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Demographic and socioeconomic conditions associated with food insecurity in households in *Campinas*, SP, Brazil

Condições demográficas e socioeconômicas associadas à insegurança alimentar em domicílios de Campinas, SP

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ABSTRACT

Objective

To evaluate the association of food insecurity with demographic and socioeconomic conditions in households in *Campinas*, *São Paulo* state, Brazil.

Methods

This is a cross-sectional study conducted on a representative sample of the urban population of the Southern, Southwestern, and Northwestern Health Districts of *Campinas*, between 2011-2012. Characteristics of the head of household, family history and household patterns were investigated. The dependent variable was food security condition, categorized as food security, mild food insecurity, and moderate/severe food insecurity. All independent variables with p -value <0.20 in the bivariate multinomial logistic regression were included in the final model of multiple multinomial logistic regression, adjusted to household head age; the remaining variables had p -value <0.05 .

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Results

In the 691 households analyzed, there was 65% of food security, 27.9% of mild food insecurity, and 7.1% of moderate/severe food insecurity. The conditions associated with mild food insecurity were monthly *per capita* income less than the minimum wage, household head unemployed for more than six months between 2004-2010, living in properties given to the family/occupied/other, and density higher than two people per bedroom. The moderate/severe food insecurity was associated with informal employment condition of the household head and the presence of a beneficiary of the *Bolsa Família* (Family Allowance Program), a cash transfer-type program, in the household. The higher the score of the consumer goods, the lower the probability of mild food insecurity or moderate/severe food insecurity. There was a higher probability of mild food insecurity and moderate/severe food insecurity in unfinished masonry-built houses/other.

Conclusion

More than one third of the households investigated experienced some form of food insecurity. Mild food insecurity was associated with demographic conditions, while moderate/severe food insecurity was associated with socioeconomic conditions, especially those related to the household head.

Keywords: Food and nutrition security. Health surveys. Social conditions; Socioeconomic factors.

RESUMO

Objetivo

Avaliar a associação da insegurança alimentar com as condições demográficas e socioeconômicas em domicílios de Campinas (SP).

Métodos

Estudo transversal com amostra representativa da população urbana dos Distritos de Saúde Sul, Sudoeste e Noroeste de Campinas, realizado entre 2011-2012. Estudaram-se as características do chefe de família, dos antecedentes familiares e do domicílio. A variável dependente foi condição de segurança alimentar, categorizada em segurança alimentar, insegurança alimentar leve e insegurança alimentar moderada/grave. Todas as variáveis independentes com p -valor < 0,20 na regressão logística multinomial bivariada foram incluídas no modelo final de regressão logística multinomial múltipla, ajustado pela idade do chefe da família, permanecendo aquelas com p < 0,05.

Resultados

Nos 691 domicílios analisados, houve 65,0% em segurança alimentar, 27,9% em insegurança alimentar leve e 7,1% em insegurança alimentar moderada/grave. As condições associadas à insegurança alimentar leve foram renda familiar mensal per capita menor que um salário mínimo, desemprego do chefe da família por mais de seis meses entre 2004-2010, residir em domicílios de condição cedido/invasão/outra e com densidade maior que duas pessoas por dormitório. A insegurança alimentar moderada/grave esteve associada à informalidade do emprego do chefe da família e ter titular do Bolsa Família no domicílio. Quanto maior o escore de bens de consumo, menor foi a chance de insegurança alimentar leve ou moderada/grave, enquanto que houve maior chance da presença de qualquer tipo de insegurança alimentar nos domicílios construídos com alvenaria inacabada/outros.

Conclusão

Mais de um terço dos domicílios apresentam alguma forma de insegurança alimentar. A insegurança alimentar leve está associada às condições demográficas, enquanto que a moderada/grave associa-se às condições socioeconômicas, principalmente relacionadas ao chefe da família.

Palavras-chave: Segurança alimentar e nutricional. Inquéritos epidemiológicos. Condições sociais. Fatores socioeconômicos.

INTRODUCTION

The rights to adequate food and to food and nutrition security have been recognized and

constitutionally guaranteed in Brazil since 2006. This means that every citizen has the right to have permanent access to nutritionally adequate food, based on health-promoting practices considering

environmental, cultural, economic, and social diversity and sustainability, without restricting the access to other essential needs^{1,2}.

