

Food insecurity and sociodemographic factors in Latin America during the COVID-19 pandemic

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ABSTRACT

Objective. To understand the association of food insecurity with sociodemographic factors in a sample population in Latin America during the COVID-19 pandemic.

Methods. This was a multicenter cross-sectional study conducted in 10 countries in Latin America using an online survey through various digital platforms from October 14, 2020 to February 15, 2021. Statistical analysis of data was performed by applying descriptive statistics, chi-square test, and logistic regression analysis.

Results. Of a total of 6 357 surveys, 58.2% of respondents experienced food security, 29.3% were slightly food insecure, 9.2% were moderately food insecure, and 3.3% were severely food insecure. Concerning the association food insecurity and sociodemographic variables, there is a significant association in the variables studied, including area of residence, education level, occupation, number of persons in the household, household with children younger than 10 years of age, and socioeconomic level.

Conclusions. These findings indicate that sociodemographic factors associated with food insecurity during the COVID-19 pandemic in Latin America were rural residence; complete and incomplete basic and secondary schooling; occupation (homemaker, unemployed, and self-employed); low, medium-low, and medium socioeconomic level; household with more than four persons; and household with children younger than 10 years of age.

Keywords

Food insecurity; COVID-19; sociodemographic factors; Latin America.

In 2015, the United Nations approved 17 Sustainable Development Goals (SDGs) as part of the 2030 Agenda. These

goals are expected to achieve a sustainable future for all by addressing challenges including poverty, inequality, climate

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change, and hunger and food insecurity among the most vulnerable populations (1). Food *security*, according to the United Nations Food and Agriculture Organization (FAO) is achieved when all people have continuous physical and economic access to sufficient, safe, and nutritious food that meets their needs and cultural preferences and supports an active and healthy life (2).

The conditions that must be present for food security to exist are (a) food availability, which is related to aspects from production, processing, and transportation to markets or community food aid centers; (b) access, which includes processes of acquisition by individuals, through purchase, private or state food aid, or social assistance—i.e., people have sufficient economic resources and easy access to affordable, nutritious, and good quality food; and (c) utilization, which means people have the necessary conditions to properly prepare the food (3).

In 2019, it was estimated that more than 60 million people had been affected by hunger since 2014. If this trend continues, the number of undernourished people will exceed 840 million by 2030, making it difficult to end hunger and achieve food security. The number of people who have had to reduce the quantity and quality of their food intake has also increased; an estimated 26% of the global population is experiencing hunger and/or lacking regular access to sufficient food of good nutritional quality (4).

On the other hand, according to the FAO, food insecurity is when people do not have regular access to food, which may be due to food scarcity and/or lack of resources for obtaining food. The FAO measures food insecurity through the Food Insecurity Experience Scale (FIES), categorizing it from mild to severe (5).

In 2019, approximately 32% of the population in Latin America and the Caribbean (LAC) was forced to reduce the quality and quantity of their food, finding themselves with moderate or severe food insecurity. In addition, approximately 7% of the population (48 million people) in LAC were living with hunger (6). It was in this context that on 11 March 2020, the World Health Organization (WHO) declared the COVID-19 pandemic. The WHO did so fully recognizing that this was not just a public health crisis, but that various sectors would be affected differently, and it invited countries to adopt different strategies to prevent infections, save lives, and minimize the consequences of this crisis (7).

Some research at the time indicates that the COVID-19 pandemic would be associated with more food shortages worldwide, mainly in developing and low-income countries. This shortage would be further aggravated by droughts and floods and by higher market-level food prices (8). In addition, the decrease in income and the increase in poverty would affect food security and nutrition; that is, people living in extremely disadvantaged conditions would not be able to purchase food due to a lack of resources, and many people with low- or very low-income would have to select cheaper and less nutritious food (9).

The COVID-19 pandemic has been associated with global increases in hunger and severe food insecurity, in addition to increasing trends in undernutrition, essential micronutrient deficiencies and excess malnutrition in children, maternal anemia, and obesity among the adult population. The global prevalence of moderate or severe food insecurity reached

around 2.3 billion people in 2021, with approximately 12% living with severe food insecurity (10).

According to what the Economic Commission for Latin America reported in its economic study of LAC, the COVID-19 pandemic generated a substantial social crisis that persists through the third consecutive year (11). Although the pandemic has ended, the region has not been able to recover from the social repercussions nor been able to return to its pre-pandemic status. Concerning the poverty rate, it was projected that by the end of 2022, it would stand at 32% of the population, that is, 0.7 percentage points lower than in 2020; and extreme poverty would remain at 13% (11). Regarding the pre-pandemic economic indicators (third quarter 2019), unemployment had been approximately 8%; regional employment rate, 58%; and economic participation rate, 64%. Three years after the start of the pandemic (third quarter of 2022), the approximate rates are: unemployment, 7%; regional employment rate, 58%; and economic participation rate, 63%. An average unemployment rate of 7% was projected for 2022, which is substantially lower than in 2019 (12).

