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Trend of the nutritional status of pregnant adolescent beneficiaries of the Brazilian Bolsa Família conditional cash transfer program in the 2008-2018 period

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Abstract *This ecological study aimed to analyze the trend of the nutritional status of pregnant adolescent beneficiaries of the Brazilian Bolsa Família conditional cash transfer program in the 2008-2018 period. We evaluated secondary data of pregnant adolescent beneficiaries of the Bolsa Família Program from January 2008 to December 2018, extracted from the public reports of the WEB Food and Nutrition Surveillance System. We accessed the monitoring reports on the consolidated public-access health conditionalities of the Bolsa Família Program, always considering the second validity. An annual variation of -1.2% (95%CI: [-1.6; -0.8] p<0.01) was observed in the prevalence of underweight in Brazil in the studied sample. The prevalence of overweight and obesity in the country had annual variations of 2.9% (95%CI: [2.0; 3.7] p<0.01) and 7.5% (95%CI: [5.7; 9.3] p<0.01), respectively. We conclude by saying, that, in the evaluated period, the prevalence of underweight among pregnant adolescent beneficiaries of the Bolsa Família Program showed a decreasing trend, while the prevalence of overweight and obesity increased throughout Brazil.*
Key words *Pregnancy in adolescence, Nutrition assessment, Nutritional surveillance, Health information systems*

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Introduction

Adolescent pregnancy is a global public health issue due to its biological, psychological, economic, family, and educational consequences, which can reverberate over a country's social, economic, and health indicators[1]. According to the World Health Organization (WHO), adolescence is the transition period between childhood and adulthood, starting at 10 and extending to 19 years of age[2]. The WHO estimates indicate that 16 million adolescents aged 15-19 years become pregnant each year, equivalent to about 11% of total global births[3]. In Brazil, the estimated prevalence of pregnant women in this same age group is 11.8%[4]. According to data from the report published by the United Nations (UN), the adolescent pregnancy rate in Brazil is 68.4 births for every 1,000 adolescents, exceeding Latin American/Caribbean and global rates (65.5 and 46.0 births for every 1,000 adolescents, respectively)[5].

Pregnancy in this stage of the life cycle further increases the already high energy and nutritional needs, given that this phase is characterized by the completion of the height growth process, body weight and bone mass increase, maturation of sexual organs, body composition changes, which can cause competition for nutrients between the mother and the fetus and promote a decreased linear growth of mothers[6,7]. Moreover, the risks of adverse outcomes for the mother-child binomial in this age group have been reported in the scientific literature, and the main ones were low birth weight, prematurity, stillbirth, pre-eclampsia, feeling of social isolation, maternal depression, and delay or neglected maternal education[8-10].

Adolescent pregnancies seem to be significantly influenced by social and economic issues. The WHO estimated that about 95% of births to mothers aged 15-19 years occur in developing countries[3]. This condition is driven by poverty, low schooling, social, sexual, and gender exclusion, lack of job opportunities, and early relationship/marriage[5,11]. In this context, adolescent pregnancy contributes to the maintenance of intergenerational cycles of poverty, exclusion, and marginalization, characterized by a higher risk of poverty and worse health-related outcomes in the children of adolescent mothers[5].

Conditional cash transfer programs such as the *Bolsa Família* Program (BFP) in Brazil are recognized worldwide for relieving the poverty of their beneficiaries, increasing the use of health services, and improving the health indicators of children and adults[12-14]. The BFP can be considered one of the most important initiatives of the Brazilian government in the fight against poverty in the country and resulted from the unification of the existing cash transfer programs. It was implemented by the Federal Government in 2003, through Provisional Measure Nº 132, which was later enacted as Law N° 10.836, of January 9, 2004. The program grew and became the largest globally, paying out more than R$ 31 billion to 14 million beneficiaries in 2019 alone[15].

The BFP consists of a direct conditional cash transfer program for the immediate relief of poverty to improve the development of human capital through greater access to education, health, and the promotion of food security in the long term. Some of the conditions of the BFP program in health for pregnant women is the duty to attend prenatal care visits with the monitoring of nutritional status, vaccination according to the calendar recommended by the Ministry of Health, and participate in educational activities on breastfeeding, guidelines for healthy eating for pregnant women and preparation for childbirth. In order to increase protection for the mother and child and increase household income, the BFP establishes that households benefiting from the BFP with pregnant women identified in health care establishments should receive nine monthly installments of the Pregnant Women Variable Benefit. With this action, the program seeks to provide monetary aid and become an instrument to promote equity in access to basic social rights[14,16,17].