Food insecurity is inversely associated with socioeconomic status, and it has been investigated and monitored in developed and developing countries. In the United States, in 2014, 14.0% of the population lived in food-insecure households³, whereas in 2011/2012, in Mexico, the prevalence of food insecurity was 69.8%⁴, and in 2013, in Brazil, it was 22.6%⁵.

Despite global hunger reduction, about 805 million people are still chronically undernourished in the world. Therefore, hunger and poverty reduction remain as Sustainable Development Goals to be achieved by 2030^{6,7}.

The literature has reported various factors related to food insecurity, demonstrating that it is a complex phenomenon which is inter-related with structural features of society, labor market, and social and cultural aspects and lifestyle of families⁸⁻¹¹. This justifies investigations, such as the present study, on the living conditions in food insecure households, mainly when evaluated in terms of the extent to which each of these characteristics is associated with food insecurity and how they can contribute to the planning, execution, and monitoring of social, health, food, and nutrition policies aimed at food insecurity reduction.

Therefore, the aim of this study was to evaluate the association of food insecurity with demographic and socioeconomic conditions in the city of *Campinas*, *São Paulo* state, Brazil.

METHODS

A cross-sectional study was carried out on the urban population residing in the Southern, Southwestern, and Northwestern Health Districts, known as Southern region, in the city of *Campinas*, between April 2011 and September 2012. This region, with a population of 616,000 inhabitants (City Hall data based on the 2010

census), is home to those in the lowest socioeconomic status category in *Campinas*. Thus, since the likeability of identifying food insecure households is higher in low socioeconomic areas, due to budget constraint reasons, this study was restricted to this region.

The present study used some variables from a research that focused on identifying the association between food insecurity and chronic diseases in adults. We used the complete sample of the initial stage of that research, which investigated the characteristics of the head of the family, family history, and household. The algebraic expression for the estimation of proportions (Kish)¹² was used to calculate the number of households needed to estimate the prevalence of food insecurity (sample size).

$$n_o = \frac{P(1-P)}{(d/z)^2} \quad n = n_o \cdot deff$$

Since P is the proportion to be estimated, the value of 0.50 was adopted based on data from a previous research¹³; $z=1.96$ is the value of the standard normal distribution corresponding to the 95% confidence level used to determine the confidence interval; $d=0.10$ is the standard error of the sampling distribution. Applying these values, the initial sample size of 96 was determined. The design effect equal to 2.5 was used based on data of a previous study¹³. Thus, the sample calculated was composed of 240 households per district, totaling 720 households in the three districts. Initially, ten sectors were randomly selected in each one of the three districts, and after compiling a list of all households in the region studied (6,349), a total of 2,814 households were randomly selected. In order to replace households in which no one answered the door or which refused to participate, 938 previously selected households were visited, and 694 were included in the study. The houses in which there was no answer were visited at least three times on different week days. Considering the sample size, there was a sample loss of 3.6%. Three households did not provide

an answer to the outcome variable and were excluded from the study. Therefore, a total of 691 households were analyzed.

The household interviews were conducted by previously trained healthcare professionals under daily supervision. One occupant per household (≥ 18 years), who had knowledge of the family dynamics in terms of demographic and socioeconomic status and family nutrition, was interviewed.

The demographic variables regarding the characteristics of the head of the household were gender (male, female) and age (18-39, 40-59, 60 and over). The socioeconomic variables were: household head's level of education (< 4 years, ≥ 4 years and < 8 years, ≥ 8 years); household head's employment status (formally employed, informally employed/self-employed/casual worker, retired, pension holder/homemaker/student/other), monthly household *per capita* income (≥ 1 minimum wage, < 1 minimum wage, income not disclosed); the presence of a beneficiary of the *Bolsa Família* (Family Allowance Program), a cash transfer-type program (yes, no); and total sum of the scores of the presence of household goods and services according to the *Critério de Classificação Econômica Brasil - Associação Brasileira de Empresas de Pesquisa (ABEP) 2008* (Criteria of Economic Classification - Brazil, *Associação Brasileira de Empresas de Pesquisa 2008*) (color TV, radio, bathroom, car, computer, motorcycle, monthly maid service, washing machine, VCR and/or DVD, refrigerator, and freezer), with the score ranging from 0-38 since it did not include the level of education of the household head. The Criteria of Economic Classification - Brazil, *Associação Brasileira de Empresas de Pesquisa 2008* has established five economic classes¹⁴, which are grouped into A+B; C; D+E. Data about the unemployment of the head of the household for more than six months between 2004 and 2010 (no/did not work, yes) were also included.

