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This study comes from the master's thesis entitled "Household food insecurity in the municipality of Criciúma-SC," authored by Edimar Torres Zanoni and guidance by Fernanda de Oliveira Meller, by The Graduate Program in Public Health of the Universidade do Extremo Sul Catarinense, presented in June 2022. Criciúma, SC, Brasil.

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Household food insecurity in a city from southern Brazil: a population-based study

Insegurança alimentar domiciliar em um município do sul do Brasil: estudo de base populacional

Abstract

Introduction: Food insecurity (FI) is characterized by the lack of access to food in adequate quantity and quality. In recent years, there has been an upward trend in FI, and sociodemographic factors seem to influence it. ***Objective***: To verify the prevalence of FI and its associated factors in households in a municipality in southern Santa Catarina. ***Methods***: Population-based cross-sectional study, conducted in Criciúma-SC in 2019, with individuals aged ≥18 years. The analysis included all families in which the head of the household (individual who contributed most of the household income) participated in the research. The Brazilian food insecurity scale assessed the household FI, and sociodemographic and food characteristics were evaluated as independent variables. The study performed adjusted analyses using Poisson regression, considering a significance level of 5% to evaluate the associations between FI and the independent variables. ***Results***: Four hundred and thirty-nine households and five hundred and sixty-two individuals participated in the study. The prevalence of FI was 25.8%, being higher in households with residents between 18 and 29 years of age (PR=1.72; 95% CI 1.08-2.76) and between 30 and 39 years of age (PR=2.02; 95% CI 1.35-3.03), mixed race (PR=1.47; 95% CI 1.01-2.13), under 18 years of age (PR=1.70; 95% CI 1.16;2.47), and who ate 1-2 meals daily (PR=2.29; 95% CI 1.15-4.60), all compared with their peers. In addition, income showed an inverse linear trend with FI, which means that as income decreases, the prevalence of home FI increases (<0.001). ***Conclusion***: One in four households is FI, and demographic, socioeconomic, and nutritional factors influence this outcome. Given these findings, it will be possible to direct public actions and policies to ensure adequate food for the population.

Keywords: Food and nutrition security. Human Rights. Cross-Sectional Studies

Resumo

Introdução: A insegurança alimentar (IA) é caracterizada pela falta de acesso a alimentos em quantidade e qualidade adequadas. Nos últimos anos, uma tendência de crescimento em sua prevalência vem sendo observada, e fatores sociodemográficos parecem influenciar a IA. ***Objetivo***: Verificar a prevalência de IA e seus fatores associados em domicílios de um município do sul de Santa Catarina. ***Métodos***: Estudo transversal de base populacional, conduzido em Criciúma-SC em 2019, com indivíduos com ≥18 anos. Todos os domicílios nos quais o chefe da família (indivíduo que contribuía com a maior parte da renda domiciliar) participou da pesquisa foram incluídos nas análises. A IA domiciliar foi avaliada através da Escala Brasileira de Insegurança Alimentar, e características sociodemográficas e alimentares foram avaliadas como variáveis independentes. Para avaliar as associações entre IA e as variáveis independentes, foram realizadas análises ajustadas utilizando-se Regressão de Poisson, considerando nível de significância de 5%. ***Resultados***:

Participaram do estudo 439 domicílios e 562 indivíduos. A prevalência de IA foi de 25,8%, sendo maior nos domicílios com: moradores entre 18 e 29 anos (RP=1,72; IC95%1,08-2,76) e entre 30 e 39 anos (RP=2,02; IC95%1,35-3,03),de cor parda (RP=1,47; IC95% 1,01-2,13), menores de 18 anos de idade (RP=1,70; IC95% 1,16;2,47),e que realizavam 1-2 refeições diárias (RP=2,29; IC95% 1,15-4,60), todos comparados com seus pares. Ademais, a renda apresentou tendência linear inversa com a IA, isto é, conforme a diminuição da renda, maior a prevalência de IA domiciliar (<0,001). *Conclusão*: Um em cada quatro domicílios apresenta IA,sendo esse desfecho influenciado por fatores demográficos, socioeconômicos e nutricionais. Diante desses achados, será possível direcionar as ações e políticas públicas para a garantia da alimentação adequada à população.

Palavras-chave: Segurança Alimentar e Nutricional. Direitos Humanos. Estudos Transversais.