On the other hand, there is information from the World Food Program describing the effects of the pandemic at the global level and estimating that 81.8 million people in the Region of the Americas have experienced food insecurity, among which 12.3 million people live with severe food insecurity. This figure is four times higher than before the COVID-19 pandemic (13). However, although there are several studies describing the effects of the pandemic in various countries, few studies have shown what is happening in LAC, a region that has shown high levels of COVID-19 infection. Therefore, the present study aimed to investigate the association of food insecurity with sociodemographic characteristics in a sample population in Latin America during the COVID-19 pandemic.

METHODS

This was a multicenter cross-sectional study conducted in 10 countries: Argentina, Chile, Colombia, Ecuador, El Salvador, Guatemala, Panama, Paraguay, Peru, and Mexico. Data were obtained through an online survey that was made available on various digital platforms and social networks, including Facebook, Instagram, X (formerly Twitter), and through personal and institutional emails, among others. The survey was available from 14 October 2020 to 15 February 2021. The Google Forms platform (Google LLC, Menlo Park, California, United States) was used to perform the data collection.

The recruitment of participants was done by snowball sampling in which the population of interest helps to recruit other participants from the population until the predetermined sample size is reached (14). Participant inclusion criteria included being 18 years of age or older and completing an online informed consent. Exclusion criteria were the following: being in the first 4 months of pregnancy or breastfeeding; undergoing pharmacological treatment; being in psychological therapy for depression, anxiety disorders, stress, or mood disorders; and having any pathologies requiring dietary treatment. To apply the exclusion criteria, an initial selection filter on the survey asked respondents to answer questions regarding those criteria (e.g., mood disorder or pregnancy); when the response was “yes,” the survey closed automatically and the individual was thanked for responding; no further data were collected.

Survey instrument

The survey instrument included several sections. The first section contained an overview of the study and the opportunity for potential participants to provide informed consent or opt to withdraw. The second section consisted of the initial screening that identified exclusion criteria mentioned previously. This was followed by questions to collect data on sociodemographic characteristics, type and duration of COVID-19 quarantine confinement, and area of residence (rural or urban), among others. The third section collected information on the perception of nutritional status. The fourth section was dedicated to collecting data through screening questions related to food during the past 3 months. The fifth and last section consisted of questions related to stressors in the past 3 months and the foods prioritized by the household during the most recent food purchase.

Food insecurity

To perform the data analysis and interpretation of the food-related survey responses, we used the Food Insecurity Scale Based on Experience (FIES-SM) (15). This scale was developed by the FAO based on experiences from the “Voices of Hunger” project. The FIES-SM is composed of 8 food-related questions with dichotomous answers (yes/no). This 8-point scale provides insight into people’s actual experiences with access to food over the past 12 months (5). A score value of 1 was assigned for any “yes” response, and a value of 0 for any “no” response. For each respondent, all the assigned values for each answer to the FIES-SM questions were summed to obtain the raw score, which ranged 0 to 8 points. The total score for each respondent was used to classify their food insecurity status as follows: score of 0, the respondent reported food security; score of 1 to 3, mild food insecurity; 4 to 6, moderate insecurity; and 7 to 8, severe insecurity.

Statistical analysis

Statistical analysis of the data was performed using the R Studio (The R Foundation for Statistical Computing). First, descriptive statistics were applied to characterize the total sample and each country. To perform the association of food insecurity variables and sociodemographic variables, the chi-square test was used, and logistic regression analysis was performed for the association of food insecurity with duration of quarantine, area of residence, education level, occupation, socioeconomic level, sex, age, number of persons in the household, household with a child younger than 10 years of age, and household with an adult older than 60 years of age. A value of $P < .05$ was considered statistically significant.

Descriptive statistics were performed on the main study variables and P values describing differences between food insecurity and sociodemographic factors were calculated for each variable using the chi-square test. In univariate analyses, calculation of odds ratios provided insight into any association of food insecurity with the variable of interest.

After the univariate analysis was carried out, any variable significantly associated with food insecurity was included in a multivariate forward stepwise logistic regression. The variables that remained statistically significant in these multivariate analyses were the main results. The coding of the variables was

carried out, and in the case of the variable food insecurity, a value of 0 was assigned to the results indicating food security and a value of 1 for those indicating food insecurity. For the independent variables mentioned previously, they were coded with a dichotomous categorization. The Hosmer and Lemeshow test of fit (16) was used for the different models (except the crude model) of logistic regression on the dependent variable of food insecurity.

Ethical approval

This study was conducted in accordance with the Declaration of Helsinki for human studies and the Singapore Declaration on Integration in Research. Informed consent was obtained from each participant through the electronic survey. The study was approved by the Scientific Ethics Committee of the Pontificia Universidad Católica de Chile.