The household characteristics evaluated were: property status (owned, rented, given to

the family/occupied), types of materials used for wall construction (finished masonry, unfinished masonry/poor quality material), type of sewage (public sewer; cesspit/no sewer system), and number of persons per bedroom (≤ 2 , > 2).

The dependent variable, food security, was measured using the *Escala Brasileira de Insegurança Alimentar (EBIA*, Brazilian Household Food Insecurity Measurement Scale), which is composed of 14 closed-ended questions that can be answered by a simple 'yes' or 'no'¹⁵, referring to the experiences of food insecurity in the last three months at several levels of severity. Considering that each affirmative answer corresponds to 1 point and that the scale ranges from 0 to 14 points, the scores are as follows: food security (0 points); mild food insecurity (1-5 points) in households with children under age 18 or (1-3 points) in households without minor children; and moderate insecurity (6-9) or (4-5) and severe insecurity (10-14) or (6-8 points) in households with or without minor children, respectively¹⁶.

Data were collected using Android (OS 2.1) mobile phones (smartphones). The data collected were synchronized by the field researcher weekly and were transferred to the database of the company responsible for programming the questionnaire. The database (dBase) files were converted into Stata (Stata Corporation, College Station, Texas, United States) version 9.0. Descriptive analysis was carried, absolute and relative frequency and chi-square values were calculated or a generalization of Fisher's exact test was used, at 5% significance level, to assess the differences according to the three categories of food security/insecurity: security vs mild food insecurity vs moderate or severe food insecurity. The effect of each category of the independent variables on the two levels of food insecurity was estimated using odds ratio with 95% confidence interval, calculated by the bivariate multinomial logistics regression.

Spearman correlation was used to test the association between the independent ordinal

variables, and Cramer's V was used with the other variables to verify the need to create interaction variables—if the pairs of variables had high correlation ($p \geq 0.500$).

Finally, the variables with $p < 0.20$ in the bivariate multinomial logistics regression were included in the final model of multiple multinomial logistic regression; the remaining variables had p -value < 0.05 .

All participants were individually informed of the purpose of the present study and were interviewed after signing the written informed consent form. This study was approved by the Research Ethics Committee of the *Faculdade Ciências Médicas, Universidade Estadual de Campinas* (School of Medical Sciences, University of Campinas), in December 2010 (CEP nº 1135/2010).

RESULTS

In the 691 households evaluated, the frequency of Food Security (FS) was 65.0%, whereas Mild Food Insecurity (MFI) and Moderate/Severe Food Insecurity (MSFI) were 27.9% and 7.1%, respectively.

With regard to the characteristics of the household heads, it was found that 67.5% were male, 69.5% were aged 18-59 years (51.8 ± 14.5), 47.2% had less than four years of schooling, 38.6% were formally employed, and 21.7% were unemployed for more than six months between 2004 and 2010. Most families (54.6%) belonged to economy class C and had monthly *per capita* income greater than or equal to the minimum wage (63.1%). In addition, 9.6% were beneficiaries of the cash transfer-type program, and in 89.6% of the households there were up to two people per bedroom (1.51 ± 0.73), 74.1% were owned properties, 70.9% were finished masonry-built houses, and 84.1% were connected to the public sewer system (Table 1). Statistical analyses showed that there were no strong correlations between the independent variables; therefore, there was no need to create interaction variables.

The bivariate multinomial regression showed higher probability of MFI in households whose head had less than 8 years of schooling, families of economic classes C and D+E, monthly *per capita* income less than the minimum wage, households with a beneficiary of the cash transfer-type program, those whose head was unemployed for more than six months between 2004-2010, properties that were given to the family/occupied/other, unfinished masonry-built houses, households with poor quality construction, and those not connected to the public sewer system (cesspit/no sewer system) and with more than two people per bedroom. In addition to all these variables, there was higher probability of MSFI in female-headed households and whose head was informally employed/self-employed or pension holder/homemaker/student/other (Table 2).

