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CURRENT DEVELOPMENTS IN NUTRITION

Nutritional Epidemiology and Public Health

National Trends and Disparities in Severe Food Insecurity in Brazil between 2004 and 2018

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ABSTRACT

Background: The Brazilian Household Food Insecurity Measurement Scale (EBIA) is the main tool for assessing household food insecurity (FI) in Brazil and facilitates the monitoring and improvement of national public policies to promote food security. Since 2004, the Brazilian government has conducted National Household Sample Surveys, and in 2018, the government carried out the last national evaluation of FI.

Objectives: To describe trends in severe FI in Brazil from 2004 to 2018.

Methods: Data from 3 cross-sectional Brazilian National Household Sample Surveys (sample sizes: 2004 = 112,530; 2009 = 120,910; 2013 = 116,196) and from the last Household Budget Survey (sample size = 57,920) that assessed the status of FI using the EBIA were analyzed. Changes in severe FI during 2 periods (2004–2013; 2013–2018) were estimated while considering sociodemographic factors.

Results: The period between 2004 and 2013 was marked by a significant decrease in severe FI (–53.6%), but this trend reversed in 2013–2018 (+43.8%). The greatest decrease in severe FI occurred in the Northeast (–57.6%) among households where the reference person was a man (–57.6%) and self-identified as white (–58.1%) (2004–2013). In 2013–2018, households with children aged ≤4 y (+6.3%) and members aged ≥65 y (+12.5%) experienced the lowest increases in severe FI.

Conclusions: After a significant reduction from 2004 to 2013, severe FI increased sharply from 2013 to 2018, likely due to disruptions in public policies aimed at reducing hunger and unemployment rates. *Curr Dev Nutr* 2022;6:nzac034.

Keywords: food and nutrition security, hunger, time series studies, health surveys, Brazil

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Supplemental Table 1 is available from the "Supplementary data" link in the online posting of the article and from the same link in the online table of contents at https://academic.oup.com/cdn/.
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Abbreviations used: BPC, Benefício de Prestação Continuada; CONSEA, National Food and Nutrition Security Council; EBIA, Brazilian Household Food Insecurity Measurement Scale; FI, food insecurity; IBGE, Instituto Brasileiro de Geografia e Estatística; PBF, Programa Bolsa Família; PNAD, Brazilian National Household Sample Survey; POF, Pesquisa de Orçamentos Familiares; PSU, Primary Sampling Units; SDG, Sustainable Development Goal; SISAN, National Food and Nutritional System.

Introduction

Although governments around the world have committed to ending hunger, food insecurity (FI), and malnutrition by 2030, the attainment of this key Sustainable Development Goal (SDG) has yet to be realized. The global human health consequences have been dire, especially since the COVID-19 pandemic has increased hunger substantially (1, 2). The FAO defines FI as a condition that exists "when people lack secure access to sufficient amounts of safe and nutritious food for normal growth and development and an active and healthy life" (3). A direct estimate of severe FI reflects collective and individual hunger experiences since it measures the disruption of eating patterns including reductions in food intake (4, 5). Indeed, according to the FAO (6), households with severe FI are likely to run out of food, and members of such households are likely to go a day or more without eating during the reference timeframe. These criteria are fully consistent with the hunger construct.

According to a recent FAO report, The State of Food Security and Nutrition in the World – SOFI 2021 (7), hunger has increased worldwide. An estimated 720–811 million people, comprising almost 9.9% of the global population, were facing hunger in 2020. The FAO

reported that nearly 1 in 3 people in the world did not have access to adequate food in 2020, with greater proportions in Africa, South Asia, and Latin America.

In the early 2000s, Brazil was recognized as experiencing major FI challenges. Therefore, in 2003, the government of Brazil invested in and launched major social policies and programs to improve food and nutrition security. These included the Zero Hunger Strategy (Estratégia Fome Zero) (8, 9), which included the conditional cash transfer program called the Programa Bolsa Família (PBF) (10, 11). The PBF was initially established by unifying previous Brazilian social programs [School Allowance (Bolsa Escola); Food Allowance (Bolsa Alimentação), Food Card (Cartão Alimentação), and Gas Aid (Auxílio Gás)] and quickly expanded its population coverage and the amount of cash transferred to program beneficiaries. In addition, the Brazilian government introduced measures to regulate food prices to reduce the cost of a basic food basket and established legal structures to guarantee the security of food stocks (12).

In 2006, the Brazilian government strengthened the legal framework for food and nutrition security with the establishment of the National Food and Nutritional System (SISAN). The governance of SISAN has strong civil society participation through the National Food and Nutrition Security Council (CONSEA) (13). In 2010, the Brazilian National Congress included, by constitutional amendment, defined access to food as a basic human right. In the same year, all strategies, programs, and activities gained stability under the food and nutrition security law created by the National Congress (14). These initiatives and institutional developments were essential in enabling the FAO to remove Brazil from its Hunger map in 2014 (15, 16). Strong political commitment followed by legislation was indeed decisive for the reduction of hunger and extreme poverty (16) and the reduction of household FI, especially at the severe level (17).