However, a review study that assessed the impacts of BFP on promoting food security among beneficiaries (not selecting a specific age group), through the assessment of financial expenditure on food, food consumption, hemoglobin levels, food insecurity, and anthropometric data, observed the following paradox: while the program promotes an increasing access to food in terms of quantity, this increase is not necessarily accompanied by higher nutritional quality of purchased foods[18]. Lignani et al.[19] also observed that a higher purchasing power of families benefiting from the program increased the consumption of high-energy density processed foods, possibly associated with the lower cost of these foods, which contributes to a higher prevalence of nutritional deviations in the program's beneficiaries. Thus, this work aimed to analyze the trend of the nutritional status of pregnant adolescents who are beneficiaries of the BFP in the 2008-2018 period.

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Methods

This ecological study evaluated the secondary data of pregnant adolescent beneficiaries of the BFP from January 2008 to December 2018 were evaluated, extracted from the public reports of the Sistema de Vigilância Alimentar e Nutricional (SISVAN) Web (http://sisaps.saude.gov.br/sisvan/relatoriopublico/index, accessed 15/12/2019). Filters "*pregnant women*" and "*adolescents*", and the "Bolsa Família management system (DATASUS)" for the data source system were used to generate the report. The Brazilian consolidated data were shown and stratified according to the Federation Units (FU) and the North, Northeast, Midwest, Southeast, and South macro-regions of the country.

The nutritional status of pregnant women available on SISVAN Web is classified per the Body Mass Index (BMI) graph according to the gestational week proposed by Atalah et al.[20]. This instrument proposes four categories of nutritional status: underweight, normal weight, overweight, and obesity. It is noteworthy that this classification of nutritional status is not specific for pregnant adolescents, but according to the Ministério da Saúde do Brasil guidelines for collection in health services, can be used in this audience provided that the interpretation of the results is flexible and specificity of the group in question is considered[21].

The monitoring reports on the consolidated health conditions of public access of the BFP were accessed to determine the percentage of nutritional follow-up coverage for pregnant women benefiting from the BFP, always considering the second term (https://bfa.saude.gov.br/relatorio/consolidated and http://bolsafamilia.datasus.gov.br/w3c/bfa_relconsol.asp, accessed 16/12/2019). This coverage considers the number of pregnant women benefiting from the program located by health teams and the number of pregnant women whose nutritional data were included in the information systems.

This study was not submitted to the Research Ethics Committees and the National Research Ethics Commission for evaluating the system, considering that it is a research using public domain databases, as provided resolution N° 510 of April 7, 2019 of the National Health Council.

After extraction, data were tabulated and double-entered independently in spreadsheets and then validated. The relative variation in the prevalence of nutritional deviations in the period was calculated with the following formula: relative variation=((P2-P1)/P1)*100, where P2 corresponded to the prevalence of nutritional deviation in 2018 and P1 to the prevalence in 2008. Prevalence and the confidence intervals (CI) for population proportions were presented for each year of the evaluated period (2008-2018).

Then, the generalized linear analysis by Prais-Winsten[22] was used to assess the trend of time series. In the model, the prevalence of nutritional status (underweight, overweight, and obesity) was the dependent variable, and the evaluative years was the independent variable. The Durbin-Watson test was applied to verify the autocorrelation of the series. The method suggested by Antunes and Cardoso[22] was used. First, the values of the prevalence of nutritional status were logarithmized. Then, the Prais-Winsten autoregressive model was applied, estimating the beta, minimum beta, and maximum beta values. The annual variation rates and their respective 95%CI were calculated with these values, which can be interpreted as increasing (positive variation rate), stationary (no statistical difference), and decreasing (negative variation rate). Alpha values of 5% were adopted for the statistical significance levels. All statistical analyses were conducted in the R (R Foundation for Statistical Computing, Vienna, Austria) statistical package.

Results

The number of annual observations of pregnant adolescents increased 682.2% from 11,835 to 92,577, from 2008 to 2018. The nutritional status of pregnant adolescents in Brazil had prevalence levels of 37.8% for underweight, 46.9% for normal weight, 12.1% for overweight, and 3.3% for obesity in 2008. In 2018, the prevalence levels of 33.1% of underweight, 43.7% normal weight, 16.4% overweight, and 6.8% of obesity were observed in the country, with positive variations in overweight and obesity compared to 2008 (35.5% and 106.1%, respectively). In contrast, the observed underweight showed a negative relative variation of 12.4%. The other prevalence levels of underweight, normal weight, overweight, and obesity, and relative variations in Brazil and FU in the 2008-2018 period are shown in Table 1. The crude prevalence of nutritional deviations (underweight, overweight, and obesity) in 2008 and 2018 are shown graphically in Figure 1.

Table 2 shows the list of pregnant women located by health teams and region and pregnant women with nutritional data included in the

Table 1. Prevalence of underweight, normal weight, overweight, and obesity in pregnant adolescents who are beneficiaries of the Bolsa Família Program in the 2008-2018 period, according to Brazilian federative units.

