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Social and intersectional inequalities in the occurrence of food insecurity in Southern Brazil after the pandemic: who are the most affected?

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Abstract

Socioemographic characteristics are important determinants of health, especially in Brazil, which has marked inequalities. Food insecurity is a public health problem in the country, and it has been intensified due to the pandemic. The objective was to assess the inequalities and intersectionality of sociodemographic factors of food insecurity in adults and elderly in southern Brazil. Cross-sectional study carried out in 2022/23 with adults aged 18 and over. The outcome was food insecurity and the exposures were sex, skin color and education. The intersectionality these factors was created using the Jeopardy index, with the aim of evaluating the cumulative effect of these exposures. The results showed a prevalence of food insecurity of 34.1%. As the degree of inequity increased, there was an increase in the occurrence of the outcome. Women, black/brown/yellow and indigenous people with low levels of education had a risk of food insecurity approximately three times greater when compared to men, white people and those with high levels of education. Inequalities were evidenced in the characteristics analyzed separately, in addition to an interaction between them producing a cumulative risk of food insecurity in the most vulnerable groups such as women, black/brown/yellow or indigenous skin color and low socioeconomic status.

Introduction

Food insecurity (FI), characterized by a limited or uncertain access to sufficient, safe, and nutritious food to maintain a healthy lifestyle (1), is recognized as a global public health challenge (2).

In Brazil, this health crisis worsened after the COVID-19 pandemic (3), with severe FI affecting an estimated 15.5% of the population, disproportionately impacting families in the North and Northeast states (3). In the southern region, the prevalence of severe FI reached 14.1% (3). These estimates underscore the importance of monitoring FI, especially given Brazil's considerable health inequalities (4, 5, 6) and spatial clustering of FI observed during the pandemic (3).

The Brazilian Food Insecurity Scale is the most widely used tool for assessing FI, which measures the levels of FI in a population and classifies it as mild, moderate, and severe (7). FI is shaped by both socioeconomic and environmental factors (6, 8, 9). However, epidemiological research on social inequalities in FI has primarily explored inequality indicators separately, without considering how multiple social disadvantage characteristics jointly influence health outcomes (10, 11, 12). It should be noted that social inequalities are not uniformly experienced, underscoring the necessity of identifying and analyzing the populations most affected (13).

Alternatively, assessing FI through the framework of intersectionality highlights the importance of understanding how structural inequalities influence different social groups (14). In Brazil, one of the most unequal countries globally (15), the prevalence of FI is higher in households economically supported by Black or Brown women (10). Evidence from research on health inequities suggests that sex, skin color, and socioeconomic status can interact synergistically, intensifying their combined impact on health outcomes (16, 17, 18).

Although socioeconomic and demographic factors - such as education, skin color, and sex - are strongly associated with FI (9, 10, 19), conventional approaches frequently fail to capture the complexity of individuals lived experiences of different (17, 18), highlighting that social inequalities in this context do not affect all individuals equally (20, 21). Research in this domain has played a pivotal role in expanding the existing body of literature (10). However, population-based studies using innovative analytical approaches are needed, particularly in the post-pandemic era which was a period of economic recession whose inequalities were exacerbated, to identify the most vulnerable groups (22) and to generate data to inform public policies aimed at reducing inequalities, a key target of the United Nations Sustainable Development Goals for 2030 worldwide. Accordingly, the objective of this study was to assess inequalities and the intersectionality of sociodemographic factors in FI among adult and older residents of a municipality in Southern Brazil. Our hypothesis is that the greater the degree of vulnerability, the greater the risk of being in a situation of food insecurity.

Methods

This cross-sectional study was conducted in Southern Brazil. Rio Grande, a coastal port city near the Uruguay border, has an estimated population of 191,900 inhabitants (23) and a high human development index of 0.744, comparable to that of Brazil during the same period (0.724) (23). The Gini coefficient of this city was 0.51, slightly below the national average (0.60) (24).

The aforementioned research, called SulCovid-19, comprised two phases: a baseline study and an initial follow-up. The current study utilized data from the initial follow-up collected between October 2022 and May 2023.

The study included individuals aged ≥ 18 years who were diagnosed with severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) by RT-PCR between December 2020 and March 2021, were symptomatic during the acute phase of the infection, and were residing in the target municipality. Exclusion criteria included individuals diagnosed in the municipality but residing elsewhere, those in the prison system, and individuals with cognitive limitations that precluded participation.

To identify COVID-19-positive cases during the study period, the epidemiological surveillance service was contacted, generating a list of 4,014 individuals who tested positive for COVID-19 by RT-PCR, along with their respective data (name, address, telephone number, and presence of symptoms). After excluding those with incomplete data, 3,822 participants were eligible for the baseline study, and 2,929 were interviewed. During the follow-up period, all individuals interviewed in the baseline study were contacted using the same procedures, resulting in data from 1,918 individuals. Data collection commenced with telephone contact, and home visits were subsequently performed for individuals who failed to respond. Individuals who remained unreachable after following five telephone attempts, one via WhatsApp, and three home visits at different times were deemed lost to follow-up.

This study utilized structured electronic questionnaires, adapted for administration via telephone contact or home interviews through the REDCap application. All interviews were administered by trained

interviewers. For further details on the Sulcovid-19 study methodology, see Saes et al. (25). This study was approved by the Health Research Ethics Committee (CEPAS) of the Federal University of Rio Grande (FURG) (Certificate of Presentation for Ethical Appreciation: 39081120.0.0000.5324).