The documentation of changes over time in food security and different levels of FI was possible due to the introduction, adaptation, and validation in Brazil of an experience-based food security scale, the Brazilian Food Insecurity Scale [Escala Brasileira de Insegurança Alimentar (EBIA)] (15, 18–20). Experience-based scales are now being used in many countries, including Brazil (21, 22). Indeed, the FAO now tracks SDG 2.2 with a related measurement tool, the Food Insecurity Experience Scale (23).

The EBIA is based on the US Household Food Security Survey Module, which has been used in population surveys since the early 1990s (24). The scale, the validation of which began in 2003 (25) with subsequent refinement (26, 27), is based on the premise that FI is perceived and experienced by families at different levels of severity. The EBIA has contributed information and strategic data for the management of policies, programs, and actions directly related to the fight against hunger and poverty (12, 28). For example, in Salvador, Bahia in Northeast Brazil, Aliaga et al. (29) studied a food and nutrition security participatory assessment codeveloped by community leaders and city residents that included EBIA. They concluded that the food and nutrition security assessment was indispensable for social action in the city. Thus, the EBIA has been essential for evaluating and monitoring the dimensions related to the SDGs in the 2030 Agenda and a valuable tool for analyzing food and nutrition security governance in Brazil (12).

The Brazilian Institute of Geography and Statistics [Instituto Brasileiro de Geografia e Estatística (IBGE)] added the EBIA to the Brazilian National Household Sample Survey [Pesquisa Nacional por Amostra de Domicílios (PNAD)] in 2004, 2009, and 2013. Thus, the EBIA has allowed the analysis of FI trends for almost a decade (30). In 2017, the IBGE included this measurement of FI in the Family Budget Survey [Pesquisa de Orçamentos Familiares (POF)] to continue estimating the prevalence of household food security/FI and to enable these data to be analyzed with respect to family expenses, personal food consumption indicators, and other living conditions of the Brazilian population (31). The POF, similar to the PNAD, is representative of the population at the national and macroscale regional levels as well as urban and rural households. The first set of findings from the POF 2018 was released in September 2020 (31), providing a timely update of food security/FI trends in Brazil.

Considering that the last national assessment of FI in the country was performed by the POF 2018, the aim of this study was to analyze trends and variations in food security and severe FI in Brazil from 2004 to 2018 on the basis of specific demographic and socioeconomic characteristics.

Methods

This study was based on an analysis of data from 4 nationally representative surveys assessing FI in the Brazilian population (2004, 2008, 2013, and 2018) (31–34). Details of the respective sampling designs, the assessment of household food security, and different levels of severity of FI as well as the social and demographic variables are provided below.

Survey design

Brazil is a heterogeneous country divided into 5 socioculturally and economically distinct macroscale regions (North, Northeast, Midwest, Southeast, and South). The North and Northeast regions contain the least-developed municipalities, with low average household incomes, low schooling, and poor health outcomes (35). These heterogeneous characteristics are based on the PNAD and the POF 2018 results, which followed best practices, including strong data quality control procedures. The main purpose of these surveys is to generate indicators useful for the timely monitoring of the social and economic development of the country.

In all representative household surveys, the IBGE follows a survey design and sample selection procedure based on its master sample for its Integrated System of Household Surveys, comprised of census sectors as primary sampling units (PSUs). Detailed information on the Integrated System of Household Surveys is available from IBGE (36).

The PNAD applies a 3-stage probabilistic cluster sampling design, with municipalities selected in the first stage, census tracts in the second stage, and households in the third stage. The POF involves a stratified, 2-stage probabilistic cluster sampling design, with census tracts selected as PSUs in the first stage and households selected in the second stage. The selection of PSUs employs probability proportional to the size of the cluster according to the number of private households per census tract. The total number of PSUs is determined according to the type of estimator used and the level of precision set for estimating the total data for the households. The household data were obtained from the 2010 Demographic Census, considering the number of households expected in each census sector. The numbers of households were 112,530 (PNAD

2004), 120,910 (PNAD 2009), 116,196 (PNAD 2013), and 57,920 (POF 2018). Estimates from the POF 2018 were weighted due to the sampling design and adjusted to compensate for nonresponse of the investigated units.

In both the PNAD and POF, the data were collected in the households through face-to-face interviews. Trained technical staff subjected the database to data quality control measures to assess the coherence of the information.

Assessment of household FI

The classification of the EBIA establishes 4 mutually exclusive categories of food security and 3 levels of FI (food security/FI) on the basis of recommended cut-offs for households with and without children and/or adolescents aged <18 y (27): *1*) food security, when the family/household has regular and permanent access to good quality food in sufficient quantity; *2*) mild FI, when there is concern or uncertainty about access to food in the future and inadequate food quality resulting from behavior that aims not to compromise the quantity of food; *3*) moderate FI, when there is quantitative reduction in food among adults and/or disruption in eating patterns resulting from lack of food among adults; and *4*) severe FI, when there is also quantitative reduction in food among those aged under 18 y, implying a disruption in eating patterns resulting from lack of food among all residents.