INTRODUCTION

Food and Nutrition Security (FNS) focuses on the fulfillment of the Human Right to Adequate Nutrition (HRAN), which corresponds to access to sufficient food in quantity and quality for the entire population. The HRAN also guarantees respect for the principle of health-promoting dietary practices that respect the cultural, environmental, and economic variety and are socially sustainable.[1,2] Thus, food insecurity (FI) is conditioned by the lack of access to food in quantity and quality and can be categorized in a milder degree (absence of hunger) even more severe, reaching the state of hunger. These distinct levels of FI can compromise the physical and psychological aspects of the human being.[3]

In Brazil, the Family Budget Survey (FBS) of 2017-2018 showed that 36.7% of private households were in a situation of FI. Of these, 24.0% in mild FI, 8.1% in moderate FI, and severe FI was 4.6%.[4] This data is in accordance with a trend observed in the national territory since 2013, in which studies observed until 2018 an increase of 76.1% in the prevalence of moderate FI and 43.7% in the prevalence of severe FI.[4] When specifically analyzed the Southern Region of Brazil, variations in the prevalence of FI are found over the years: in 2004, it was 23.5%; in 2009, it reduced to 18.6%, and in 2013, to 14.9%; however, in 2018 there was an increase to 20.7%, reaching a prevalence of 48.2% in 2022.[4-6]

In its second edition, the national survey on FI in the context of the COVID-19 pandemic in Brazil analyzed data collected between November 2021 and April 2022, showing that more than half of Brazilian households were in a situation of FI. This result is worrying and reveals the injustice and neglect to millions of Brazilians. There are 125.2 million people in FI in the country, and more than 33 million are in severe FI, that is, in a situation of hunger.[6]

Factors that violate the HRAN and are associated with FI correspond to socioeconomic and demographic issues, such as age, skin color, education, and monthly income.[7-15] The study by Facchini et al., which sought to compare FI in the Northeast and South of Brazil, showed that, in the Northeast, households in which the head of household reported mixed race and black skin color had, respectively, 1.18 and 1.50 times more moderate or severe FI, compared to those with white skin color. In the Southern Region, individuals with mixed race skin color had a prevalence 1.37 times higher of moderate or severe FI compared to those with white skin color, and in individuals with black skin color this prevalence was 1.69 times higher.[16]

In the study by Santos et al.,[17] the authors observed a higher prevalence of FI among adults aged 20-39 and 40-59 years when compared to the older people (≥60 years). Similarly, research of Maas et al.,[14] observed a lower probability of FI in people over 70 years of age (PR 0.63; 95% CI 0.42;0.95) when compared to adults aged 18 to 29 years. An investigation by Schott et al.[18] showed a positive relationship between FI and low income *per capita.* Research of Cabral et al.,[19] observed that as the years passed and there was an increase in family income, there was a significant reduction in the number of families with moderate and severe FI.

Considering the upward trend of FI throughout the Brazilian territory, it is crucial to identify the factors related to this outcome for the development of health actions and policies that can fight against this situation. Therefore, the present study aimed to verify the prevalence of FI and its associated factors in households in a municipality in the south of Santa Catarina-SC.

METHODS

A cross-sectional study with a quantitative approach, conducted with data from the population-based survey entitled "The Health of the Criciumense Population," developed from March to December 2019 in the municipality of Criciúma-SC. Criciúma has about 219,393 inhabitants, a territorial area of 234,865 km^2, a Human Development Index of 0.788, and Gross Domestic Product *per capita* of 38.244,79 reais.[20]

The study included adults aged 18 years or older living in the urban area of the studied municipality. It excluded individuals unable to answer the questionnaire due to physical and/or cognitive impossibilities.

The sampling process was conducted in two stages, based on data from the 2010 demographic Census.[21] The primary sampling units were census tracts, and the secondary units were households. First, the study listed in ascending order, and according to the given code, all 306 census tracts located in the municipality's urban area that had private properties. After, 25% of them were drawn, which totaled 77 sectors, resulting in 15,218 households identified. Of these, 618 households were randomly selected to participate in the research. The study invited all individuals aged 18 or over living in the households drawn.

Trained interviewers conducted the interviews in the households. They used a questionnaire with an average application time of 30 minutes that contained demographic, socioeconomic, nutritional, behavioral, and health questions. This questionnaire was unique, standardized, and pre-coded. After collection, the fieldwork supervisor reviewed all data, and the interviewers coded them. The analysis included double typing, and the EpiData 3.1 *software* validated the data to ensure the quality of the information.

The outcome variable studied in the present study was FI, which was evaluated using the long form of the Brazilian Food Insecurity Scale (EBIA), validated by Pérez-Escamilla et al.[22] It is a psychometric scale, with 14 closed questions, referring to the period of three months before the interview, which assesses the perception of intra-family food security (FS) in relation to access to food and identifies groups vulnerable to violations of the HRAN. In households with residents under 18 years of age, interviewers apply the 14 questions of the scale, but in households without residents under 18 years of age, they apply only eight questions of the scale. The household food security situation is classified into four levels: FS (0 points), mild FI (1-5 points in households with individuals under 18 years of age; 1-3 points in households without residents under 18 years of age), moderate FI (6-9 points in households with persons under 18 years of age; 4-5 points in households without residents under 18 years of age), severe FI (10-14 points in households with residents under 18 years of age; 6-8 points in households with residents under 18 years of age).[22-24]

The interviewers applied this scale to the head of the household of the homes that were part of the study. The study attributed the FS situation to all the other residents, i.e., if a household had more than one resident, the FS classification identified from the scale applied to the head of the family was considered the same for all the residents.