RESULTS

The study’s multicenter sample totalled 6357 participants with a mean (SD) age of 34.8 (12.1) years and of whom 5314 were female (83.5%). At the time survey of completion, 3291 participants (51.6%) reported being in quarantine/compulsory or voluntary confinement; 60.0% reported more than 4 months of compulsory or voluntary quarantine; 5750 respondents (90.3%) reported residing in an urban area, and 618 (9.7%), in a rural area.

Table 1 shows the distribution of the sample by country according to the sociodemographic characteristics of the respondents. Concerning the distribution of the respondents, Figure 1 shows the percentage of respondent participation by country of residence: 21% from Chile, 18% from Colombia, and 15% from Mexico. The country with lowest percentage of participation was Paraguay with 3%.

Regarding the percentage of food insecurity by country, Figure 1 shows that during the pandemic, most of the participants had a level of food security greater than 41%, and as high as 74%. From 21% to 38% of respondents reported mild food insecurity, and from 5% to 29% reported moderate to severe food insecurity (Figure 1).

Table 2 shows the classification of food security by quarantine time. We found no differences in food security or insecurity by time: approximately 30% of the sample reported mild food insecurity; 10%, moderate; 4%, severe food insecurity; and 58% had no food insecurity (secure).

Table 3 shows that the findings indicated an association between food insecurity and the variables area of residence, education level, occupation, number of people in the household, household with a child younger than 10 years of age, and socioeconomic level.

Table 4 shows the results of the binomial logistic regression for food insecurity and the factors that affected it; it can be observed that in the crude model, the variable quarantine had a statistical significance of $P < .10$. Additionally, the variables area of residence (rural), education level (complete and incomplete primary and secondary school), occupation (homemaker, independent worker, and unemployed), and socioeconomic level (low, medium-low, and medium) showed a statistical significance of $P < .001$ in the various models. In model 4, it can be observed that a household with a child younger than 10 years showed a statistical significance of $P < .01$, and a household with

TABLE 1. Distribution of the study sample according to sociodemographic information, by country