The study outcome, “food insecurity,” was assessed using the short version of the Brazilian Food Insecurity Scale (26), based on the following questions: 1) In the last three months, have you been concerned that the food in your home would run out before you were able to buy, receive, or produce more food?2) In the last three months, have you run out of food before you had money to buy more? 3) In the last three months, have you had no money to eat a healthy and varied diet? 4) In the last 3 months, have you or any adult in your home ever reduced the amount of food at meals or skipped meals because there was insufficient money to buy food? 5) In the last three months, have you ever eaten less than you thought you should because there was insufficient money to buy food? Participants were classified as experiencing FI if they answered affirmatively to at least one of the five questions.

Analyses were based on the principle of “multiple risk” (Jeopardy index), an approach that serves to guide research on the intersectionality theory and social phenomena. The multiple risk framework posits that various aspects of an individual’s identity, such as sex, class, or race, that lead to discrimination or oppression are interdependent and exert a compound or cumulative effect (27).

Accordingly, exposure variables used to construct the jeopardy index were sex (male, female), self-reported race/skin color (Caucasian, Black/Brown/Yellow/Indigenous), and completed years of education (0–8 up to elementary education, 9–11 high education, and ≥ 12 years higher education). The intersectionality of these sociodemographic characteristics was categorized into five levels (0 to 4) and constructed by summing the categories of the mentioned variables: variables with two categories were coded as “0 and 1”, and those with three categories as “0, 1, and 2”. Within the intersectionality framework, a score of 0 indicates the least inequity (male, Caucasian, and a high level of education), while a score of 4 refers to the greatest degree of inequity (female, Black/Brown/Yellow, and Indigenous people with a low level of education).

Data analyses were performed using Stata 15.0. Prevalence rates and 95% confidence intervals (CIs) for outcomes were calculated separately and by exposure using the chi-square test. Poisson regression was employed to estimate crude and adjusted prevalence ratios (PRs) and 95% CIs for the outcome according to exposure in the total sample stratified by age (adults and older individuals).

Results

Of the 1,918 individuals interviewed during follow-up, 1,857 provided information regarding FI. The sample was predominantly 61.5% female, 77.8% Caucasian, and 43.1% had 9–11 years of education. According to the jeopardy index, White males with high levels of education represented 8.6% of the sample, whereas Black females with low levels of education represented 3.7% (Table 1).

Table 1
Absolute and relative description of the sample according to sociodemographic characteristics and Jeopardy index. Rio Grande, Brazil. 2023.

Variables	**Sample** **N (%)**
Sex	
Male	715 (38.5)
Female	1,141 (61.5)
Race/skin color	
Caucasian	1,435 (77.8)
Black/Brown/Yellow/Indigenous	410 (22.2)
Education (years)	
0–8	469 (25.7)
9–11	786 (43.1)
12 or more	570 (31.2)
Jeopardy index*	
0 (lower risk)	156 (8.6)
1	583 (32.1)
2	655 (36.0)
3	358 (19.6)
4 (greater risk)	67 (3.7)
*0 = Caucasian man with high levels of education; 4 = Black/Brown/Yellow/Indigenous woman with low education	

The prevalence of FI was 34.1% (95% CI 32.0–36.3). The most frequently reported concern was the lack of food (27.8%), followed by insufficient money to have a healthy diet (22.5%), and insufficient food before having money to buy more (13.1%) (Fig. 1).

Figure 2 presents the prevalence of each outcome separately according to the jeopardy index. Overall, a direct relationship was observed between the prevalence of FI and the degree of inequality. Black/brown/Yellow, and Indigenous women with low levels of education exhibited the highest rates of FI indicators: concern about lack of food (44.8%); lack of food before having money to buy more (31.3%); insufficient money for a healthy diet (41.8%); reduced number of meals (25.4%); and eating less than necessary due to financial constraints (23.9%).

FI prevalence was the highest among females (39.7%), Black/Brown/Yellow, or Indigenous people (40.0%), and those with lower levels of education (41.6%). Examining the intersectionality of these factors revealed that women, Black/Brown/Yellow people, and Indigenous people with low educational levels had a 56.7% prevalence of FI (Table 2).

Table 2
Prevalence, prevalence ratios, and confidence intervals of food insecurity according to sociodemographic variables and Jeopardy index. Rio Grande, Brazil. 2023 (N = 1,819).

Variables	**Prevalence (CI95%)**	**RP crude (CI95%)**	**RP adjusted (CI95%)**
Sex			
Male	25.2 (22.1; 28.5)	1.00	1.00
Female	39.7 (36.9; 42.6)	1.58 (1.33; 1.87)	1.68 (1.41; 2.00)
Race/skin color			
Caucasian	32.4 (30.0; 34.9)	1.00	1.00
Black/Brown/Yellow/Indigenous	40.0 (35.4; 44.9)	1.23 (1.03; 1.47)	1.18 (0.99; 1.42)
Education (years)			
0–8	41.6 (37,2; 46,1)	1.65 (1.33; 2.04)	1.70 (1.37; 2.12)
9–11	35.9 (32,6; 39,3)	1.42 (1.16; 1.74)	1.46 (1.19; 1.79)
12 or more	25.3 (21,9; 29,0)	1.00	1.00
Jeopardy index*			
0 (lower risk)	18.6 (13,2; 25,5)	1.00	-
1	24.5 (21,2; 28,2)	1.32 (0.89; 1.97)	-
2	37.7 (34,1; 41,5)	2.03 (1.38; 2.98)	-
3	45.3 (40,1; 50,5)	2.43 (1.64; 3.61)	-
4 (greater risk)	56.7 (44,5; 68,2)	3.05 (1.88; 4.95)	-
Model: sex, race/skin color and education			
PR: Prevalence Ratio			
*0 = Caucasian man with high levels of education; 4 = Black/Brown/Yellow/Indigenous woman with low education			

Adjusted analysis estimated that females had a 1.68-fold higher prevalence of FI than males, and participants with 0 to 8 years of schooling had a FI prevalence ratio 1.70-fold higher than those with ≥ 12 years of schooling. No statistically significant differences in FI were observed according to skin color.