Importantly, the study defined "head of household" as the individual who contributed most of the household income.

All household residents answered sociodemographic, behavioral, and nutritional questions. The analysis evaluated the following exposure variables: gender (female, male); age (collected in full years and categorized into 18-29 years, 30-39 years, 40-49 years, 50-59 years, ≥60 years); skin color (white, black, yellow, mixed-race, indigenous); education of the head of household (collected in full years and categorized into 0-4 years, 5-8 years, 9-11 years and ≥12 years); monthly income (<500.00 reais, 500.00-1,000.00 reais,1,001.00-2,000.00 reais and >2,000.00 reais); paid work (no, yes); marital status (single, married/common-law, separated/divorced, widowed); type of housing (own, rented, borrowed); the number of residents in the household (1, 2, 3, ≥4); the presence of resident(s) under 18 years of age (no, yes); nutritional status (not overweight, overweight), self-perception of food (very good, good, regular, poor, very poor); the number of meals eaten during the day (1, 2, 3, 4, 5, 6); achievement of the main meals of the day, defined as breakfast, lunch, and dinner (no, yes) and food quality (evaluated in tertile).

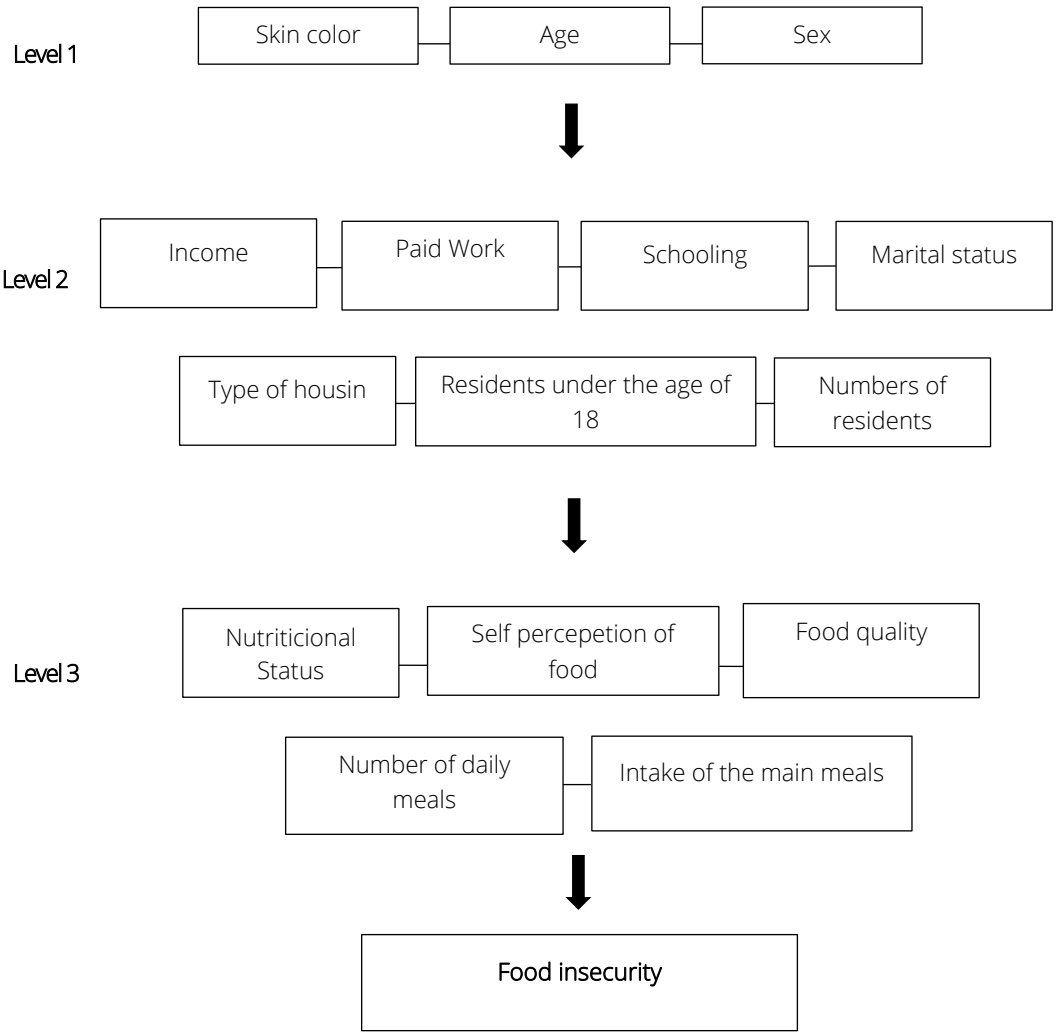
The research assessed food quality using the indicator proposed by Francisco et al. for Brazilian adults and older people.[25] This indicator was developed from a set of meals considered healthy or protective for chronic diseases (fruits, vegetables, milk, and legumes) and foods considered unhealthy or at risk for chronic diseases (sweets, soda or industrialized juice, and red meat).[25] For the construction of the indicator, the research asked about the frequency of weekly consumption of the such foods. A score of 0-4 points is offered for each food according to the consumption responses (never, almost never, 1-2 days, 3-4 days, 5-6 days, daily), and for healthy foods, the lower the score, the higher the consumption. For unhealthy foods, the opposite is true (the higher the score, the higher the consumption). The final score corresponds to the sum of this score and can range from 0 (worst quality) to 28 points (best quality).[25,26]