Since its introduction in the 2004 PNAD, the EBIA has undergone adaptations in the number of items used to evaluate food security/FI levels, with no loss of the comparability of estimated prevalence across surveys. The original 15-item EBIA used in PNAD 2004 included the item "a member older than 18 y reduced his or her meal size or skipped meals", which was then disaggregated in PNAD 2009 into 2 items, namely "reducing the meal size" and "skipping meals". In response to new psychometric analyses, this 16-item version was further reduced in the PNAD 2013 to a 14-item version by removing the items "an adult reduced his or her meal size" and "an adult started skipping meals" (27).

The measurement of FI by the EBIA consistently classifies the construct into categorical strata, and regardless of whether the scale is directed to adult-only households and regardless of the number of component items of the version (14, 15, or 16) (27). The current version of the EBIA (POF 2018) consists of 14 questions comprising dichotomous items ("yes" or "no"). Eight items apply only to households with adults only (aged 19 y or above), with 6 items relating exclusively to households with children and/or adolescents (27). A person within the family responsible for purchasing and preparing meals was the preferred interviewee both in the PNAD and POF 2018.

Covariates

The analyses stratified information about the location of the household (urban/rural area), the region of the country (North, Northeast, Midwest, Southeast, and South), the number of household members (≤3, 4 to 6, and 7 or more), and sociodemographic characteristics, including gender (male/female) and race/skin color (white, black, and mixed race color), both of which were collected for the household reference person (37). Other characteristics evaluated were age group within the household (0–4 y, 5–17 y, 18–49 y, 50–64 y, and 65 y or more) and household per capita income (ratio of the sum of all family income and the number of residents in the family) by quintile.

Ethical considerations

All IBGE data collection activities are governed by Law No. 5534 issued on 14 November, 1968. This nationwide legislation guarantees confidentiality to all individuals and legal entities who provide statistical information to the IBGE. As a result, they are all informed that the information provided will be used exclusively for statistical analyses.

Researchers who use secondary data available in the public domain do not need approval by a local Ethics Committee CEP-CONEP System, according to Resolution No. 466 of 12 December, 2012, from the National Committee of Ethics in Research (CONEP). This research used data made available in the public domain by the IBGE.

Data analysis

The absolute and weighted percentage values were estimated for each survey (**Table 1**). We analyzed the prevalence trends according to the food security/FI strata by household survey and by sociodemographic characteristics (**Supplemental Table 1**). Changes in prevalence in the extreme groups' food security (g_1) and severe FI (g_2) were used to explore variations over the periods 2004–2013 (Δ_1) and 2013–2018 (Δ_2), respectively (**Table 2**).

The contrasts C per food security/FI strata $g = [1,2]$ and periods $\Delta = [1,2]$ are given by $[C_\Delta = (p_{y2} - p_{y1})/p_{y1}]_g$, where p_{y2} and p_{y1}, represent the proportions (prevalence) for the 2 periods, respectively. Estimates from the PNADs and POF 2018 were weighted according to the sampling design and adjusted to compensate for nonresponse. The '*svy*' command of Stata 16 was used to this end (38).

Results

The prevalence trends of food security/FI strata according to the 4 household surveys were analyzed. Following a steady and significant increase between 2004 and 2013, food security declined from 2013 to 2018, reaching an even lower level than in 2004. Consistent with this pattern, severe FI declined substantially between 2004 and 2013 but showed a rebound from 2013 to 2018 (**Figure 1**).

In 2013, almost 51.5 million households had regular and permanent access to sufficient quality food without having to compromise access to other essential needs, such as housing and health care. By 2018, the POF showed that this figure had dropped to ∼43.5 million households. The number of households experiencing moderate FI almost doubled in the 2013–2018 period (2.9 to 5.6 million), and severe FI was experienced by >1 million new households in 2018. The reversal of the trends in food security and severe FI in the last decade occurred in all regions of the country, with the greatest difference occurring in the Midwest. In 2018, North and Northeast Brazil continued to present the highest proportions of household FI (mild, moderate, and severe levels), whereas Southeast and South Brazil had the highest proportions of food security (Table 1).