According to the jeopardy index, women, Black/Brown/Yellow, and Indigenous people with low levels of education were approximately three times more likely to experience FI than males, White participants, and those with high levels of education (PR = 3.05) (Table 2).

Regarding Fig. 3, overall, Black/Brown/Yellow or Indigenous women exhibited higher prevalences of food insecurity across different educational strata, with particular emphasis on those with lower educational attainment, among whom more than half reported FI (56.7%).

Discussion

This study examined the inequalities and intersectionality of sociodemographic factors related to FI. Approximately one-third of participants reported experiencing FI. When considered individually, sociodemographic characteristics, such as female sex, Black/Brown/Yellow/Indigenous, skin color, and low education level, were associated with a higher risk of FI. Furthermore, when analyzed collectively, the same characteristics amplified inequities, revealing that females, Black/Brown/Yellow, and Indigenous individuals, and those with low levels of education have a three-fold higher risk of FI than males, White participants, and those with high levels of education. Upon analyzing the association between intersectionality and FI in adults and older individuals, a higher prevalence was observed among younger people; however, no statistically significant difference was detected, possibly owing to the small sample size.

In the current study, approximately six in ten Black, Brown, Yellow, or Indigenous females with low levels of education lived in households classified as food insecure. This alarming finding aligns with previous Brazilian studies reporting higher FI prevalence in this population (28, 29, 30). For example, an analysis of microdata from the 2018 Household Budget Survey (POF) found that the northern region of Brazil experienced the highest proportions of FI. However, in the southern region, FI prevalence was elevated among Black females (28), indicating that this was an existing concern that intensified during and after the COVID-19 pandemic, with greater consequences for this population (28, 29, 30).

This scenario is also underscored by the findings of our study, which examined the intersectionality of these factors and highlighted the importance of the intersectoral debate on FI in Brazil. Notably, females are primarily responsible for food production in rural areas, representing 74% of family farmers according to a 2020 survey conducted by the National Farmers' Company (31). In urban areas, females create solidarity networks aimed at enhancing food security in their communities (32). These findings underscore the crucial role of females in ensuring food access and security across both rural and urban settings (30).

Furthermore, approximately two in ten individuals lacked the financial resources to maintain a healthy diet, and this proportion doubled to four in ten among Black females and those with low levels of education. This finding highlights the role of the obesity paradox, as FI is characterized not only by food insufficiency, but also by the consumption of low-nutritional-value foods high in fat and sugar, which can contribute to high calorie intake and, consequently, overweight and obesity (33, 34). Additionally, FI has

been strongly associated with anxiety, depression, and emotional stress, which can contribute to increased consumption of foods considered low-cost and energy-dense, which are more accessible and cheaper but can cause obesity and other chronic conditions (35).

Brazil is characterized by substantial and persistent social inequalities, which profoundly affect the population's health, education, and food security. Black and Brown individuals, those with lower levels of education, and females encounter systematic disadvantages in key indicators such as income, access to health services, and even life expectancy (36, 37). A study conducted in Bahia assessing FI revealed that households headed by Black females were more likely to experience FI in all three domains (mild, moderate, or severe) than households headed by White males (29). This aligns with our findings and underscores the persistent inequalities in the country, independent of region. Therefore, understanding these dynamics is essential for informing new intersectoral public policies that ensure equity, in addition to improving existing ones, like the National Food and Nutritional Security Policy (13).

Although FI is recognized as a social phenomenon with national dimensions (3, 10), it is important to emphasize that the data presented in this study reflect the period following the COVID-19 pandemic, highlighting the potential economic impact that likely contributes to the increased prevalence of FI. Therefore, while FI has multiple determinants, it is crucial to recognize that socioeconomic factors—such as family income, education, employment and work conditions of the household head, presence of children in the household, family debt, and access to current income transfer programs—can exacerbate FI by affecting the ability to secure food (3, 10, 16). According to nationwide data, the overall prevalence rates of mild, moderate, and severe FI in Rio Grande do Sul were 22.2%, 11.3%, and 14.1%, respectively (3).

In Brazil and worldwide, it is essential to estimate the magnitude of inequities in specific groups, as the statistical invisibility of these vulnerable populations can lead to the maintenance or worsening of structural inequalities. Measuring these inequalities generates evidence that is fundamental for designing public policies and interventions, as well as for ensuring appropriate resource allocation. This relationship aligns with the United Nations 2030 Agenda, which includes Goal 2 on eliminating world hunger, as well as other targets related to reducing social inequalities (38). In this context, it is important to emphasize that FI disproportionately affects females, Black females, and those with lower levels of education, given that this segment of the population is increasingly responsible for maintaining households, especially those with children in their family composition (29, 39, 40).