Table 3 shows the final model of the multiple multinomial logistic regression. There was a higher probability of MFI in households with monthly *per capita* income less than the minimum wage (*Odds Ratio* (OR) = 1.69, 95% Confidence Interval (95%CI) 1.06-2.70), whose head was unemployed for more than six months between 2004-2010 (OR=2.10, 95%CI 1.28-3.44), properties that were given to the family/occupied/other (OR=2.45; 95%CI 1.30-4.63), and households with more than two people per bedroom (OR=2.20, 95%CI 1.16-4.15). Higher probability of MSFI was observed in households whose head was informally employed/self-employed/casual worker (OR=4.51, 95%CI 1.51-13.4) or pension holder/homemaker/student/other (OR=5.74, 95%CI 1.73-18.9) and there was a beneficiary of the cash transfer-type program (OR=3.33, 95%CI 1.22-9.09). The higher the score of the consumer goods, the lower the probability of MFI and MSFI (OR=0.95, 95%CI 0.91-0.98 and OR=0.86; 95%CI 0.80-0.92, respectively). Higher probability of MFI and MSFI was also observed in unfinished masonry-built houses/other (OR=2.64, 95%CI 1.67-4.18, and OR=3.20, 95%CI 1.38-7.39, respectively).

Table 1. Characterization of the families and households investigated in terms of demographic, socioeconomic, and sanitary conditions. Campinas (SP), Brazil, 2012.

Family characteristics	n=691	%
<i>Gender of household head*</i>		
Male	423	67.5
Female	204	32.5
<i>Age of household head*</i>		
18-39 years	131	20.9
40-59 years	305	48.6
60 years and over	191	30.5
<i>Education level of household head*</i>		
≥8 years	190	30.5
≥4 years and <8 years	139	22.3
<4 years	294	47.2
<i>Economic class*</i>		
A + B	214	34.3
C	340	54.6
D + E	69	11.1
<i>Employment status of household head*</i>		
Formally employed	232	38.6
Informally employed/ Self-employed/Casual work*	133	22.1
Retired	151	25.1
Pension holder/ Homemaker/ Student/Other	85	14.1
<i>Monthly household per capita income*</i>		
≥1MW	433	63.1
<1MW	187	27.3
Income not disclosed	66	9.6
<i>Beneficiary of the Family Allowance Program</i>		
No	625	90.4
Yes	66	9.6
<i>Household head unemployed for more than six months between 2004-2010</i>		
No/did not work	541	78.3
Yes	150	21.7
Household characteristics		
<i>Property status*</i>		
Owned	511	74.1
Rented	92	13.3
Given to the family/Occupied/Other	87	12.6
<i>Type of construction</i>		
Finished masonry	490	70.9
Unfinished masonry/poor quality construction	201	29.1
<i>Type of sewage</i>		
Public sewer	581	84.1
Cesspit/no sewer system	110	15.9
<i>Number of people per bedroom*</i>		
Up to 2	609	89.6
>2	71	10.4

Note: *Due to missing values the total is less than 691.

MW: Minimum Wage.

Table 2. Bivariate multinomial logistic regression of the conditions associated with mild and moderate/severe food insecurity using Food Security as the category of reference. Campinas (SP), Brazil, 2012.