The analysis used the participants' self-reported weight and height to assess nutritional status. Excess weight was identified by body mass index (BMI), which determines nutritional status by dividing weight by height squared. The cut-off points for overweight were BMI ≥25 Kg/m^2 for adults up to 59 years of age, as recommended by the World Health Organization,[27] and BMI ≥27 Kg/m2 for the old people (≥60 years) according to the Lipschitz suggestions, recommended by the Ministry of Health and which best indicate the risk for mortality in the older people.[28-30]

Descriptive analyses of all variables studied were performed by presenting the absolute (n) and relative (%) frequencies. Crude analyses of the association between FI and independent variables were performed using Pearson's Chi-square test, with a significance level of 5%.

In addition, the research conducted adjusted analyses using Poisson regression with robust variance, showing a p-value corresponding to the Wald test for heterogeneity and/or linear trend. For the adjusted analyses, it constructed a hierarchical three-level determination model (Figure 1). In the first level (distal), the research included the variables skin color, age, and gender; in the second level (intermediate), the variables income, paid work, education, marital status, type of housing, residents under 18 years of age and number of residents in the household; and in the third level (proximal), nutritional status, self-perception of food, quality of food, number of meals and main meals.

Figure 1. Hierarchical model of factors associated with food insecurity.


Level 1
Skin color
Age
Sex
Level 2
Income
Paid Work
Schooling
Marital status
Type of housin
Residents under the age of 18
Numbers of residents
Level 3
Nutriticional Status
Self percepetion of food
Food quality
Number of daily meals
Intake of the main meals
Food insecurity

The analysis considered the variables with a significance level of 20% (p-value <0.20) as possible confounding factors.

The study used the IBM SPSS version 23.0 program for all statistical analyses.

All participants provided written informed consent to participate in the study. The Human Research Ethics Committee of the Universidade do Extremo Sul Catarinense approved the research in December 2018 (CAAE: 04033118.4.0000.0119).

RESULTS

The study was conducted with 618 households. However, as the head of the family was not present in all households, the study had the participation of 439 households (response rate of 71%, totaling 562 individuals studied).

Table 1 presents the participants' demographic, socioeconomic, behavioral, and dietary characteristics. Most of them were 60 years old or older (52.3%), female (56.8%), married (57.7%), reported white skin color (79.1%), lived in their own home (87.7%), had 9-11 years of Education (30.8%) and were overweight (57.5%). About a third of the individuals had a monthly income of 1,001.00 - 2,000.00 reais and reported paid work in the last 30 days prior to the interview (35.0%). In addition, 73.8% of the individuals reported a perception of good or very good nutrition, about a third had four meals a day (37.3%), and one in four had the main meals of the day (breakfast, lunch, and dinner) (24.2%).

Table 1. Sociodemographic, behavioral, and feeding characteristics of the adults and old people studied. Criciúma-SC, Brazil, 2019. (n=562)