For vulnerable populations, public policies are both necessary and urgent, especially in countries such as Brazil, where persistent social inequalities have been exacerbated by the COVID-19 pandemic (29, 36). In addition to supporting and, to a certain extent, protecting these populations, such policies have demonstrated effectiveness in alleviating serious problems associated with FI. For example, programs such as Bolsa Família have been shown to reduce poverty in Brazil and improve access to food, enabling beneficiary families to achieve better living conditions and eliminate the risk of FI (41, 42). A study conducted in Brazil’s northeastern region found that families receiving Bolsa Família primarily used the

funds for food-related purchases (41), highlighting the program's importance in mitigating severe hunger in the country. Additionally, a study conducted in the northeastern region of Brazil in 2017 reported an increased consumption of fresh foods among families receiving the program compared with non-beneficiary families (43). This finding underscores the critical role of income transfer programs in positively influencing the nutritional status of vulnerable populations.

Although effective programs have been shown to directly contribute to improving hunger in Brazil, it is crucial to highlight the importance of strategies that are fully focused on specific groups, such as Black or Brown females with low levels of education, who are often the primary providers in their households, especially single mothers.

This study provides post-pandemic insights into the situational diagnosis of FI and its distribution across different groups, based on sociodemographic characteristics that are key health determinants, particularly in Brazil, a country with profound inequalities. Nevertheless, the limitations of this study need to be addressed, particularly the sample size, which restricted the possibility of conducting more detailed analyses, such as the categorization of skin color as Black, Brown, Yellow, or Indigenous. Given the distinct social constructs associated with each group, evaluating them independently would be valuable. Furthermore, the intersectionality constructed using the jeopardy index can account for other variables, such as income; however, this would require a larger sample size. In this study, education level was selected as a proxy for socioeconomic status, given its better fit in the model, as demonstrated by the sensitivity analysis. Regarding the outcome, food insecurity, the assessment using the reduced scale is limited by its comparability with other studies that used more questions. Even so, due to the scarcity of data on the subject after the pandemic, it is believed that these results are relevant and can inform the direction of health policies and the fight against inequalities.

Collectively, our findings underscore the need for larger and more comprehensive studies to further investigate these associations across diverse groups for identifying those at greater vulnerability and in need of priority public policy intervention, given that FI is a condition that affects humanity as a whole.

Declarations

Clinical trial number

Not applicable

Ethics approval and consent to participate

All research participants authorized after reading the informed free term. The consent was given via telephone before starting the questions. The subjects approved their participation in the study through informed consent, including those with no education level. People who were identified as unable to respond, due to lack of understanding or health condition, a key informant was interviewed after

informed consent was provided. Informed Consent for the participation of illiterate people was also given through their legal representatives All interviews and consents were recorded. Research has minimal risk. Participation is voluntary and the respondent has the option to stop responding at any time. All information collected is confidential. All methods were carried out in accordance with relevant guidelines and regulations. The project was submitted and approved by the Ethics and Research Committee of the Federal University of Rio Grande with Opinion number 4,375,697.

Consent for publication

Not applicable.

Competing interests

The authors declare no competing interests.

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Author Contribution

R.G.N. performed the statistical analyses. R.G.N. and T.R.F. wrote all sections of the article. N.S.G. and T.G.L. worked on the literature review. S.M.S.D., T.A., N.F. and M.O.S. critically reviewed the entire manuscript. All authors approved this version of the manuscript.

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Availability of data and materials

The datasets generated and/or analysed during the current study are not publicly available due the data are not public but are available from the corresponding author on reasonable request.

References

1. Brasil. Ministério da Saúde. Insegurança Alimentar e Nutricional. Glossário Saúde Brasil. Brasília: Ministério da Saúde; publicado em 14 de dezembro de 2022; atualizado em 18 de janeiro de 2023.

Available from: https://www.gov.br/saude/pt-br/assuntos/saude-brasil/glossario/inseguranca-alimentar-e-nutricional