Focusing on demographic and socioeconomic trends (**Figure 2**), the increase in severe FI from 2013 to 2018 occurred in both rural and urban areas (Figure 2A). Notably, among regions of the country, the North and Midwest regions had the highest proportional increases in the prevalence of severe FI (Figure 2B). The highest proportional increases in

TABLE 1 Absolutes and percentage values (%) from Brazilian households according to the food security and food insecurity (FI) levels by regions and year of evaluation. Brazil, 2004–2018

	Food security and FI levels[1] [absolute values (*n*) expressed in 1000 households]							
	Food security		Mild FI		Moderate FI		Severe FI	
Brazil and regions	*n*	%	*N*	%	*n*	%	*n*	%
				PNAD 2004[2]				
Brazil	33,929	65.1	9409	18.0	5172	9.9	3624	6.9
North	1920	53.4	765	21.3	485	13.5	423	11.8
Northeast	6204	46.4	3054	22.8	2337	17.5	1767	13.2
Midwest	2603	68.8	676	17.9	310	8.2	190	5.0
Southeast	16,948	72.9	3773	16.2	1569	6.8	940	4.0
South	6256	76.5	1141	14.0	471	5.8	304	3.7
				PNAD 2009[2]				
Brazil	41,411	69.8	11,088	18.7	3863	6.5	2959	5.0
North	2544	60.0	9017	21.6	390	9.2	391	9.2
Northeast	8291	53.9	3820	24.8	1841	12.0	1435	9.3
Midwest	3070	69.8	897	20.4	254	5.8	178	4.0
Southeast	20,093	76.7	4248	16.2	1078	4.1	762	2.9
South	7413	81.4	1206	13.2	300	3.3	193	2.1
				PNAD 2013[2]				
Brazil	51,524	77.4	9643	14.8	2985	4.6	2107	3.2
North	3049	63.9	1031	21.6	369	7.7	321	6.7
Northeast	10,588	61.9	4038	23.6	1520	8.9	949	5.6
Midwest	4092	81.8	634	12.7	161	3.2	114	2.3
Southeast	24,288	85.5	2886	10.2	687	2.4	535	1.9
South	8507	85.1	1053	10.5	248	2.5	188	1.9
				POF 2018[3]				
Brazil	43,587	63.3	16,541	24.0	5598	8.1	3136	4.6
North	2151	43.0	1589	31.8	749	15.0	508	10.2
Northeast	8864	49.7	5138	298	2391	13.4	1276	7.1
Midwest	3459	64.8	1240	23.2	387	7.3	251	4.7
Southeast	20,682	68.8	6774	22.5	1733	5.8	864	2.9
South	8431	79.3	1621	15.3	338	3.2	237	2.2

[1]Estimated by the Brazilian Household Food Insecurity Measurement Scale [*Escala Brasileira de Insegurança Alimentar* (EBIA)].
[2]Data from reports of Brazilian National Households Sample Surveys [*Pesquisas Nacionais por Amostras de Domicílios* (PNADs)] from 2004 (IBGE, 2006), 2009 (IBGE, 2010), and 2013 (IBGE, 2014).
[3]Data from reports of Household Budget Survey 2017/2018 (*Pesquisa de Orçamentos Familiares*) (IBGE, 2020).

severe FI occurred in households with 7 or more residents (Figure 2C), those with women as the person of reference (Figure 2D), and those comprising blacks and mixed race people (Figure 2E). The presence of household members aged between 5 and 49 y increased the risk of severe household FI (Figure 2F).

Table 2 shows the proportional changes in food security/FI status for the periods 2004–2013 and 2013–2018 by comparing 2 extreme household strata (food security and severe FI). Food security increased from 2004 to 2013 (18.9%) and decreased from 2013 to 2018 (−18.2%). The same pattern occurred in both urban and rural areas. The Northeast region had the greatest increase in the status of food security from 2004 to 2013 (+33.4%), see Supplemental Table 1 for details.

The North region stood out as having the largest reduction in severe FI from 2004 to 2013 (−32.7%). Households with 7 or more residents had the most prominent percentage increase in food security from 2004 to 2013 and reduction in the following period (2013–2018). The highest percentages of improvements in food security were observed in households between the 1st and 2nd quintiles of per capita family income from 2004 to 2013; these quintiles also had the highest percentages of worsening food insecurity in the following period (Table 2).

Consistent with the increasing and decreasing trends in food security in the analyzed periods, a significant reduction in severe FI was observed between 2004 and 2013 (−53.6%). Among households located in rural areas, changes in severe FI over time were less pronounced than the national average (−42.7% and +29.1% in the first and second periods, respectively). The reduction in severe FI during 2004 to 2013 was greater in the Northeast (−57.6%) and Midwest (−54%) regions, which is in marked contrast to the Midwest region in the following period (2013 to 2018) where severe FI rose 104.3%. The most significant reduction in severe FI from 2004 to 2013 took place in households with 4 to 6 residents (−52.2%), whose reference person was male (−57.6%) or of white skin color (−58.1%), with children aged under 4 y (−53.4%), or in the lowest quintiles of family income per capita. From 2013 to 2018, the lowest increases in severe FI were observed in households with children aged under 4 y (+6.3%) or with members aged over 65 y (+12.5%) (Table 2).