Characteristic	No. (%)									
	Argentina	Chile	Colombia	Ecuador	El Salvador	Guatemala	Mexico	Panama	Paraguay	Peru
Total Participants, No.	495	1317	1155	666	286	322	963	615	175	363
Gender										
Female	411 (83.0)	1208 (91.7)	1043 (90.3)	446 (67.0)	229 (80.0)	252 (78.3)	749 (77.8)	557 (90.6)	149 (85.1)	270 (74.4)
Male	79 (16.0)	108 (8.2)	110 (9.5)	218 (32.7)	57 (20.0)	70 (21.7)	212 (22.0)	58 (9.4)	26 (14.9)	92 (25.3)
Other	5 (1.0)	1 (0.1)	2 (0.2)	2 (0.3)	0	0	2 (0.2)	0	0	1 (0.3)
Area of residence										
Rural	23 (4.6)	87 (6.6)	69 (6)	78 (11.7)	93 (32.5)	61 (18.9)	88 (9.1)	81 (13.1)	9 (5.1)	29 (7.9)
Urban	472 (95.4)	1230 (93.4)	1087 (94)	589 (88.3)	193 (67.5)	261 (81.1)	875 (90.9)	537 (86.9)	166 (94.9)	337 (92.1)
Education level										
Elementary school, complete	3 (0.6)	1 (0.1)	4 (0.4)	5 (0.8)	9 (1.6)	5 (1.6)	2 (0.2)	0 (0.0)	3 (1.7)	2 (0.6)
Secondary school, complete	63 (12.7)	50 (3.8)	61 (5.3)	45 (6.7)	22 (7.7)	22 (6.8)	27 (2.8)	44 (7.2)	17 (9.7)	29 (8.0)
Higher, incomplete	96 (19.4)	151 (11.5)	166 (14.4)	176 (26.4)	89 (27.6)	89 (27.6)	288 (29.9)	159 (25.9)	38 (21.7)	131 (36.1)
Higher, completed	333 (67.3)	1115 (84.7)	924 (80.0)	440 (66.1)	206 (64.0)	206 (64.0)	646 (67.1)	412 (67.0)	117 (66.9)	201 (55.4)
Occupation										
Homemaker	39 (7.9)	127 (9.6)	126 (10.9)	50 (7.5)	65 (22.7)	30 (9.3)	136 (14.1)	93 (15.1)	25 (14.3)	60 (16.5)
Unemployed	25 (5.1)	145 (11.0)	67 (5.8)	45 (6.76)	28 (9.8)	18 (5.6)	73 (7.6)	43 (7.0)	5 (2.9)	24 (6.6)
Retired	18 (3.6)	28 (2.1)	28 (2.4)	18 (2.7)	18 (6.3)	4 (1.2)	18 (1.9)	5 (0.8)	8 (4.6)	12 (3.3)
Dependent/hourly worker	318 (64.2)	725 (55.1)	594 (51.4)	356 (53.5)	129 (45.1)	202 (62.7)	435 (45.2)	364 (50.2)	94 (53.7)	170 (46.8)
Self-employed	95 (19.2)	292 (22.2)	340 (29.4)	197 (29.6)	46 (16.1)	68 (21.1)	301 (31.3)	110 (17.9)	43 (24.6)	97 (26.7)
People living in household, No.										
1-4	409 (82.6)	1068 (81.1)	982 (85)	466 (70)	165 (57.7)	181 (56.2)	692 (73.1)	464 (75.4)	98 (56)	204 (56.2)
>4	86 (17.4)	249 (18.9)	173 (15)	200 (30)	121 (42.3)	141 (43.8)	255 (26.9)	151 (24.6)	77 (44)	159 (43.8)
Child <10 years old in household										
No	343 (69.3)	872 (66.2)	771 (66.8)	425 (63.8)	193 (67.5)	193 (59.9)	700 (72.1)	360 (58.5)	90 (51.4)	245 (67.5)
Yes	152 (30.7)	445 (33.8)	384 (33.3)	241 (36.2)	93 (32.5)	129 (40.1)	263 (27.3)	255 (41.5)	85 (48.6)	118 (32.5)
Adult >60 years old in household										
No	410 (82.8)	966 (73.4)	805 (69.7)	408 (61.3)	153 (53.5)	196 (60.9)	722 (75.0)	452 (73.5)	113 (64.6)	174 (47.9)
Yes	85 (17.2)	351 (26.7)	350 (30.3)	258 (38.7)	133 (46.5)	126 (39.1)	241 (25.0)	163 (26.5)	62 (35.4)	189 (52.1)
Currently in compulsory or voluntary quarantine or confinement										
No	265 (53.5)	596 (45.3)	454 (39.3)	340 (51.1)	127 (44.4)	177 (55.0)	242 (25.1)	293 (47.6)	95 (54.3)	112 (30.9)
Yes	212 (42.8)	652 (49.5)	665 (57.6)	282 (42.3)	140 (50.0)	116 (36.0)	657 (68.2)	272 (44.2)	61 (34.9)	227 (62.5)
I have not been in quarantine	18 (3.6)	69 (5.2)	36 (3.1)	44 (6.6)	19 (6.6)	29 (9.0)	64 (6.7)	50 (8.1)	19 (10.9)	24 (6.6)
Mandatory or voluntary quarantine duration										
<1-3 months	264 (53.4)	794 (60.3)	798 (69.1)	313 (47)	183 (64)	138 (42.9)	624 (64.8)	384 (62.5)	76 (43.4)	243 (66.9)
≥4 months	167 (33.7)	401 (30.4)	274 (23.7)	259 (38.9)	78 (27.3)	83 (25.8)	251 (26.1)	133 (21.6)	69 (39.4)	75 (20.7)
I have not been in quarantine	64 (12.9)	122 (9.3)	83 (7.2)	94 (14.1)	25 (8.7)	101 (31.3)	88 (9.1)	98 (15.9)	30 (17.2)	45 (12.4)
Socioeconomic level										
Low	15 (3.0)	21 (1.6)	21 (1.8)	20 (3.0)	33 (11.5)	9 (2.8)	18 (1.9)	17 (2.8)	15 (8.6)	23 (6.3)
Medium	325 (65.7)	578 (43.9)	658 (57.0)	451 (67.7)	129 (45.1)	213 (66.2)	565 (58.7)	362 (58.9)	94 (53.7)	205 (56.5)
Lower-middle	73 (14.8)	174 (13.2)	181 (15.7)	125 (18.8)	117 (40.9)	67 (20.8)	211 (22.0)	168 (27.3)	53 (30.3)	90 (24.8)
Upper-middle	79 (16.0)	401 (30.5)	261 (22.6)	69 (10.4)	7 (2.5)	30 (9.3)	150 (15.6)	67 (10.9)	11 (6.3)	43 (11.9)
High	3 (0.6)	143 (10.9)	34 (2.9)	1 (0.2)	0	3 (0.9)	19 (2.0)	1 (0.2)	2 (1.1)	2 (0.6)
Food insecurity										
Mild	146 (29.5)	283 (21.5)	321 (27.8)	241 (36.1)	87 (30.4)	103 (32.0)	256 (26.5)	233 (37.7)	50 (28.6)	146 (39.9)
Moderate	35 (7.1)	50 (3.8)	100 (8.7)	83 (12.4)	60 (21.0)	25 (7.8)	79 (8.2)	81 (13.1)	30 (17.1)	42 (11.5)
Severe	8 (1.6)	7 (0.5)	28 (2.4)	44 (6.6)	23 (8.0)	8 (2.5)	32 (3.3)	21 (3.4)	11 (6.3)	25 (6.8)
None (food secure)	306 (61.8)	977 (74.2)	707 (61.2)	299 (44.8)	116 (40.6)	186 (57.8)	599 (62.0)	283 (45.8)	84 (48.0)	153 (41.8)

Source: Prepared by the authors from the study results.