Variables	Food security condition						p-value	OR (CI95%) (c/a) ^{1,2}	p-value	OR (CI95%) (c/a) ^{1,2}	p-value
	Food security (a)		Mild food insecurity (b)		Moderate/severe food insecurity (c)						
	n=449	%	n=449	%	n=49	%					
Family Characteristics											
Gender of household head**											
Male	288	68.1	118	27.9	17	4.0	<0.01	1	3.68 (1.91-7.07)	0.10	<0.01
Female	115	56.4	64	31.4	25	12.2		1			
Age of household head**											
18-39 years	80	61.0	42	32.1	9	6.9	0.90	1			
40-59 years	196	64.3	88	28.5	21	6.9		0.85 (0.54-1.34)	0.49	0.95 (0.41-2.16)	0.90
60 years and over	127	66.5	52	27.2	12	6.3		0.77 (0.47-1.27)	0.32	0.83 (0.33-2.08)	0.70
Education level of household head**											
≥ 8 years	143	75.3	40	21.0	7	3.7	<0.01	1			
≥ 4 years and <8 years	88	63.3	44	31.7	7	5.0		1.78 (1.08-2.95)	0.02	1.62 (0.55-4.78)	0.37
<4 years	170	57.8	97	33.0	27	9.2		2.03 (1.32-3.13)	<0.01	3.24 (1.37-7.67)	<0.01
Economic class**											
A + B	166	77.6	45	21.0	3	1.4	<0.01*	1			
C	204	60.0	107	31.5	29	8.5		1.93 (1.29-2.89)	<0.01	7.86 (2.35-26.2)	<0.01
D + E	31	45.0	29	42.0	9	13.0		3.45 (1.88-6.31)	<0.01	16.0 (4.11-62.6)	<0.01
Employment status of household head**											
Formally employed	158	68.1	68	29.3	6	2.6	<0.01*	1			
Informally employed/ Self-employed/Casual worker	76	57.1	44	33.1	13	9.8		1.34 (0.84-2.14)	0.21	4.50 (1.64-12.3)	<0.01
Retired	108	71.5	40	26.5	3	2.0		0.86 (0.54-1.36)	0.52	0.73 (0.17-2.98)	0.66
Pension holder/HOMEMAKER/Student/Other	44	51.8	24	28.4	17	20.0		1.26 (0.71-2.24)	0.41	10.1 (3.78-27.3)	<0.01
Monthly household per capita income**											
≥1 MW	315	72.8	97	22.4	21	4.8	<0.01*	1			
<1 MW	90	48.1	74	39.6	23	12.3		2.67 (1.82-3.91)	<0.01	3.83 (2.02-7.24)	<0.01
Income not disclosed	40	60.6	21	31.8	5	7.6		1.70 (0.95-3.03)	0.06	1.87 (0.66-5.24)	0.23
Beneficiary of the Family Allowance Program											
No	425	68.0	165	26.4	35	5.6	<0.01	1			
Yes	24	36.4	28	42.4	14	21.2		3.00 (1.69-5.33)	<0.01	7.08 (3.36-14.9)	<0.01

Table 2. Bivariate multinomial logistic regression of the conditions associated with mild and moderate/severe food insecurity using Food Security as the category of reference. Campinas (SP), Brazil, 2012.

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Variables	Food security condition						p-value	OR (CI95%) (c/a) ^{1,2}	p-value	OR (CI95%) (b/a) ^{1,2}	p-value	OR (CI95%) (c/a) ^{1,2}
	Food security (a)		Mild food insecurity (b)		Moderate/severe food insecurity (c)							
	n=449	%	n=193	%	n=49	%						
<i>Household head unemployed for more than six months between 2004-2010</i>							<0.01					
No/did not work	379	70.1	131	24.2	31	5.7		1	1		1	
Yes	70	46.7	62	41.3	18	12.0		2.56 (1.72-3.80)	<0.01	3.14 (1.66-5.92)	<0.01	
<i>Household characteristics</i>												
<i>Property status**</i>							<0.01					
Owned	361	70.6	122	23.9	28	5.5		1	1		1	
Rented	54	58.7	29	31.5	9	9.8		1.58 (0.96-2.60)	0.07	2.14 (0.96-4.79)	0.06	
Given to the family/Occupied	33	37.9	42	48.3	12	13.8		3.76 (2.28-6.20)	<0.01	4.68 (2.18-10.1)	<0.01	
<i>Type of construction</i>							<0.01					
Finished masonry	365	74.5	104	21.2	21	4.3		1	1		1	
Unfinished masonry/poor quality construction	84	41.8	89	44.3	28	13.9		3.71 (2.57-5.37)	<0.01	5.79 (3.13-10.7)	<0.01	
<i>Type of sewage</i>							<0.01					
Public sewer	401	69.1	144	24.7	36	6.2		1	1		1	
Cesspit/no sewer system	48	43.6	49	44.5	13	11.9		2.84 (1.82-4.41)	<0.01	3.01 (1.49-6.08)	<0.01	
<i>Number of people per bedroom**</i>							<0.01					
Up to 2	413	67.8	156	25.6	40	6.6		1	1		1	
>2	29	40.8	34	47.9	8	11.3		3.10 (1.82-5.26)	<0.01	2.84 (1.22-6.64)	0.01	

Note: ¹Generalization of Fisher's exact test. ²Due to missing values the total is less than 449 to Food Security, 193 to Mild Food Insecurity, and 49 to Moderate/Severe food insecurity; ¹OR calculated by multinomial logistic regression; ²Category of reference: Food Security.
OR: Odds Ratio; CI: 5% Confidence Interval.