2. U.S. Department of Health and Human Services. Office of Disease Prevention and Health Promotion. Food Insecurity [Internet]. Healthy People 2030. Economic Stability, Social Determinants of Health Literature Summaries. Available from: https://odphp.health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/food-insecurity
3. Rede PENSSAN. II VIGISAN: Inquérito Nacional sobre Insegurança Alimentar no Contexto da Pandemia da Covid-19 no Brasil [Internet]. Brasília: Rede Brasileira de Pesquisa em Soberania e Segurança Alimentar e Nutricional; 2022. Available from: https://olheparaafome.com.br/wp-content/uploads/2022/06/Relatorio-II-VIGISAN-2022.pdf
4. Madruga SW, Machado BOB, Oliveira AR. Quem são os usuários da Cozinha Solidária? Estudo sobre desigualdades na garantia da segurança alimentar e nutricional a partir da experiência da comunidade do Sol Nascente – Distrito Federal, Brasil. Rev Nutr. 2024;37:e230112. 10.1590/1678-9865202437e230112.
5. Zanoni ET, Dallazen C, Schäfer AA, Santos LPD, Quadra MR, Meller FO. Insegurança alimentar domiciliar em um município do sul do Brasil: estudo de base populacional. Demetra (Rio J). 2023. 10.1590/1678-9865202337e71282.
6. Coutinho GR, Santos SMC, Gama CM, Silva SO, Santos MEP, Silva NJ. Fatores demográficos e socioambientais associados à insegurança alimentar domiciliar nos diferentes territórios da cidade de Salvador, Bahia, Brasil. Cad Saúde Pública. 2022;38(11). 10.1590/1678-9865202238e00280821.
7. Kepple AW, Segall-Corrêa AM. Conceituando e medindo segurança alimentar e nutricional. Ciênc saúde coletiva. 2011;16(1):187–99. 10.1590/S1413-81232011000100022.
8. Bezerra MS, Jacob MCM, Ferreira MAF, Vale D, Mirabal IRB, Lyra CO. Insegurança alimentar e nutricional no Brasil e sua correlação com indicadores de vulnerabilidade. Ciênc saúde coletiva. 2020;25(10):3588–98. 10.1590/1413-812320202510.35882018.
9. Godoy C, Savio KEO, Akutsu RC, Gubert MB, Botelho RBA. Food insecurity and nutritional status of individuals in a socially vulnerable situation in Brazil. Ciênc saúde coletiva. 2017;22(2):607–16. https://doi.org/10.1590/1413-81232017222.17132016.
10. Lignani JB, Palmeira PA, Antunes MML, Salles-Costa R. Relationship between social indicators and food insecurity: a systematic review. Rev Bras Epidemiol. 2020;23. 10.1590/1980-549720200068.
11. Mielke GI, Malta DC, Nunes BP, Cairney J. All are equal, but some are more equal than others: social determinants of leisure time physical activity through the lens of intersectionality. BMC Public Health. 2022;22(1):36. 10.1186/s12889-021-12428-7.
12. Mahendran M, Lizotte D, Bauer GR. Quantitative methods for descriptive intersectional analysis with binary health outcomes. SSM Popul Health. 2022;17:101032. 10.1016/j.ssmph.2022.101032.
13. Harari L, Lee C. Intersectionality in quantitative health disparities research: a systematic review of challenges and limitations in empirical studies. Soc Sci Med. 2021;277:113876. 10.1016/j.socscimed.2021.113876.

14. Cooper B. Intersectionality. In: Disch L, Hawkesworth ME, editors. The Oxford Handbook of Feminist Theory. Oxford University Press; 2015. pp. 385–406. 10.1093/oxfordhb/9780199328581.013.20.
15. Banco Mundial. Índice de Gini [Internet], Washington DC. Banco Mundial; 2025 [citado 1º set. 2025]. Available from: https://data.worldbank.org/indicator/SI.POV.GINI
16. Taylor D, Richards D. Triple jeopardy: complexities of racism, sexism, and ageism on the experiences of mental health stigma among young Canadian Black women of Caribbean descent. Front Sociol. 2019;4:43. 10.3389/fsoc.2019.00043.
17. Agénor M. Future directions for incorporating intersectionality into quantitative population health research. Am J Public Health. 2020;110(6):803–6. 10.2105/AJPH.2020.305610.
18. Bauer GR. Incorporating intersectionality theory into population health research methodology: challenges and the potential to advance health equity. Soc Sci Med. 2014;110:10–7. 10.1016/j.socscimed.2014.03.022.
19. Bezerra TA, Olinda RA, Pedraza DF. Insegurança alimentar no Brasil segundo diferentes cenários sociodemográficos. Ciênc saúde colet. 2017;22(2):637–51. 10.1590/1413-81232017222.19952015.
20. Berning JP, Todd JE, MacDonald JM. Disparities in food insecurity among Black and White households: an analysis accounting for unobservable characteristics. Appl Econ Perspect Policy. 2022;44(1):322–38. 10.1002/aepp.13210.
21. Office of Disease Prevention and Health Promotion. Food insecurity: literature summary [Internet]. Washington, DC: U.S. Department of Health and Human Services; [cited 2025 May 14]. Available from: https://odphp.health.gov/healthypeople/priority-areas/social-determinants-health/literature-summaries/food-insecurity
22. Bauer GR, Churchill SM, Mahendran M, Walwyn C, Lizotte D, Villa-Rueda AA. Intersectionality in quantitative research: a systematic review of its emergence and applications of theory and methods. SSM Popul Health. 2021;14:100798. 10.1016/j.ssmph.2021.100798.
23. Instituto Brasileiro de Geografia e Estatística (IBGE). Rio Grande (RS) – Panorama [Internet]. Rio de Janeiro: IBGE; 2025 [citado 1º set. 2025]. Available from: https://cidades.ibge.gov.br/brasil/rs/rio-grande/panorama
24. Atlas do Desenvolvimento Humano no Brasil. Consulta em Tabela [Internet]. Rio de Janeiro: PNUD Brasil, Ipea e FJP; [citado 1º set. 2025]. Available from: https://www.atlasbrasil.org.br/consulta/planilha
25. Saes MO, Rocha JQS, Rutz AAM, Silva CN, Camilo LS, Oliveira BC, et al. Aspectos metodológicos e resultados da linha de base do monitoramento da saúde de adultos e idosos infectados pela COVID-19 (Sulcovid-19). Rev Contexto Saúde. 2024;24(48):e14140. 10.21527/2176-7114.2024.48.14140.
26. Santos LP, Lindemann IL, Motta JVS, Mintem G, Bender E, Gigante DP. Proposal of a short-form version of the Brazilian Food Insecurity Scale. Rev Saude Publica. 2014;48(5):783–9. 10.1590/S0034-8910.2014048005195.
27. King DK. Multiple jeopardy, multiple consciousness: the context of a Black feminist ideology. Signs (Chic Ill). 1988;14(1):42–72. 10.1086/494491.