FIGURE 1. Level of food insecurity (FI) experienced by the population of each study country

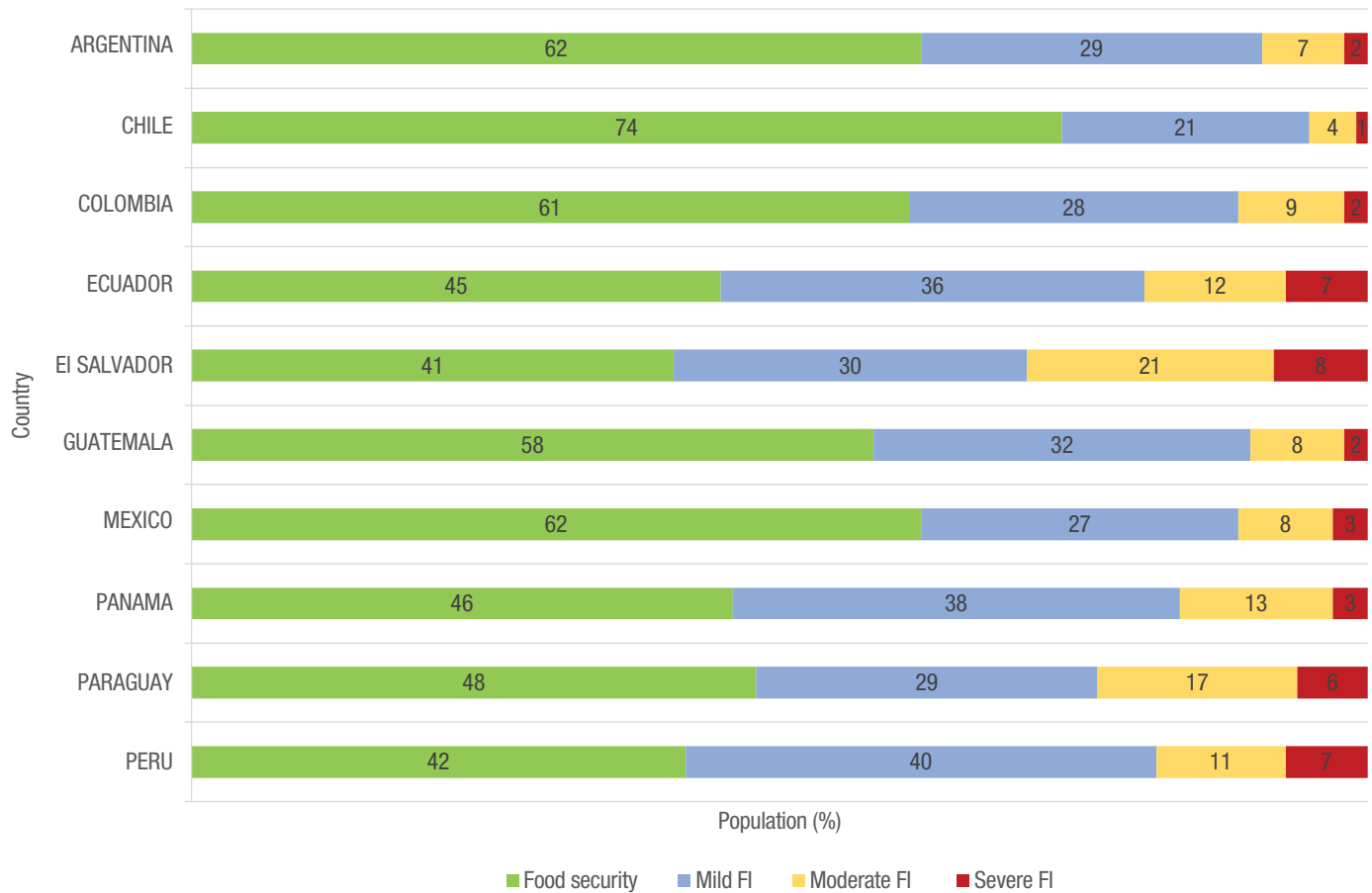


TABLE 2. Classification of food insecurity by duration of COVID-19 quarantine

Level of insecurity	Participants, No. (%), by quarantine duration ^a				
	None (no confinement)	<1 month	1-3 months	4-6 months	≥7 months
Mild	219 (29.2)	131 (30.5)	410 (30.0)	581 (28.4)	525 (29.6)
Moderate	55 (7.3)	47 (11.0)	121 (9.0)	197 (9.6)	165 (9.3)
Severe	32 (4.3)	11 (2.6)	49 (3.6)	51 (2.5)	64 (3.6)
None (food security)	444 (59.2)	240 (55.9)	786 (57.5)	1218 (59.5)	1022 (57.5)
Total (100%)	750	429	1366	2047	1776

^aChi-square test, *P* value=.24.
Source: Prepared by the authors from the study results.

more than 4 persons (OR=1.14; 95% CI: 1.01-1.27) had a *P* <.05 level. According to the results of model 4, people living in rural areas (OR=1.39; 95% CI: 1.16-1.65) had up to 1.8 times more risk of having food insecurity compared with those living in urban areas.