TABLE 2 Change in the prevalence (Δ%) of food security and severe food insecurity (FI) among Brazilian surveys, Brazil, 2004–2018

Sociodemographic characteristics	Δ% Food security[1]		Δ% Severe FI[1]	
	Variation in 2004 and 2013[2]	Variation in 2013 and 2018[2]	Variation in 2004 and 2013[2]	Variation in 2013 and 2018[2]
Household area				
Brazil	+18.9	–18.2	–53.6	+43.8
Urban	+19.2	–18.4	–56.3	+46.4
Rural	+15.1	–17.2	–42.7	+29.1
Region				
North	+19.4	–32.7	–43.7	+52.2
Northeast	+33.4	–19.7	–57.6	+26.8
Midwest	+18.7	–20.8	–54.0	+104.3
Southeast	+17.3	–19.5	–52.5	+52.6
South	+11.2	–6.8	–48.6	+15.8
Household characteristics				
Number of residents				
3 or fewer	+12.4	–16.9	–47.4	+26.7
4 to 6	+20.3	–24.2	–52.2	+54.5
7 or more	+40.8	–35.7	–50.3	+30.3
Gender of reference person				
Male	+19.9	–15.2	–57.6	+35.7
Female	+16.9	–21.1	–48.7	+40.0
Skin color of reference person				
White	+15.4	–12.9	–58.1	+38.9
Black or mixed race	+27.6	–22.4	–55.0	+35.6
Other	-4.7	–0.1	+5.0	+9.5
Age group, y				
0–4	+32.2	–24.0	–53.4	+6.3
5–17	+29.7	–26.0	–52.4	+49.0
18–49	+20.2	–22.2	–51.5	+46.9
50–64	+15.9	–17.0	–49.2	+34.4
65 or older	+14.9	–11.8	–47.8	+12.5
Family per capita income (quintile)				
1st	+87.6	–45.3	–54.0	+48.5
2nd	+39.0	–35.3	–54.9	+73.0
3rd	+15.9	–30.8	–46.7	+62.5
4th	+7.7	–22.4	–47.4	+120.0
5th	+1.7	–10.5	–40.0	+200.0

[1] Estimated by the Brazilian Household Food Insecurity Measurement Scale [*Escala Brasileira de Insegurança Alimentar* (EBIA)] applied in the Brazilian National Households Sample Surveys [*Pesquisas Nacionais por Amostras de Domicílios* (PNADs)] from 2004 to 2013 (IBGE, 2006; IBGE, 2010; IBGE 2013) and in the Household Budget Survey 2017/2018 (*Pesquisa de Orçamentos Familiares*) (IBGE, 2020).
[2] Variation (C) considering the proportions of food security/food insecurity strata g = 2004–2013, 2013–2018 and periods 2004–2013 and 2013–2018 is given by $[C_{\Delta} = (p_{y2} - p_{y1})/p_{y1}]_g$, where p_{y2} and p_{y1} stand for the proportions (prevalence) in the years 2013 and 2004 for the period 2004–2013 and 2018 and 2013 for the period 2013–2018, respectively.

Discussion

The study analyzed trends and variations in food security and severe FI in Brazil from 2004 to 2018. The data show that in the period of 2004–2013, there was an increase in food security, mostly among the most vulnerable households. By contrast, in the period of 2013–2018, there was an increase in severe FI in almost all households with the same characteristics.

Since the validation of the EBIA, the measurement of household FI in the PNAD (2004, 2009, and 2013) has contributed to the discussion on the direction the country should take when planning programs and initiatives to guarantee food and nutrition security for the Brazilian population. The effectiveness of these actions is reflected in the strong reduction in FI, particularly in its most severe form, in the first period of almost 10 y (34).

A more recent picture provided by the POF 2018 reveals a conspicuous setback in Brazil regarding the human right to food in the face of increasing social inequalities. Following positive trends in the decade after 2004, food security decreased from 2013 to 2018, while all forms of FI increased markedly in the same 5-y period (31). The reason may be major disruptions in access to healthy foods and, in some instances, even to enough food, regardless of quality.

In addition, inequities in severe FI remained across Brazilian regions, as different patterns of severe FI were found between 2004 and 2013. Specifically, the North and Northeast regions continued experiencing the highest prevalence of severe FI which worsened even more by 2018, erasing the previous advances (31). It is disquieting that just under half of residents in the North and Northeast regions had full and regular access to food. The North region includes the states covered by the Amazon rainforest, which is the area with the highest proportion of