28. Santos LA, Ferreira AA, Pérez-Escamilla R, Sabino LL, Oliveira LG, Salles-Costa R. Gender and skin color/race intersections in food insecurity across Brazilian households. Cad Saúde Pública. 2023;38(11):e00130422. 10.1590/0102-311XPT130422.
29. Silva SO, dos Santos SMC, Gama CM, Coutinho GR, Santos MEP, Silva NJ. A cor e o sexo da fome: análise da insegurança alimentar sob o olhar da interseccionalidade. Cad Saúde Pública. 2022;38(7):e00255621. 10.1590/0102-311XPT255621.
30. Schall B, Gonçalves FR, Valente PA, Rocha M, Chaves BS, Porto P, Moreira AM, Pimenta DN. Gender and food insecurity in the COVID-19 pandemic in Brazil: hunger through women's voices. Ciênc Saúde Coletiva. 2022;27(11):4145–54. 10.1590/1413-812320222711.07502022EN.
31. Companhia Nacional de Abastecimento (CONAB). Agricultura Familiar. Programa de Aquisição de Alimentos – PAA: resultados das ações da Conab em 2020. Brasília: Conab; 2021. (Compêndio de Estudos Conab, v. 30).
32. Nunes NRDA. The power that comes from within: female leaders of Rio de Janeiro's favelas in times of pandemic. Global Health Promot. 2021;28(2):38–45. 10.1177/1757975921994690.
33. Keenan GS, Christiansen P, Hardman CA. Household food insecurity, diet quality, and obesity: an explanatory model. Obes (Silver Spring). 2021;29(1):143–9. 10.1002/oby.23033.
34. Kowaleski-Jones L, Wen M, Fan JX. Unpacking the paradox: testing for mechanisms in the food insecurity and BMI association. J Hunger Environ Nutr. 2019;14(5):683–97. 10.1080/19320248.2018.1464997.
35. Arenas DJ, Thomas A, Wang JC, DeLisser HM. A systematic review and meta-analysis of depression, anxiety, and sleep disorders in U.S. adults with food insecurity. J Gen Intern Med. 2019;34(12):2874–82. 10.1007/s11606-019-05202-4.
36. Paim J, Travassos C, Almeida C, Bahia L, Macinko J. The Brazilian health system: history, advances, and challenges. Lancet. 2011;377(9779):1778–97. 10.1016/S0140-6736(11)60054-8.
37. Gonçalves FR, Schall B, Rocha M, Chaves BS, Porto P, Moreira AM, Pimenta DN. A cor e o sexo da fome: análise da insegurança alimentar sob o olhar da interseccionalidade. Cad Saúde Pública. 2022;38(7):e00025522. 10.1590/0102-311XPT255621.
38. United Nations. Transforming our world: the 2030 Agenda for Sustainable Development (A/RES/70/1). New York: United Nations; 2015.
39. Vargas EBD, Dias MS, Schuch I, Rosa PBZ, Fanton M, Canuto R. The community food environment as an effect modifier of the relationship between racial discrimination and food insecurity among adults in Southern Brazil. Int J Equity Health. 2024;23(1):224. 10.1186/s12939-024-02311-3.
40. Dias MS, Dumith SC, Vaz JDS, Susin LRO. Insegurança alimentar em um município do extremo sul do Rio Grande do Sul, Brasil, 2016: um estudo de base populacional. Epidemiol Serv Saude. 2020;29(2):e2019204. 10.5123/S1679-49742020000200007.
41. da Silva CS, Lima M, de Oliveira C, Tavares JS, de LP FC, Leal VS, Valente FLS, de Lira PIC, Batista Filho MB. Situação de insegurança alimentar em domicílios de Pernambuco, Região Nordeste do

Brasil: contribuições para discussão da violação do direito à alimentação. Saúde Soc. 2022;31(4):e210617. 10.1590/S0104-12902022210617pt.

42. Pacheco PM, Pedroso MR, de O, Gonçalves SC, de Cuervo MR, Rossoni E. Segurança alimentar e nutricional de famílias assistidas pelo Programa Bolsa Família na atenção primária à saúde. O Mundo da Saúde. 2018;42(2):459–77. 10.15343/0104-7809.20184202459477.
43. Sperandio N, Rodrigues CT, Franceschini SDCC, Priore SE. Impacto do Programa Bolsa Família no consumo de alimentos: estudo comparativo das regiões Sudeste e Nordeste do Brasil. Ciência & Saúde Coletiva. 2017; 22:1771–1780.