DISCUSSION

The present study aimed to identify the association of food insecurity with sociodemographic antecedents among a sample in Latin America during the COVID-19 pandemic. The main

results found a significant association between food insecurity and sociodemographic variables, such as area of residence, education level, occupation, number of people in the household, household with a child younger than 10 years of age, and socioeconomic level. These results are similar to those of a study carried out in households with preschool children in Mexico that found that households with low and very low welfare conditions (housing and property ownership), indigenous households, and households in rural areas had a higher prevalence of food insecurity and a greater proportion of children with long-term malnutrition (16).

In rural areas, which are usually considered to be more prone to food insecurity, this is not always the case. For example, a study conducted in El Salvador showed that households located in rural areas, despite having been exposed to stressors (e.g., excess rainfall) and social factors (e.g., mobility restrictions during 2020), did not show a higher prevalence of food insecurity (18). In addition, in households with three members, the probability of being food insecurity decreased as income increased. Each additional person in the household increased the likelihood of experiencing food insecurity, except for among low-income households in which food insecurity is likely regardless of the number of household members (19).

The loss of employment during the COVID-19 pandemic in the Caribbean countries was among the most negative consequences for vulnerable populations. The high cost of healthy

TABLE 3. Association of food insecurity with sociodemographic variables

Variable	Participants and level of food insecurity, No. (%) ^a				P value
	None (secure)	Mild	Moderate	Severe	
Gender					
Female	3 123 (84.2)	1 546 (82.9)	498 (85.1)	156 (75.4)	<.001
Male or other	587 (15.8)	320 (17.1)	87 (14.9)	51 (24.6)	
Area of residence					
Rural	283 (7.6)	209 (11.2)	86 (14.7)	40 (19.3)	<.001
Urban	3 427 (92.4)	1 657 (88.8)	499 (85.3)	167 (80.7)	
Education level					
Elementary school, complete	4 (0.1)	16 (0.9)	9 (1.5)	6 (2.9)	<.001
Secondary school, complete	158 (4.3)	131 (7.0)	67 (11.5)	26 (12.6)	
Higher, incomplete	655 (17.7)	498 (26.7)	189 (32.3)	79 (38.2)	
Higher, completed	2 893 (78.0)	1 221 (65.4)	320 (54.7)	96 (46.4)	
Occupation					
Homemaker	381 (10.3)	230 (12.3)	102 (17.4)	40 (19.3)	<.001
Unemployed	247 (6.7)	159 (8.5)	50 (8.5)	18 (8.7)	
Retired	121 (3.3)	24 (1.3)	8 (1.4)	4 (1.9)	
Dependent/hourly worker	2 075 (55.9)	974 (52.2)	256 (43.8)	88 (42.5)	
Self-employed	886 (23.9)	479 (25.7)	169 (28.9)	57 (27.5)	
People living in household, No.					
<4	2 878 (45.1)	1 338 (21.0)	385 (6.0)	135 (2.1)	<.001
≥4	832 (13.0)	528 (8.2)	200 (3.1)	72 (1.1)	
Child <10 years of age in household					
No	2 582 (69.6)	1 149 (61.6)	351 (60)	117 (56.5)	<.001
Yes	1 128 (30.4)	717 (38.4)	234 (40)	90 (43.5)	
Adult >60 years old in household					
No	2 602 (70.1)	1 264 (67.7)	398 (68)	141 (68.1)	.27
Yes	1 108 (32.2)	602 (32.3)	187 (32)	66 (31.9)	
Quarantine duration time					
<6 month	2 688 (72.5)	1 341 (71.9)	420 (71.8)	49 (23.7)	.24
≥7 month	1 022 (27.5)	525 (28.1)	165 (28.2)	51 (24.6)	
Socioeconomic level (low, medium-low, and medium)					
Low	30 (0.8)	66 (3.5)	51 (8.7)	45 (21.7)	<.001
Medium-low	405 (10.9)	521 (27.9)	245 (41.9)	94 (45.4)	
Medium	2 170 (58.5)	1 089 (58.4)	260 (44.4)	66 (31.9)	
Medium-high	908 (24.5)	180 (9.6)	28 (4.8)	2 (1.0)	
High	197 (5.3)	10 (0.5)	1 (0.2)	0 (0.0)	

^a Chi-square tests.

Source: Prepared by the authors from the study results.

food in the Caribbean subregion increased the consumption of cheaper foods and low nutritional diets, further exposing those with low income to food insecurity and greater vulnerability during the COVID-19 pandemic (20).