Table 3. Final model of the multiple multinomial logistic regression of the conditions associated with mild and moderate/severe food insecurity using Food Security as the category of reference. *Campinas* (SP), Brazil, 2012.

Variables	Mild food insecurity ²			Moderate/severe food insecurity ²		
	OR	CI95%	p-value	OR	CI95%	p-value
<i>Employment status of household head</i>						
Formally employed	1			1		
Informally employed/Self-employed/Casual worker	1.42	0.82-2.48	0.20	4.51	1.51-13.4	<0.01
Retired	1.17	0.67-2.05	0.57	0.71	0.15-3.29	0.66
Pension holder/Homemaker/Student/Other	1.03	0.51-2.09	0.92	5.74	1.73-18.9	<0.01
<i>Monthly household per capita income</i>						
≥1 MW	1			1		
<1 MW	1.69	1.06-2.70	0.02	2.17	0.98-5.02	0.07
Income not disclosed	1.89	0.84-4.23	0.84	0.81	0.16-3.93	0.79
<i>Beneficiary of the Family Allowance Program</i>						
No	1			1		
Yes	1.00	0.46-2.16	0.98	3.33	1.22-9.09	0.01
<i>Number of household goods</i>						
	0.95	0.91-0.98	<0.01	0.86	0.80-0.92	<0.01
<i>Household head unemployed for more than six months between 2004-2010</i>						
No/did not work	1			1		
Yes	2.10	1.28-3.44	<0.01	1.43	0.59-3.45	0.41
<i>Property status</i>						
Owned	1			1		
Rented	1.52	0.82-2.82	0.17	0.78	0.24-2.51	0.68
Given to the family/Occupied/Other	2.45	1.30-4.63	<0.01	1.21	0.42-3.51	0.71
<i>Type of construction</i>						
Finished masonry	1			1		
Unfinished masonry/poor quality construction	2.64	1.67-4.18	<0.01	3.20	1.38-7.39	<0.01
<i>Number of people per bedroom</i>						
Up to 2	1			1		
>2	2.20	1.16-4.15	0.01	1.30	0.39-4.30	0.39

Note: ¹OR calculated by multiple multinomial logistic regression; ²Category of reference: Food Security.

OR: Odds Ratio; CI: 95% Confidence Interval; MW: Minimum Wage.

DISCUSSION

The identification, analysis, documenting, and recognition of factors associated with food and nutrition insecurity in Brazil are key objectives of the *Política Nacional de Segurança Alimentar e Nutricional* (PNSAN, National Food and Nutrition Insecurity Policy), which has the responsibility to defend and protect the human right to adequate food¹⁷.

Although *Campinas* is one of the richest cities in the country, the 2003 population survey data, conducted using the *EBIA*, showed that more than half of the entire population experienced some level of food insecurity¹³,

reflecting the great inequality of income distribution and access to food. In 2011-12 this value decreased to 35% for the population of the region with the lowest socioeconomic status, suggesting that the prevalence of food insecurity in the entire city can be even lower. Similarly, food insecurity reduction has been reported in Brazil since 2004 by the *Pesquisa Nacional por Amostra de Domicílios* (PNAD, National Household Sample Survey). In 2013, there was a reduction in the three levels of Food Insecurity (FI), with prevalence of 14.8% of Mild FI, 4.6% of moderate FI, and 3.2% of severe FI⁵. Despite the considerable reduction in FI in *Campinas*, it is worth mentioning that the frequency of MFI was almost twice the

2013 national average; however, the MSFI was slightly lower than the national average (7.1% vs 7.8%).

The study sample is representative of the three districts with the lowest socioeconomic status in the city, which was home to 59.6% of the city when this research was carried out. Therefore, understanding the factors associated with FI can contribute to the development of new actions aimed at its reduction.

Although the level of education of the household head was not included in the final model of multiple multinomial regression, it was inversely associated with FI, which is consistent with the findings of other studies^{9,10}. Level of education is directly related to higher earnings^{18,19}, which in turn, can determine the consumption pattern of the population. Moreover, education is an important indicator of food security, not only due to its potential correlation with occupation and income, but also because it has a positive impact on how the household resources are managed²⁰. This management is related to the family's ability to cope with deprivation, increasing the probability to overcome or reduce FI¹⁰.