Figures

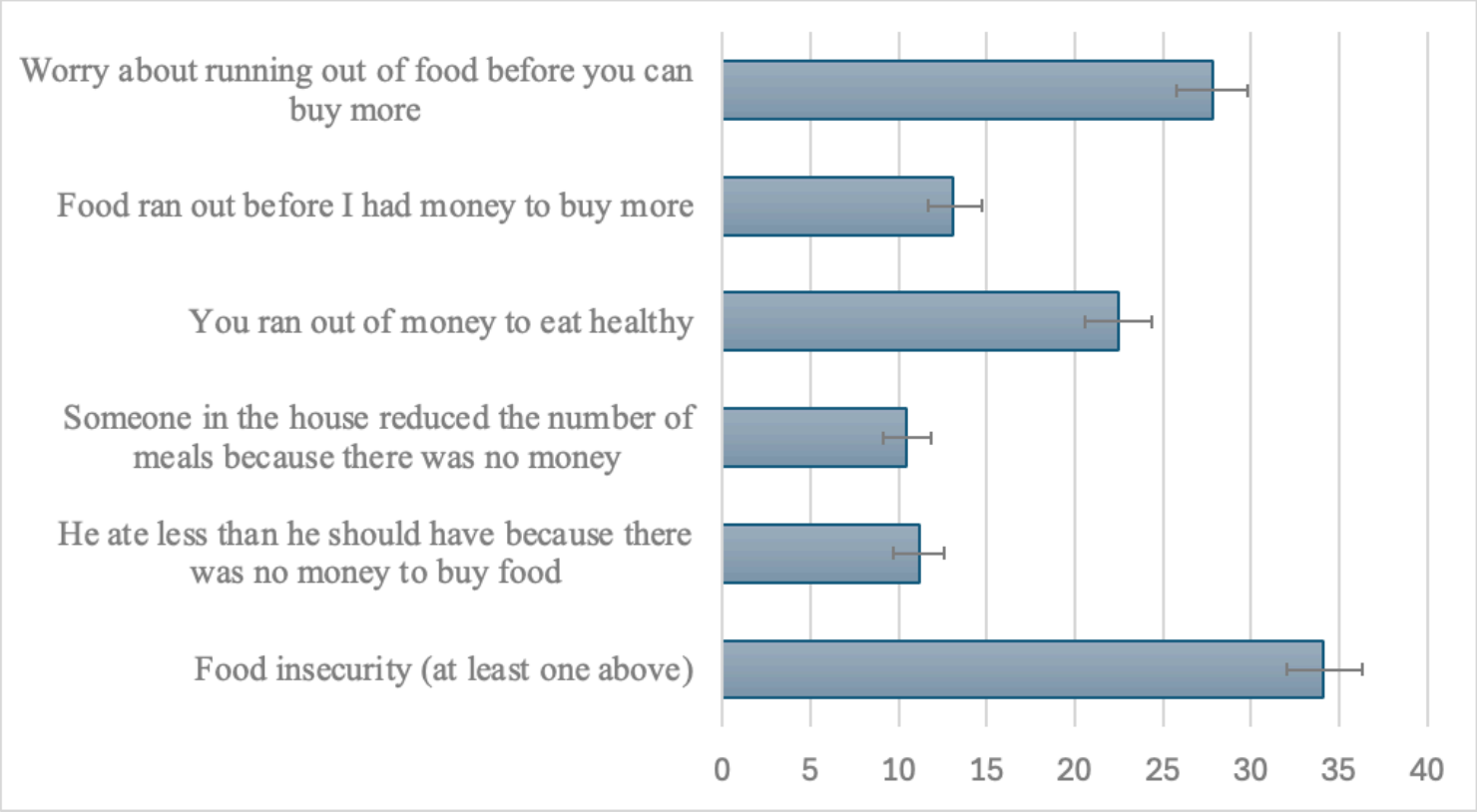


Figure 1

Prevalence of food insecurity indicators and their confidence intervals. Rio Grande, Brazil. 2023 (N=1,857).