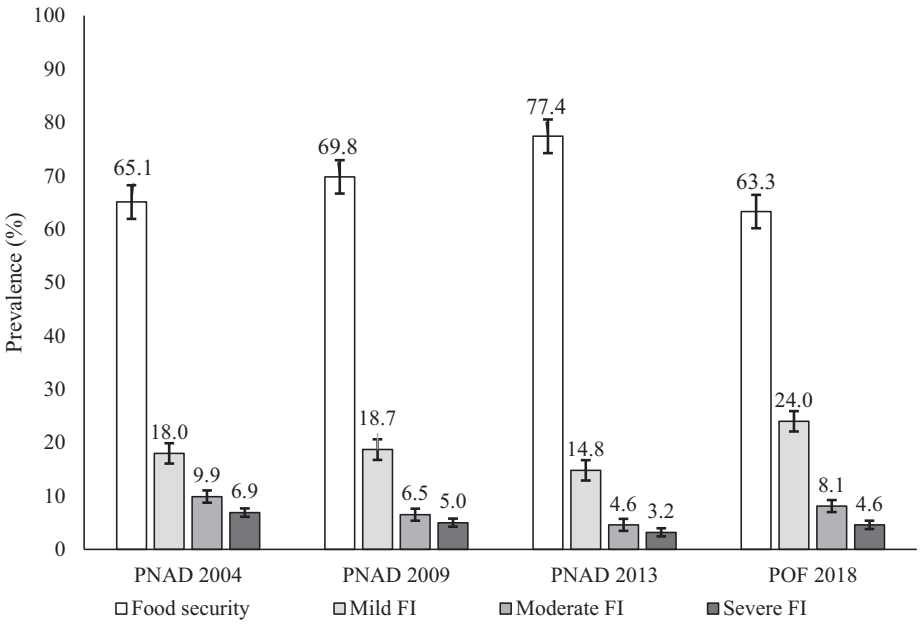

FIGURE 1 Prevalence of food security and food insecurity levels, Brazil, 2004–2018. FI, food insecurity; PNAD, Brazilian National Household Sample Survey; POF, Pesquisa de Orçamentos Familiares.

indigenous people, slave-descendant communities known as *Quilombolas*, and other Brazilian traditional populations. Another characteristic of this region is the presence of strong social inequalities related to reduced access to basic sanitation and potable water (36). Households in these regions were 4 times more likely to experience severe FI than households in the more developed regions of the country (South and Southeast). Severe FI was 3 times more prevalent in the Northeast – a historically, socioeconomically, and environmentally vulnerable semiarid region – than in other regions. However, this does not imply that there were no families experiencing hunger in better-off regions of Brazil. According to the 2018 data, >1.3 million households comprising ~5 million people endured severely restricted access to food in the South and Southeast regions (39).

The sociodemographic characteristics associated with FI were similar between the 2 periods of variation considered in this study (2004–2013 and 2013–2018) (15). Severe FI was consistently higher in households with a higher density of residents, with low income, or whose household person of reference was female and declared herself to be black/mixed race people (40). Households with ≥1 of these characteristics experienced a strong reduction in severe FI between 2004 and 2013, followed by an increase between 2013 and 2018, with the returning of the strong inequities previously documented (41).

Risk components reflecting strong inequities in severe FI in Brazil were also documented for certain demographic characteristics, including the presence in the household of members of different ages (42). Interestingly, despite the high prevalence of severe FI in households with ≥1 child aged under 5 y, this group experienced the smallest increase in FI between 2013 and 2018. In turn, families with ≥1 older adult (>65 y) consistently had a lower prevalence of severe FI. It is possible that cash transfer programs have helped protect children from experiencing severe FI, at least to some extent. Palmeira et al. (42) endorsed this hypothesis in an area of extreme climatic and social vulnerability in the Northeast. Extremely poor families are the beneficiaries of the PBF, and families with children (aged under 5 y) receive a slightly higher financial benefit. As the PBF has good coverage and targeting (43), beneficiary families should be better protected against severe FI. In turn, older adults with insufficient incomes are entitled to a continuous benefit of a minimum wage per month [Benefit of Continuous Instalment, or Benefício de Prestação Continuada – (BPC)], which has also contributed to poverty reduction (44). Therefore, poor families with older adult BPC beneficiaries should also be more protected against FI. Consistent with findings from other parts of the world (10, 15), our findings suggest that maintaining such programs may help protect households in the most vulnerable groups against severe FI, even in the context of fiscal austerity.

The period from 2004 to 2013 was marked by favorable economic and political conditions in Brazil, along with public policies to promote food and nutrition security. This not only enabled greater access to food but also protected the most vulnerable households, such as those in the North and Northeast regions, with children aged under 5 y and with the lowest incomes (45, 46).

Between 2004 and 2013, there was indeed an increase on the order of 30% in average incomes in the employed population. This positive economic outcome partly. reflected an increase of >60% in the real value of the Brazilian minimum wage, coupled with the reduction in open unemployment over this period (47). At the same time, the Brazilian PBF cash conditional program was created, and its coverage gradually expanded to 13.8 million families in 2013 (48). Households engaged in family farming and in a situation of food vulnerability received relevant incentives through: *1*) a program of prepaid acquisition of their products (Food Acquisition Program or Programa de Aquisição de