The analysis of *PNAD*, 2004 data showed that low household *per capita* income was the most important determinant of food insecurity^{9,21}. Other studies have also shown this association^{3,8}. Using only *PNAD*, 2004 data from households that received cash transfer (CT), Segall-Corrêa *et al.*²², showed that for every cash transfer of R\$10.00, the chance of food security increased by approximately 8%. In the present study, lower monthly household *per capita* income was associated with MFI and MSFI, although the latter was not statistically significant at 95% confidence level. It is worth highlighting that income also determined various conditions that remained in the final model, as described below.

Municipal data show that there has been increased coverage of social cash transfer programs, especially from 2004 onwards with the creation of the cash transfer-type program (*Bolsa Família*). In 2005, 11,314 families were assisted

by this program, and in 2012, there was an increase by 59.1%, i.e., 27,685 families were assisted, accounting for 7.9% of the city's households²³⁻²⁴. Nevertheless, in the present study, the households with beneficiaries of the program were three times more likely to experience MSFI, which suggests that, on the one hand, the program is meeting the basic needs of the target population, socially vulnerable people and those who experience high levels of hunger; but, on the other hand, there is need to increase the transfer amount provided to those families as a short-term measure. Long-term measures would include strengthening education policies, job creation, and development of food and nutrition education strategies so that those families would have more autonomy and increased awareness in terms of access to nutritionally adequate food.

Like the *PNAD* 2004 data, the data from the present study also showed that the higher the score of the presence of household goods and services, the lower the risk of FI⁹; the possession of goods or services may indicate not only their current financial situation but also a history of better financial conditions or the priority that those families give to the management of their earnings.

Consistent with the findings from other studies, it was found that the living conditions, which included unfinished masonry or other; property given to the family, occupied, or other; and more than two people per bedroom, also increased the probability of food insecurity^{21,25-27}. Those families often cannot afford to improve their housing conditions because they need to use the money on priority household bills and living expenses or even to buy other goods, such as motorcycle, car, or appliances. Multigenerational households, i.e., more than two generations of the same family live under the same roof, eventually result in a household composition with greater number of people per bedroom or per room and are an approach to overcome their financial difficulties and the lack of access to housing, food, and other basic needs²⁸.

Finally, as for the household head employment status, informal workers accounted for 22.1% of the sample studied and were almost four times more likely to experience MSFI than formal workers, corroborating a result from the *Pesquisa Nacional por Amostra de Domicílios* 2013⁵. In the 1990s, level of education was identified as a necessary condition for better paying jobs²⁹, a condition that persists today combined with the importance of learning a foreign language and computer skills. The analysis of national unemployment rates among young people and the difficulties they encounter in finding work, has demonstrated the educational disadvantage among those who come from low-income families³⁰. Accordingly, unemployment or lack of formal employment are directly associated with food insecurity^{8,21}.

Since this is a cross-sectional study, it was not possible to draw cause-and-effect inferences between the variables. Additionally, the fact that the study was restricted to the lowest socioeconomic status region, due to budget constraints, may have contributed to the sample homogenization, reducing the probabilities of showing the relationship of the factors associated with food insecurity. However, the estimated power of the test was 0.9, with $\alpha=0.05$ and $\beta=0.1$, thus ensuring that the sample size was sufficiently large to confirm the relationships found between the variables studied. Therefore, these data can be extrapolated to populations with similar characteristics, i.e., urban population living in the peripheries of large cities in the Southeastern and Southern regions of the country.

CONCLUSION

Despite the noticeable efforts devoted to the implementation of public policies on food and nutrition, more than a third of the interviewed households experienced some form of food insecurity, which is higher than the 2013 national average.

The results show the differences in the household characteristics associated with food deprivation. Mild food insecurity was more strongly associated with demographic conditions, suggesting that the most immediate problems were solved. However, in order to achieve food security, changes related to household infrastructure, job stability, and adequate living condition, such as the number of bedrooms and rooms proportional to the number of people residing in the household, are needed. The greater the number of goods owned by the households, the lower the probability of food insecurity, indicating that people buy goods when they have guaranteed access to food. In addition to these characteristics, moderate or severe food insecurity is associated with socioeconomic conditions, especially unemployment.

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CONTRIBUTORS

BFNJ SOUZA wrote this article and performed the statistical analyses. L MARIN-LEON guided and reviewed all sections and versions of the article. DFM CAMARGO and AM SEGALL-CORRÊA collaborated in the revision and final version of the article.

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