Variables	n	% (95% CI)
Sex		
Male	243	43.2 (39.2-47.4)
Female	319	56.8 (52.6-60.8)
Age (full years)		
18-29	43	7.6 (5.7-9.8)
30-39	50	8.9 (6.6-11.4)
40-49	55	9.8 (7.3-12.3)
50-59	120	21.4 (17.8-24.7)
≥60	294	52.3 (48.4-56.8)
Skin color		
White	444	79.1 (75.8-82.4)
Black	39	7.0 (5.0-9.1)
Mixed race	63	11.2 (8.7-13.7)
Yellow	11	2.0 (0.9-3.2)
Indigenous	4	0.7 (0.2-1.4)
Education (full years)		
0-4	156	27.8 (24.4-31.6)
5-8	162	28.9 (25.1-32.4)
9-11	173	30.8 (26.9-34.8)
≥12	70	12.5 (10.0-15.5)
Monthly income (reais)		
<500.00	64	11.7 (9.2-14.7)
500.00-1000.00	108	19.9 (16.5-23.5)
1001.00-2000.00	187	34.4 (30.3-38.2)
>2000.00	185	34.0 (30.1-38.1)
Paid work		
No	364	65.0 (61.1-68.8)
Yes	196	35.0 (31.3-38.9)

Table 1. Sociodemographic, behavioral, and feeding characteristics of the adults and old people studied. Criciúma-SC, Brazil, 2019. (n=562)

Variables	n	% (95% CI)
Marital status		
Single(a)	80	14.2 (11.4-17.1)
Married/ common-law	324	57.7 (53.6-61.6)
Separated/divorced	69	12.3 (9.8-15.1)
Widower	89	15.8 (13.0-18.7)
Type of housing		
Own	491	87.7 (85.0-90.5)
Rented	53	9.4 (7.1-12.0)
Borrowed	16	2.9 (1.6-4.3)
Number of residents		
1	71	12.7 (9.8-15.4)
2	223	39.8 (35.7-43.9)
3	129	23.0 (19.6-26.6)
≥4	137	24.5 (20.9-28.0)
Resident(s) under 18 years of age[a]		
No	342	77.6 (73.4-81.2)
Yes	99	22.4 (18.8-26.6)
Nutritional status		
No overweight	227	42.5 (38.2-46.6)
Overweight	307	57.5 (53.4-61.8)
Self-perception of food		
Very good	62	11.0 (8.4-13.7)
Good	353	62.8 (58.7-66.9)
Regular	118	21.0 (17.4-24.4)
Bad	24	4.3 (2.7-6.0)
Very bad	5	0.9 (0.2-1.8)
Feed quality		
Tertile 1 (best)	195	34.9 (30.8-38.5)
Tertile 2	177	31.7 (27.5-35.6)
Tertile 3 (worst)	187	33.4 (29.5-37.9)
Number of meals taken		
1	1	0.2 (0.0-0.5)
2	13	2.3 (1.3-3.8)
3	117	20.9 (17.7-24.1)
4	209	37.3 (33.2-41.3)
5	158	28.2 (24.3-32.1)
6	62	11.1 (8.6-13.8)
Taking the main meals		
No	426	75.8 (72.1-79.4)
Yes	136	24.2 (20.6-27.9)

CI: confidence interval.

[a]Variable with the highest number of unknown observations (n=121; 21.5%).

Figure 2 presents the prevalence of FI, as well as its classifications. Food insecurity was noted in 25.8% of households, of which 5% were at moderate level and 2.7% at severe level.

Figure 2. Prevalence of food insecurity and its classifications. Criciúma-SC, Brazil, 2019. (n=562)