On the other hand, although we found statistically significant associations with the sociodemographic factors studied, food insecurity was not solely determined by the amount of income available at the end of the month. Rather, households reporting some degree of poverty, but also greater income certainty, could be food secure. The probability of food insecurity was higher in households with worse working conditions and less income, combined with characteristics such as head of household younger than 25 years of age, female head of household, low education level of head of household, speaking an indigenous language, household with a member older than 70 years of age, rural area of residence, and/or household with three or more unemployed or informally employed adults (21). However,

our study did not include all these characteristics (e.g., indigenous language, head of household's occupational status), but as mentioned, we did identify significant associations between the study variables and food insecurity.

There are several published studies investigating the effects of COVID-19 on food security. A systematic review (22) pointed out that the pandemic harmed household food security due to food shortages, loss of income, increased unemployment, and prices, among other conclusions. In addition, food insecurity among low-income families and disadvantaged communities, especially among those who work for daily wages and depend on remittances, has been linked to food insecurity. During the pandemic, these groups mostly experienced food insecurity (23), findings consistent with those of our study which showed that food insecurity had a significant association with low, lower-middle, and middle socioeconomic status, and occupational status as homemaker, unemployed, and self-employed.

TABLE 4. Logistic regression models for the association between food insecurity and each study variable

Variables	Crude Model 1	Model 2	Model 3	Model 4
	OR (95% CI)	OR (95% CI)	OR (95% CI)	OR (95% CI)
Quarantine time (76 months)	1.04 (0.93-1.16)	1.04 (0.93-1.16)	1.01 (0.89-1.13)	1.01 (0.89-1.13)
Residence (rural)	–	1.65 (1.40-1.96) ^a	1.49 (1.25-1.77) ^a	1.39 (1.16-1.65) ^a
Education (complete and incomplete elementary and high school)	–	2.22 (1.81-2.72) ^a	1.76 (1.43-2.18) ^a	1.73 (1.40-2.15) ^a
Occupation (homemaker, unemployed, self-employed)	–	–	1.37 (1.23-1.52) ^a	1.33 (1.19-1.48) ^a
Socioeconomic level (low, medium-low, medium)	–	–	4.52 (3.87-5.29) ^a	4.39 (3.76-5.15) ^a
Gender (female)	–	–	0.97 (0.84-1.12)	0.96 (0.83-1.10)
Age >60 years	–	–	–	0.47 (0.35-0.61)
People in the household, No. (>4)	–	–	–	1.14 (1.01- 1.27) ^b
Household with adult >60 years of age	–	–	–	1.14 (0.98- 1.31)
Household with child <10 years of age	–	–	–	1.26 (1.11-1.45)
Household with child <10 and adult >60 years of age	–	–	–	1.24 (0.97- 1.58)

Abbreviations: OR, odds ratio; 95% CI, 95% confidence interval.

^a $P < .001$ ^b $P < .05$ **Source:** Prepared by the authors from the study results.

Furthermore, our study found a statistically significant association between food insecurity and rural areas. This finding is similar to those of a study conducted in Latin America and the Caribbean during the first wave of the pandemic, where it was noted that high food insecurity in rural areas could be associated with the prevalence of informal businesses and extreme poverty, despite access to home-grown food (24). However, these results differ from those of a study carried out in Ecuador, where the urban areas had the highest percentage of food insecurity, probably because in rural areas there was access to home-grown food, which provided protection for rural households (25). In addition, in the largest cities in Latin America and the Caribbean, the most notorious effect during the pandemic was the risk of food insecurity in the most vulnerable populations, as well as panic-buying by consumers at the beginning of the quarantine and the adoption of strict measures by municipalities that forced the closure of restaurants, food services, and food sales in public spaces, among others (26).

Food insecurity has also been described as producing disorder and instability in households with children younger than 18 years of age (27). Food insecurity as a source of chaos in these households includes conflicts with work and after-school schedules, food shortages, and strategies to cope with poverty, among others. Some households spent less time as a family, and others maintained shared meal times and positive interactions (27). It has also been noted that households with children younger than 15 years of age were more vulnerable to food insecurity given their structural characteristics, such as low family income, lower education level of the head of household, and more members in the household (28). However, a study conducted in Brazil suggested that after the pandemic restrictions were adopted, including the closure of schools, families with children were less likely to experience moderate to severe food insecurity because of the social programs established at the national level and/or the solidarity of non-profit organizations and private sector efforts that delivered food kits to these families (29). Another study found that households with more rooms in urban areas were less likely to experience food insecurity, a finding that was possibly related to the socioeconomic level of the household (30). A study conducted in eight cities in Peru reported that people who lost their jobs during

the pandemic had an 82% higher prevalence of food insecurity, which could be due to the greater reduction of the labor force in that country during the year 2020 (31), a result that is consistent with our results.