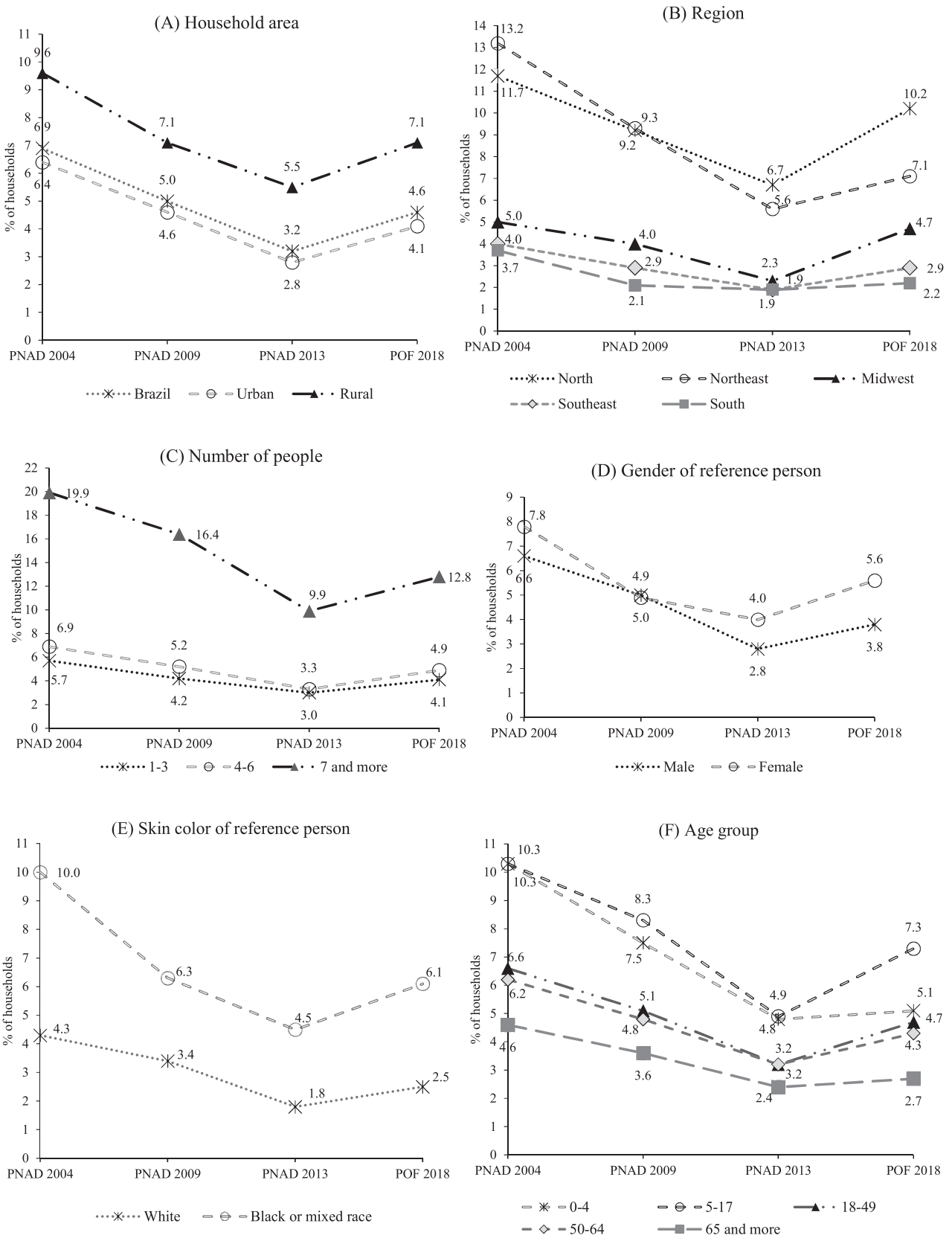

FIGURE 2 Variation in severe food insecurity prevalence according to sociodemographic characteristics. Brazil, 2004–2018. PNAD, Brazilian National Household Sample Survey; POF, Pesquisa de Orçamentos Familiares.

Alimentos), *2*) the construction of water cisterns in the Brazilian semiarid region for both consumption and food production, and *3*) the expansion of financing programs for farmers' production, including the National Program of Family Agriculture Strengthening (Programa Nacional de Fortalecimento da Agricultura Familiar) (49). Another relevant factor in this period was the Brazilian Food and Nutritional Security governance model, which ensures the strong participation of civil society (15) at the national, state, and municipal levels through the adoption of policies by the CONSEA. Since 2014, the Brazilian food and nutrition security budget has been reduced considerably, which has affected food and nutrition security policies and programs. Bocchi et al. (50) point out that Brazilian global food and nutrition security funding has been somewhat stable in recent years, hovering around $US 30.2 billion since 2017 (almost R$100 billion real). In addition, a study by Souza et al. (51) on the potential impacts on health of the austerity policies adopted in Brazil since 2014 showed a significant reduction in the national budget related to social policy support (the PBF). The authors documented a budget cut of 24.2% and a potential negative impact on Brazil's attainment of the UN SDGs by 2030, especially SDG2.