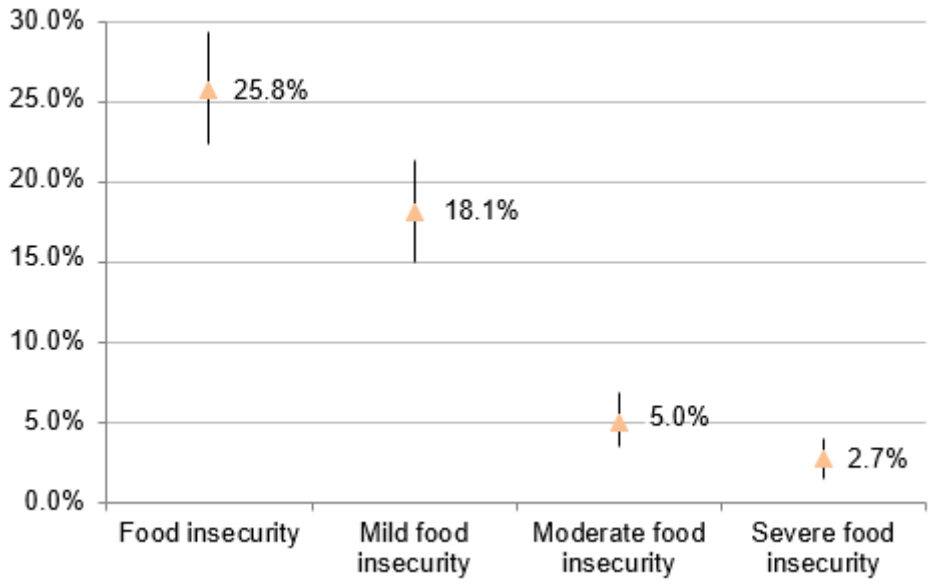


Table 2 presents the crude and adjusted analyses of the association between FI and the sociodemographic, behavioral, feeding, and nutritional status variables. In the crude analysis, the highest prevalence of FI was found in rented households (p<0.001), with residents under 18 years of age (p≤0.001), with a greater number of residents (p=0.005), where young adults (p=0.010), black skin color (p=0.011), single individuals (p=0.002), less educated (p=0.013) and with lower monthly income (p<0.001) resided. In addition, households with individuals who reported having a poor or very poor perception of food (p<0.001), worse food quality (p=0.007), and who had 1-2 meals a day (p=0.001) also had a higher prevalence of FI

Table 2. Crude and adjusted analysis of the association between food insecurity and independent variables. Criciúma, SC, Brazil, 2019 (n=562)

Variables	Food Insecurity				
	Crude Analysis*			Adjusted Analysis**	
	n	%	P-value	PR (95% CI)	P-value
Sex			0.134		0.126
Male	55	22.6		Reference	
Female	90	28.2		1.26 (0.94;1.68)	
Age (years)			0.010		<0.001
18-29	15	34.9		1.72 (1.08;2.76)	
30-39	21	42.0		2.02 (1.35;3.03)	
40-49	17	30.9		1.52 (0.97;2.37)	
50-59	31	25.8		1.25 (0.85;1.84)	
≥60	61	20.7		Reference	
Skin color[a]			*0.011*		*0.019*
White	104	23.4		Reference	
Black	15	38.5		1.46 (0.95;2.26)	
Mixed race	21	33.3		1.47 (1.01;2.13)	

Table 2. Crude and adjusted analysis of the association between food insecurity and independent variables. Criciúma, SC, Brazil, 2019 (n=562) (continues).

Variables	Food Insecurity				
	Crude Analysis*			Adjusted Analysis**	
	n	%	P-value	PR (95% CI)	P-value
Education (full years)			0.013		0.278
0-4	38	24.4		Reference	
5-8	55	34.0		1.62 (0.99;2.49)	
9-11	42	24.3		1.01 (0.61;1.66)	
≥12	10	14.3		0.79 (0.37;1.73)	
Monthly income (reais)			<0.001		<0.001[b]
<500.00	24	37.5		3.53 (1.95;6.37)	
500.00-1000.00	39	36.1		2.94 (1.81;4.79)	
1001.00-2000.00	52	27.8		1.97 (1.26;3.09)	
>2000.00	26	14.1		Reference	
Paid work			0.402		0.207
No	109	26.8		Reference	
Yes	36	23.4		0.76 (0.50;1.16)	
Marital status			0.002		0.454
Single(a)	33	41.2		Reference	
Married / common-law	67	20.7		0.69 (0.44;1.09)	
Separated / divorced	21	30.4		1.05 (0.59;1.84)	
Widower	24	27.0		1.03 (0.56;1.89)	
Type of housing			<0.001		0.079
Own	110	22.4		Reference	
Rented	30	56.6		1.88 (1.26;2.80)	
Borrowed	5	31.2		0.98 (0.40;2.41)	
Number of residents			0.005		0.934
1	18	25.4		Reference	
2	42	18.8		0.90 (0.52;1.55)	
3	36	27.9		1.05 (0.59;1.89)	
≥4	49	35.8		0.96 (0.51;1.83)	
Resident(s) Under 18 years of age[a]			<0.001		0.006
No	72	21.3		Reference	
Yes	42	42.9		1.70 (1.16;2.47)	
Nutritional status			0.137		0.333
No overweight	50	22.0		Reference	
Overweight	85	27.7		1.19 (0.84;1.69)	
Self-perception of food			<0.001		0.367
Very good/ good	88	21.2		Reference	
Regular	45	38.1		1.43 (1.01;2.04)	
Bad/ very bad	12	41.4		0.90 (0.48;1.67)	
Feed quality			0.007		0.343
Tertile 1 (best)	37	19.0		Reference	
Tertile 2	45	25.4		1.07 (0.68;1.67)	
Tertile 3 (worst)	62	33.2		1.22 (0.79;1.88)	

Table 2. Crude and adjusted analysis of the association between food insecurity and independent variables. Criciúma, SC, Brazil, 2019 (n=562) (continues).

Variables	Food Insecurity				
	Crude Analysis*			Adjusted Analysis**	
	n	%	P-value	PR (95% CI)	P-value
Number of meals taken			0.001		0.003
1-2	8	57.1		2.29 (1.15;4.60)	
3-4	95	29.1		1.34 (0.93;1.93)	
5-6	145	25.9		Reference	
Taking the main meals			0.838		0.651
No	109	25.6		Reference	
Yes	36	26.5		0.92 (0.63;1.34)	

Pearson's Chi-square test. ** Poisson regression adjusted for the variables in this table (p<0.20) according to the hierarchical model presented in Figure 1. [a]Yellow and Indigenous were excluded (n=15).[b]Wald test for linear trend. PR: prevalence ratio.