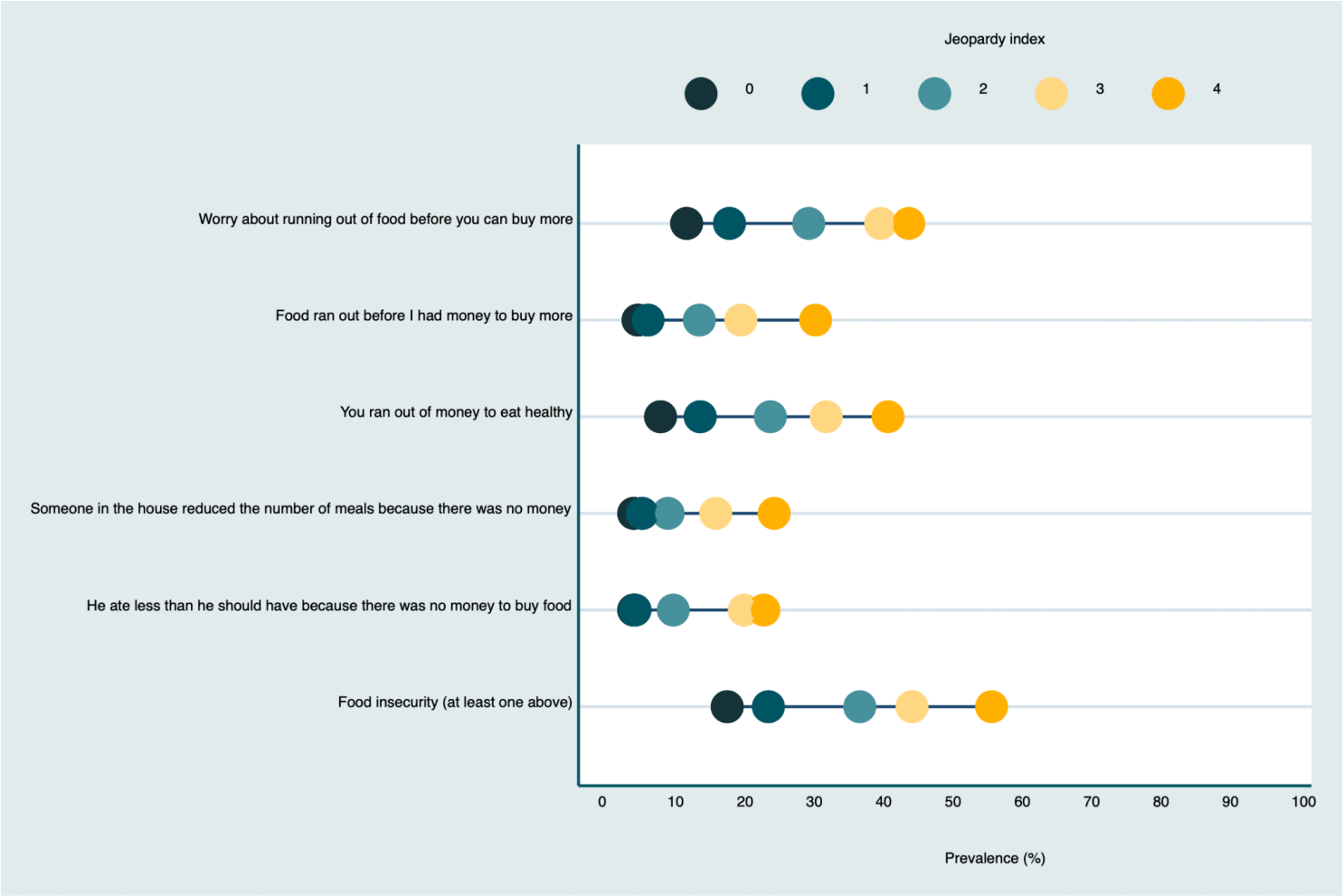


Figure 2

Prevalence of food insecurity indicators according to the Jeopardy index. Rio Grande, Brazil. 2023 (N=1,819).

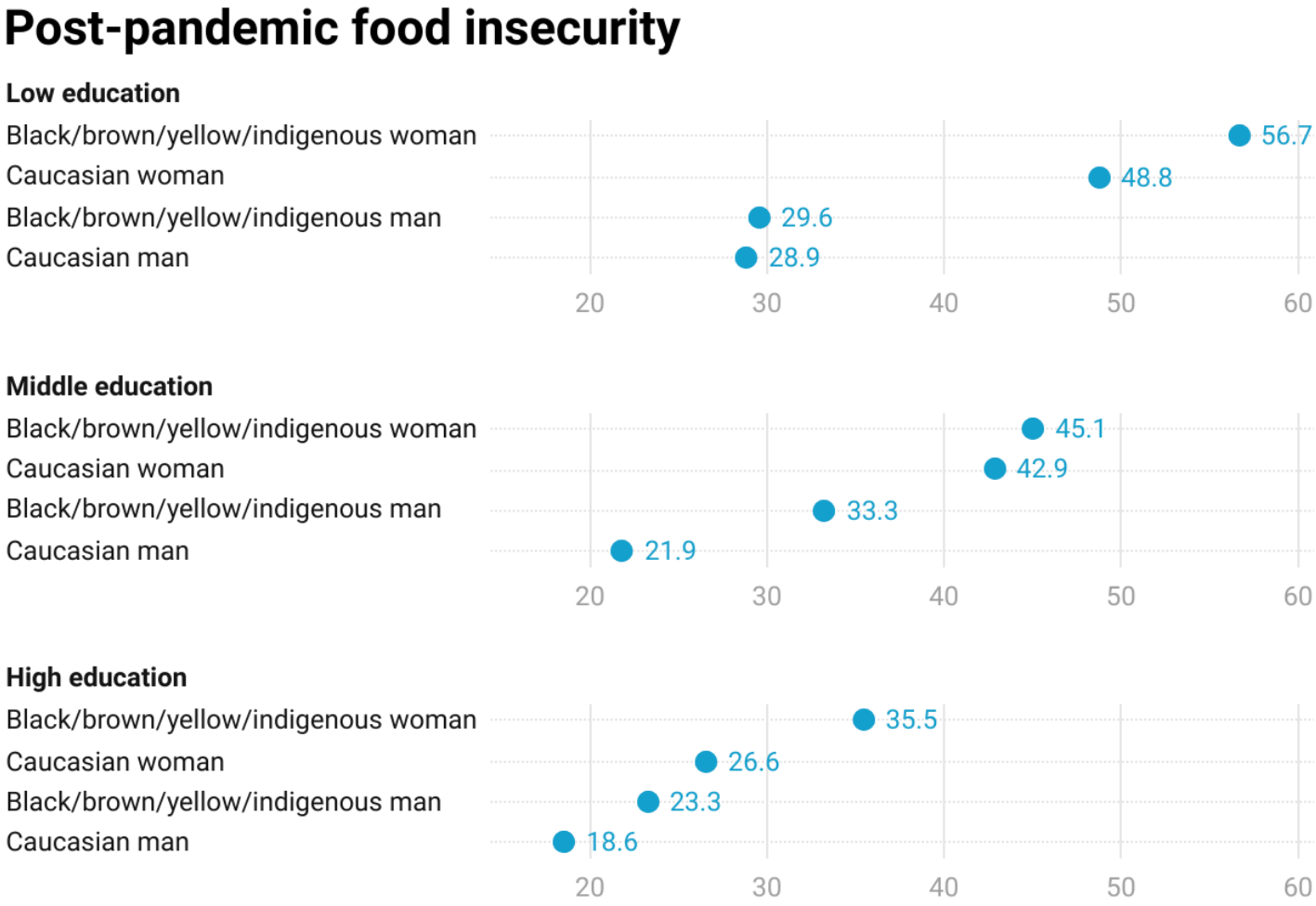


Figure 3

Post-pandemic prevalence of food insecurity according to intersectional sociodemographic characteristics, stratified by education. Rio Grande, Brazil. 2023 (N=1,819).