The effects of reducing severe FI in some municipalities on social changes in Brazil have been corroborated in other studies (52–54). Palmeira et al. (12) observed a reduction in the severe form of FI followed by improvement in socioeconomic indicators in 2 waves of data collected in representative samples in a poor municipality in Rio de Janeiro (Southeast Brazil). Their findings support the hypothesis that changes occurred due to improvements in socioeconomic indicators and participation in the PBF.

Therefore, the reduction in severe FI observed between 2004 and 2013 may also be explained by government policy initiatives deployed during this period. Both structural and emergency measures resulted in households' increased ability to access food, but above all, they led to reduced poverty and reduced extreme poverty (43). In 2003, ∼42 million Brazilians lived below the poverty line and almost 13 million in extreme poverty (55). By 2014, poverty had been reduced by one-third (14 million people), and extreme poverty had declined by more than half, to ∼5 million. In addition to the rapid overall economic progress, the FAO attributed these advances to the government's commitment to more equitable public policies (56).

Strengths and limitations

A limitation of this study is that Brazilian surveys including FI indicators are scheduled to occur only at 5-y intervals, which prevents a more refined picture of what happened between 2014 and 2017. Consistent with our findings, 3 small Gallup Polls commissioned by the FAO, showed an increase in FI beginning in 2015 that continued through to 2017 when the last survey was conducted (51). Indirect and predictive indicators of food and nutrition security also suggested a food access crisis, which was confirmed by the 2018 findings. Examples of these indicators include the progressive development of poverty and extreme poverty and the progressive increase in unemployment from 2014 to 2017 (57). According to the Institute of Economic and Applied Research, the percentage of households in extreme poverty increased by 78% (48), and the proportion of unemployment doubled in the same period (58).

Although the trend analyses described here were based on different surveys, this may not bias the estimated prevalence, since both the PNAD and POF samples are representative of the Brazilian population. The sample designs of both surveys (PNAD and POF) considered the same master sampling framework to allow comparisons of FI trends in Brazil. In addition, the use of EBIA in both surveys to assess FI allowed comparability of the estimated prevalence across surveys.

Additionally, although there is a lack of information on FI for the period of the social and political crisis that started in 2015 and worsened in 2016, severe FI was expected to increase, since poverty and unemployment are 2 of its main determinants (23). The Brazilian Monthly Employment Research (Pesquisa Mensal de Empregos) (58) and Continuous Brazilian National Household Sample Survey (PNAD Contínua) (59) show that following the period of positive economic growth between 2003 and 2014, 2015 marked the beginning of the current economic recession. Among other negative impacts, the recession increased the unemployment rate in Brazil by 81% between 2014 and 2016. The observed increase in severe FI reflected a strong reversal in the sharp reductions in social inequities observed from 2004 to 2013 in Brazil.

Looking forward, it is likely that new crises may worsen FI in Brazil. Until 2018, the sole concern was the impact of the political and economic crises on food and nutrition security, but 2020 brought a major health-related factor – the COVID-19 pandemic – into the picture (60). A study by UNICEF published in July 2020 (61) evaluating the primary and secondary impacts of the COVID-19 pandemic on Brazilian children and adolescents revealed an extremely serious household FI situation. Before the pandemic 64% of adults above the age of 18 y were working, this percentage dropped to 50% from February to July 2020. Furthermore, the pandemic caused a drop in income for more than half of the adult Brazilian population, which was further exacerbated in households with children and adolescents (55). Recent findings have confirmed that during the COVID-19 pandemic, severe household FI increased dramatically in Brazil (62).

Conclusions

This study shows a major loss of the advances achieved in the 2004–2013 period in the reduction of household FI and the mitigation of socioeconomic inequities in Brazil. The data strongly suggest that it will be very difficult for Brazil to achieve the remaining SDGs (1). The second point that this article highlights is the accentuation of regional, gender, and racial inequalities in severe FI since 2013. The dissolution of the CONSEA in early 2019, which will likely lead to less monitoring of food and nutrition security policies, is likely to worsen the household FI situation that has resulted from the economic recession and reduced spending on food and nutrition security policies since 2015. Moving forward, it will be important to conduct further policy analyses to document the governmental social, economic, and health policies adopted since FI began to be measured in Brazil via the EBIA, which would be an important complement to the results observed in this study. This research is important for determining which policies were mainly responsible for the improvements observed between 2004 and 2013. In the meantime, it is a matter of urgency to monitor and assess the public health and human rights consequences of the current Brazilian government's disinvesting in public policies designed to protect food and nutrition security and corresponding actions to specifically address hunger and poverty. This study will be key to understanding how to protect the future

development of food and nutrition security in Brazil and the well-being of its people, especially in the context of the current government.

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Data Availability

The data described in the manuscript, code book, and analytic code will be made publicly and freely available without restriction at https://www.ibge.gov.br/estatisticas/sociais/saude/24786-pesquisa-de-orcamentos-familiares-2.html?=&t=microdados] and [https://www.ibge.gov.br/estatisticas/sociais/educacao/9127-pesquisa-nacional-por-amostra-de-domicilios.html?=&t=microdados.

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