After adjusting for possible confounders, the following variables remained associated with FI: age, skin color, monthly income, presence of residents under 18 years in the household, and number of meals eaten. Households with individuals between 18 and 29 years and between 30 and 39 years had, respectively, 1.72 (95% CI 1.08-2.76) and 2.02 (95% CI 1.35-3.03) times higher prevalence of FI in relation to old individuals (60 years or more). Regarding skin color, households with mixed-race individuals were 1.47 (95% CI 1.01-2.13) times more likely to have FI, compared to white people. The income variable showed an inverse linear trend with the FI, i.e., according to the decrease in income, the higher the prevalence of household FI (<0.001). In those with monthly income of less than 500.00 reais, the prevalence of FI reached 253% (PR: 3.53; 95% CI 1.95-6.37), higher than in those who received more than 2,000.00 reais. In households with residents under 18 years, the probability of having FI was 1.70 (95% CI 1.16;2.47) times higher than in households without individuals under 18 years. Finally, households in which residents ate between 1 and 2 meals a day had a prevalence of FI of 129% (PR: 2.29; 95% CI: 1.15-4.60) higher than households in which participants ate between 5 and 6 meals a day (Table 2).

DISCUSSION

The present study, which aimed to verify the prevalence of FI and its associated factors, showed relevant results for the municipality of Criciúma. The research found that one in four households had FI in 2019. In addition, households where young adults lived, of mixed-race skin color, with lower monthly income, who ate 1-2 meals a day, and who had residents under 18 years of age had a higher prevalence of FI.

The difficulty of constantly access to sufficient, safe, and nutritious food to maintain a healthy and active life can be determined by a lack of financial resources and environmental or health crises.[31] Climatic variations, unavailability of the political-economic system, social factors to which the family is exposed, racism, food culture, lack of food and nutrition education actions and hygiene practices, as well as the production of food for self-consumption are just some of the factors that may have an influence on FI.[32,33]

This study observed the prevalence of 25.8% of household FI and, regarding their classifications, it noted that mild FI comprised 18.1%, a level related to worry and anguish of not having enough food at home. On the other hand, moderate FI (a condition presented by 5.0% of households) is characterized by the lack

of food among adults. Finally, the quantitative reduction of food among children and/or the disruption in eating patterns, conditions that lead to the state of hunger, correspond to severe FI,[3,34] which was present in 2.7% of the households studied.

Due to the humanitarian and food crisis in recent years, FI indicators have grown specifically in the most vulnerable groups, violating the HRAN.[35] Data from the Food and Agriculture Organization of the United Nations showed a significant increase in the prevalence of severe FI worldwide.[36] In 2014, the prevalence of severe FI was 8.3%, rising to 9.7% in 2019.[36] This movement is also seen in South America, where the percentage of severe AI increased from 5.5% in 2014 to 7.6% in 2019.[36] These data mean that the number of people without food, who starve and/or who spend more than a day without eating, has increased considerably worldwide.[36]

In a report on the panorama of FNS in Latin America and the Caribbean, data on South America reveal that about 122 million people faced moderate or severe FI in that Continent in 2019. In this context, we can say that one in three inhabitants present in this region did not have access to sufficient nutritious food, which can affect the quality of the diet, and eating habits and have negative consequences for nutrition, health, and well-being of the individual as an outcome.[36,37]

The results observed in the present study indicate a lower magnitude of FI in relation to national data. FBS data from 2017-2018 showed that 36.7% of private households had FI. The proportion of households with mild FI was 24.0%, moderate 8.1%, and severe 4.6%.[4] The national survey on FI in the context of the Covid-19 pandemic in Brazil, which analyzed data from November 2021 to April 2022, showed that 58.7% of Brazilian households were in FI, 28% in mild FI, 15.2% in moderate FI, and 15.5% in severe FI. The number of households in the FI situation is worrying and reveals the injustice and neglect to which millions of Brazilians are subjected.[6]

FI is a multifactorial problem, and the strategies for tackling it must also be directed at multiple aspects, involving intersectoral actions in public policy aimed at proper planning and guaranteeing FNS.[38] Thus, it is suggested an articulation that permeates the definition of objectives, the creation of action strategies, a definition of goals and resources to achieve them. In this way, each sector will be able to identify and better understand its responsibility, placing on its agendas specific actions to guarantee the HRAN, leading to the appreciation and encouragement of society's participation in the construction of macro, meso, and microeconomic policies focused on FI.[39] For this, it is essential to know the details of the collectives studied and their associations with the FI condition.