The COVID-19 pandemic brought with it a reduction in food production and access to food as a byproduct of social isolation. Thus, to reduce the risk of poverty and hunger, strategic policies should be implemented at the national level, especially in low- and middle-income countries to allow access to food in times of scarcity and crisis (8), in addition to protecting basic income. Such strategies can help to ensure food security and reduce food-related pathologies and developmental disorders (32). Appropriate state economic assistance programs should also play a role in reducing food insecurity among the most vulnerable populations (33).

Strengths and limitations

Among the strengths of the study was the participation of 10 countries, which provided a large and diverse sample population. In addition, a validated survey was used along with the FIES-SM scale, which allowed for comparisons with similar studies.

Regarding the limitations, given that this was a cross-sectional study, we assessed associations but not causality. In addition, by using an online survey, we excluded people without internet access, possibly the most vulnerable people. In addition, these study results do not consider the food security status of the respondents before the pandemic nor whether respondents had access to any state benefit program.

Conclusions

The findings of the cross-sectional study including 10 countries in Latin America suggest that, in general, sociodemographic variables affected food insecurity during the COVID-19 pandemic. We recommend that governments monitor the levels of food insecurity and the different sociodemographic characteristic involved, so that appropriate interventions can ensure that the population always has access to food in a timely manner, even during crises.

Author contributions. JM and SDA conceived the original idea. All authors collected the data. SNS and YMT analyzed the data. SNS and YMT interpreted the results. SNS, SDA, YMT, IRC, and JM wrote the paper. All authors reviewed the paper. All authors reviewed and approved the final version.

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Inseguridad alimentaria y factores sociodemográficos en América Latina durante la pandemia de COVID-19

RESUMEN

Objetivo. Determinar la asociación de la inseguridad alimentaria con factores sociodemográficos en una muestra de población de América Latina durante la pandemia de COVID-19.

Métodos. Se llevó a cabo un estudio transversal multicéntrico en diez países de América Latina mediante una encuesta en línea a través de diversas plataformas digitales, entre el 14 de octubre del 2020 y el 15 de febrero del 2021. Se realizó un análisis estadístico de los datos usando procedimientos de estadística descriptiva, la prueba ji al cuadrado y un análisis de regresión logística.

Resultados. En un total de 6 357 encuestas, el 58,2% de las personas encuestadas gozaba de seguridad alimentaria, el 29,3% tenía una inseguridad alimentaria leve, el 9,2% una inseguridad alimentaria moderada y el 3,3% una inseguridad alimentaria grave. Por lo que respecta a la asociación entre la inseguridad alimentaria y las variables sociodemográficas, hay una asociación significativa para algunas de las variables estudiadas, como la zona de residencia, el nivel de estudios, la actividad laboral, el número de personas en el hogar, el hogar con menores de 10 años y el nivel socioeconómico.

Conclusiones. Estos resultados indican que los factores sociodemográficos asociados a la inseguridad alimentaria durante la pandemia de COVID-19 en América Latina fueron la residencia en zonas rurales; la educación primaria y secundaria completa o no; la actividad laboral (trabajo doméstico, personas desempleadas y trabajadores autónomos); el nivel socioeconómico bajo, medio bajo, y medio; el hogar con más de cuatro personas; y el hogar con menores de 10 años.

Palabras clave

Inseguridad alimentaria; COVID-19; factores sociodemográficos; América Latina.

Insegurança alimentar e fatores sociodemográficos na América Latina durante a pandemia de COVID-19

RESUMO

Objetivo. Compreender a relação entre insegurança alimentar e fatores sociodemográficos em uma amostra populacional da América Latina durante a pandemia de COVID-19.

Métodos. Estudo transversal multicêntrico realizado em 10 países da América Latina por meio de uma pesquisa on-line conduzida em diferentes plataformas digitais de 14 de outubro de 2020 a 15 de fevereiro de 2021. A análise estatística dos dados foi realizada por meio da aplicação de estatísticas descritivas, teste qui-quadrado e análise de regressão logística.

Resultados. De um total de 6 357 questionários, 58,2% dos entrevistados afirmaram ter segurança alimentar, 29,3% indicaram um nível de insegurança alimentar leve, 9,2% tinham insegurança alimentar moderada e 3,3%, insegurança alimentar grave. No que diz respeito à relação entre insegurança alimentar e variáveis sociodemográficas, há uma relação significativa com as variáveis estudadas, incluindo área de residência, nível de escolaridade, ocupação, número de pessoas no domicílio, domicílio com crianças com menos de 10 anos de idade e nível socioeconômico.

Conclusões. Os achados apontam que os fatores sociodemográficos associados à insegurança alimentar durante a pandemia de COVID-19 na América Latina foram residência em zona rural; ensino fundamental e médio completo e incompleto; ocupação (do lar, desempregado(a) e autônomo(a)); nível socioeconômico baixo, médio-baixo e médio; domicílio com mais de quatro pessoas; e domicílio com crianças menores de 10 anos de idade.

Palavras-chave Insegurança alimentar; COVID-19; fatores sociodemográficos; América Latina.
