J Pediatr Gastroenterol Nutr 2008;46(01):99–110
12 Organización de las Naciones Unidas para la Alimentación y la Agricultura (FAO). El estado de las guías alimentarias basadas en alimentos en América Latina y el Caribe 21 años después de la Conferencia Internacional sobre Nutrición. [Internet]. Roma2014. [Consultado el 7 de septiembre de 2022]. Disponible en: https://www.fao.org/4/i3677s/i3677s.pdf
13 Riveros R, Durán S, Nava E, et al. Caracterización del patrón alimentario de las personas mayoresde Iberoamérica en tiempos de pandemia por COVID 19. Nutr Clín Diet Hosp 2022;42(03): 49–57
14 Gartner LM, Morton J, Lawrence RA, et al; American Academy of Pediatrics Section on Breastfeeding. Breastfeeding and the use of human milk. Pediatrics 2005;115(02):496–506
15 Maier AS, Chabanet C, Schaal B, Leathwood PD, Issanchou SN. Breastfeeding and experience with variety early in weaning increase infants' acceptance of new foods for up to two months. Clin Nutr 2008;27(06):849–857
16 Mehta UJ, Siega-Riz AM, Herring AH, Adair LS, Bentley ME. Pregravid body mass index is associated with early introduction of complementary foods. J Acad Nutr Diet 2012;112(09): 1374–1379

17 Tessema M, Belachew T, Ersino G. Feeding patterns and stunting during early childhood in rural communities of Sidama, South Ethiopia. Pan Afr Med J 2013;14:75
18 Poskitt EM, Breda J. Complementary feeding and non communicable diseases: current knowledge and future research needs. Nutr Metab Cardiovasc Dis 2012;22(10):819–822
19 Campos R, Hernandez L, Soto-Mendez MJ, Vossenaar M, Solomons NW. Contribution of complementary food nutrients to estimated total nutrient intakes for rural Guatemalan infants in the second semester of life. Asia Pac J Clin Nutr 2010;19(04):481–490
20 Niinikoski H, Ruottinen S. Is carbohydrate intake in the first years of life related to future risk of NCDs? Nutr Metab Cardiovasc Dis 2012;22(10):770–774
21 Strazzullo P, Campanozzi A, Avallone S. Does salt intake in the first two years of life affect the development of cardiovascular disorders in adulthood? Nutr Metab Cardiovasc Dis 2012;22(10): 787–792
22 Lutter CK. Growth and complementary feeding in the Americas. Nutr Metab Cardiovasc Dis 2012;22(10):806–812
23 Martínez VRI, Alvarado RGA, Sánchez PMC, et al. Estudio de las pautas alimentarias para la introducción de alimentos complementarios y su diversidad a través de la incorporación a la dieta familiar. Rev Esp Med Quir 2010;15(03):114–124
24 Verity R, Okell LC, Dorigatti I, et al. Estimates of the severity of coronavirus disease 2019: a model-based analysis. Lancet Infect Dis 2020;20(06):669–677
25 Kluge HHP, Wickramasinghe K, Rippin HL, et al. Comment: prevention and control of non-communicable diseases in the COVID-19 response. Lancet 2020;6736(20):2019–2021
26 United Nations International Children's Emergency Fund (UNICEF). Don't let children be the hidden victims of the COVID-19 pandemic: statement by UNICEF Executive Director Henrietta Fore [Internet]. New York: UNICEF; 2020. [Consulted November 22, 2022]. Available at: https://www.unicef.org/press-releases/dont-let-children-be-hidden-victims-covid-19-pandemic
27 Roberton T, Carter ED, Chou VB, et al. Early estimates of the indirect effects of the COVID-19 pandemic on maternal and child mortality in low-income and middle-income countries: a modelling study. Lancet Glob Health 2020;8(07):e901–e908
28 Reardon T, Echeverria R, Berdegué J, et al. Rapid transformation of food systems in developing regions: highlighting the role of agricultural research and innovations. Agric Syst 2019;172:47–59
29 Thurlow J. COVID-19 lockdowns are imposing substantial economic costs on countries in Africa. [Internet]. Washington: International Food Policy Research Institute; 2020. [Consulted November 22, 2022]. Available at: https://ebrary.ifpri.org/digital/collection/p15738coll2/id/133835
30 Reardon T, Bellemare MF, Zilberman D. How COVID-19 may disrupt food supply chains in developing countries. [Internet]. Washington: International Food Policy Research Institute; 2020. [Consulted November 22, 2022]. Available at: https://ebrary.ifpri.org/digital/collection/p15738coll2/id/133821
31 World Bank. Food security and COVID-19. [Internet]. Washington:2020. [Consulted November 5, 2022]. Available at: https://reliefweb.int/report/world/brief-food-security-and-covid-19?gad_source=1&gclid=CjwKCAjw65-zBhBkEiwAjrqRMEjN43Qqp-GyAFG3yAOpS3duY9iGBZ1ohWnNciAbJMbiLuXS6rYbcMBoCO-cYQAvD_BwE
32 Nabarro D, et al. Global Nutrition Report. [Internet]. Washington: Global Nutrition Report; 2020. [Consulted November 1, 2022]. Available at: https://globalnutritionreport.org/documents/565/Foreword_2020_Global_Nutrition_Report.pdf
33 Pérez-Rodrigo C, Gianzo M, Hervás B, Ruiz F, Casis L, Aranceta-Bartrina J. Cambios en los hábitos alimentarios durante el periodo de confinamiento por la pandemia COVID-19 en España. Rev Esp Nutr Comun 2020;26(02)
34 Ammar A, Brach M, Trabelsi K, et al. Effects of COVID-19 home confinement on eating behaviour and physical activity: results of the ECLB-COVID19 International Online Survey. Nutrients 2020; 12(06):1583