A crucial data presented in the present study was the association of FI with the age and education of the interviewees. The most expressive data were from the age group of 30-39 years, in which the probability of having FI was 2.02 times higher when compared to individuals aged 60 years or older. It can be justified by the economic stability of the older persons due to the retirement and pension benefits. The study by Santos et al.[17] found a higher prevalence of FI among adults aged between 20 and 59 years when compared to old people. In the research of Maas et al.,[14] the lowest probability of FI was found in individuals over 70 years in relation to individuals aged between 18 and 29 years.

Another critical result is the association between income and FI. Households whose monthly income was less than R$ 500.00 were 3.53 times more likely to have FI when compared to those with income above R$ 2,000.00. Similarly, the study by Schott et al.[18] showed a positive relationship between FI and low income *per capita*. Research of Cabral et al.[19] observed that, over the years, there was an increase in family income and a significant reduction in the number of families with moderate and severe FI.

This association is most likely related to the fact that having less money available results in fewer food purchases and less power to choose food, which makes these individuals opt for cheaper food, but that is within the family budget. Thus, it is possible to affirm that income restriction often results in limited access to

and availability of food.[40] In agreement, the FBS 2017-2018 observed that the greater the severity of FI, the lower the acquisition of vegetables, fruits, baked goods, meat, dairy products, poultry, and eggs.[4]

Food insecurity is a progressive process managed through individual and collective strategies. Typically, in a household FI, adults start skipping meals or decreasing food portions first, and later, children begin to go through the same experience.[41] In agreement, in this study, the prevalence of FI in households with residents under 18 years of age was 1.70 times higher. However, Schott et al.18 report different results when they present that the chance of food insecurity was lower in families that included individuals under 18 years of age compared to households that did not have children under 18 years of age.

Regarding the number of daily meals, households in which residents ate 1-2 meals a day had a 2.29 times higher prevalence of FI when compared to those that ate 5-6 meals. Although having fewer meals a day may be associated with an individual's work routine, which may end up concentrating food consumption at certain times such as lunch and dinner,[42] the consumption of fewer meals a day is also associated with the lack of money for this consumption, especially outside the home, which limits food consumption at home.[43]

The study by Panigassi et al.,[44] in the city of Campinas-SP, investigated the proportion of heads of families who did not make the main meals daily according to the level of FS. It found that the highest percentages of skipping meals corresponded to individuals with moderate and severe FI. According to the analysis of Preiss, Shneider & Coelho-de-Souza[45] regarding the impacts that poverty has on health, diet, and FI in the socioeconomic context, individuals who live in a situation of material deprivation and social exclusion are less likely to have resources to deal with their health and are exposed to poor sanitary conditions. Typically, the less privileged people live in dangerous places, susceptible to floods or landslides, near rubbish dumps, and without access to basic sanitation.[36] Thus, the study by Araújo et al.[46] showed that the prevalence of FI was higher in households with unsatisfactory conditions (according to economic, household, and territorial aspects).

This study has some relevant limitations. Among them is that not all households had a head of household at the time of the interview. Another limitation refers to the conduct of the study in a single municipality, which restricts the generalization of the results. Another limiting aspect is the existence of self-reported information by the participants, requiring caution in the interpretation of the results.

As strengths, the study highlights that the sampling procedure was conducted in two stages and ended with a representative sample of a municipality in southern Brazil, considered a regional reference in that State.[20] It is also necessary to highlight that this is data from the first population-based study conducted in the city of Criciúma-SC, and such studies are effective for understanding the health conditions and indicators and epidemiological profile of the population.

CONCLUSION

There was a considerable prevalence of FI in the city of Criciúma-SC, that is, about a quarter of households. In addition, important sociodemographic and dietary factors were associated with the higher prevalence of this outcome, including income, skin color, age, number of daily meals and the presence of residents under 18 years of age in the household.

Knowing this information is indispensable for monitoring the situation of FI in the population and the development of policies to guarantee the right to FNS and HRAN aimed at the most vulnerable populations. Actions aimed at these population segments may reduce malnutrition and the occurrence of FI-related diseases, contributing to the existence of better living and health conditions for the affected population, as well as reducing the monetary impact on the health sector from FI and its consequences.

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Contributors

Schäfer AA and Meller FO contributed to the conception and design of the study, analysis, and interpretation of the data, review, and approval of the final version; Zanoni ET and Dallazen C contributed to the analysis and interpretation of the data, review, and approval of the final version; Santos LP and Quadra MR contributed to the review and approval of the final version. All authors are responsible for all aspects of the work in ensuring the accuracy and completeness of any part of the work.

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