Location	Underweight (%)			Normal weight (%)			Overweight (%)			Obesity (%)		
	2008	2018	Relative variation[a]	2008	2018	Relative variation[a]	2008	2018	Relative variation[a]	2008	2018	Relative variation[a]
North												
Acre	36.4	28.7	-21.2	51.1	48.9	-4.3	11.4	17.1	50.0	1.1	5.3	381.8
Amapá	31.0	34.7	11.9	48.3	43.4	-10.1	17.2	16.8	-2.3	3.5	5.2	48.6
Amazonas	36.4	34.3	-5.8	49.3	46.8	-5.1	10.8	14.8	37.0	3.5	4.1	17.1
Pará	40.0	34.6	-13.5	48.1	47.1	-2.1	9.6	14.1	46.9	2.4	4.2	75.0
Rondônia	45.1	39.7	-12.0	43.7	39.1	-10.5	8.5	15.9	87.1	2.8	5.3	89.3
Roraima	33.3	27.5	-17.4	58.3	51.8	-11.1	4.2	15.9	278.6	4.2	4.7	11.9
Tocantins	42.2	35.9	-14.9	46.4	42.9	-7.5	8.4	15.8	88.1	3.0	5.4	80.0
Northeast												
Alagoas	38.0	35.1	-7.6	47.5	42.7	-10.1	10.6	15.4	45.3	4.0	6.8	70.0
Bahia	42.6	37.3	-12.4	45.2	42.7	-5.5	10.2	14.3	40.2	2.0	5.8	190.0
Ceará	40.6	32.3	-20.4	45.3	42.6	-6.0	11.8	18.1	53.4	2.3	7.0	204.3
Maranhão	40.4	37.4	-7.4	50.6	44.4	-12.3	8.0	14.2	77.5	1.0	4.0	300.0
Paraíba	34.2	32.1	-6.1	48.6	44.0	-9.5	14.4	16.9	17.4	2.9	7.0	141.4
Pernambuco	36.5	33.3	-8.8	48.1	44.5	-7.5	13.0	15.8	21.5	2.5	6.5	160.0
Piauí	41.5	36.9	-11.1	45.0	42.5	-5.6	11.9	15.1	26.9	1.6	5.6	250.0
Rio Grande do Norte	35.6	30.2	-15.2	46.7	42.5	-9.0	13.8	19.3	39.9	4.0	8.1	102.5
Sergipe	50.4	36.7	-27.2	37.6	41.3	9.8	8.6	15.1	75.6	3.4	6.9	102.9
Midwest												
Distrito Federal	43.9	37.6	-14.4	46.3	39.7	-14.3	9.8	14.7	50.0	0.0	7.9	-
Goiás	38.4	33.2	-13.5	40.6	43.1	6.2	17.8	16.7	-6.2	3.3	7.1	115.2
Mato Grosso	36.0	35.0	-2.8	46.7	40.8	-12.6	14.2	16.4	15.5	3.1	7.8	151.6
Mato Grosso do Sul	37.3	30.3	-18.8	46.3	45.2	-2.4	14.9	15.7	5.4	1.5	8.7	480.0
Southeast												
Espírito Santo	37.4	32.3	-13.6	43.3	42.0	-3.0	15.6	17.7	13.5	3.8	8.1	113.2
Minas Gerais	39.1	33.3	-14.8	45.9	43.0	-6.3	11.8	16.4	39.0	3.3	7.3	121.2
Rio de Janeiro	38.1	32.8	-13.9	48.1	40.2	-16.4	11.4	18.2	59.0	2.4	8.8	266.7
São Paulo	33.3	29.0	-12.9	46.2	42.6	-7.8	14.2	18.7	31.7	6.3	9.8	55.6
South												
Paraná	32.4	27.2	-16.0	50.3	44.7	-11.1	13.2	19.2	45.5	4.1	9.0	119.5
Rio Grande do Sul	28.6	23.1	-19.2	47.8	44.6	-6.7	17.5	20.3	16.0	6.1	12.1	98.4
Santa Catarina	29.6	21.7	-26.7	51.6	49.4	-4.3	13.6	19.1	40.4	5.2	9.8	88.5
Brazil	37.8	33.1	-12.4	46.9	43.7	-6.8	12.1	16.4	35.5	3.3	6.8	106.1

[a]Relative variation was calculated using the formula ((P2-P1) / P1) * 100, where P2 corresponded to the prevalence of nutritional deviation in 2018 and P1 to prevalence in 2008.

Source: Web Food and Nutrition Surveillance System.

information systems, which shows that in 2008, the Southeast and North regions had the lowest (46.9%) and the highest (66.8%) follow-up percentage, respectively. In 2018, Brazil showed a follow-up of the nutritional data of 87.3% located pregnant adolescents, which is greater than 80% in all five regions of the country.

Table 3 shows the trend analyses of the prevalence of underweight, overweight, and obesity in pregnant adolescents who are BFP beneficiaries in Brazil and its macro-regions. A decreasing trend was observed in the prevalence of underweight in Brazil with an annual variation of -1.2% (95%CI: [-1.6; -0.8] $p<0.01$), and the

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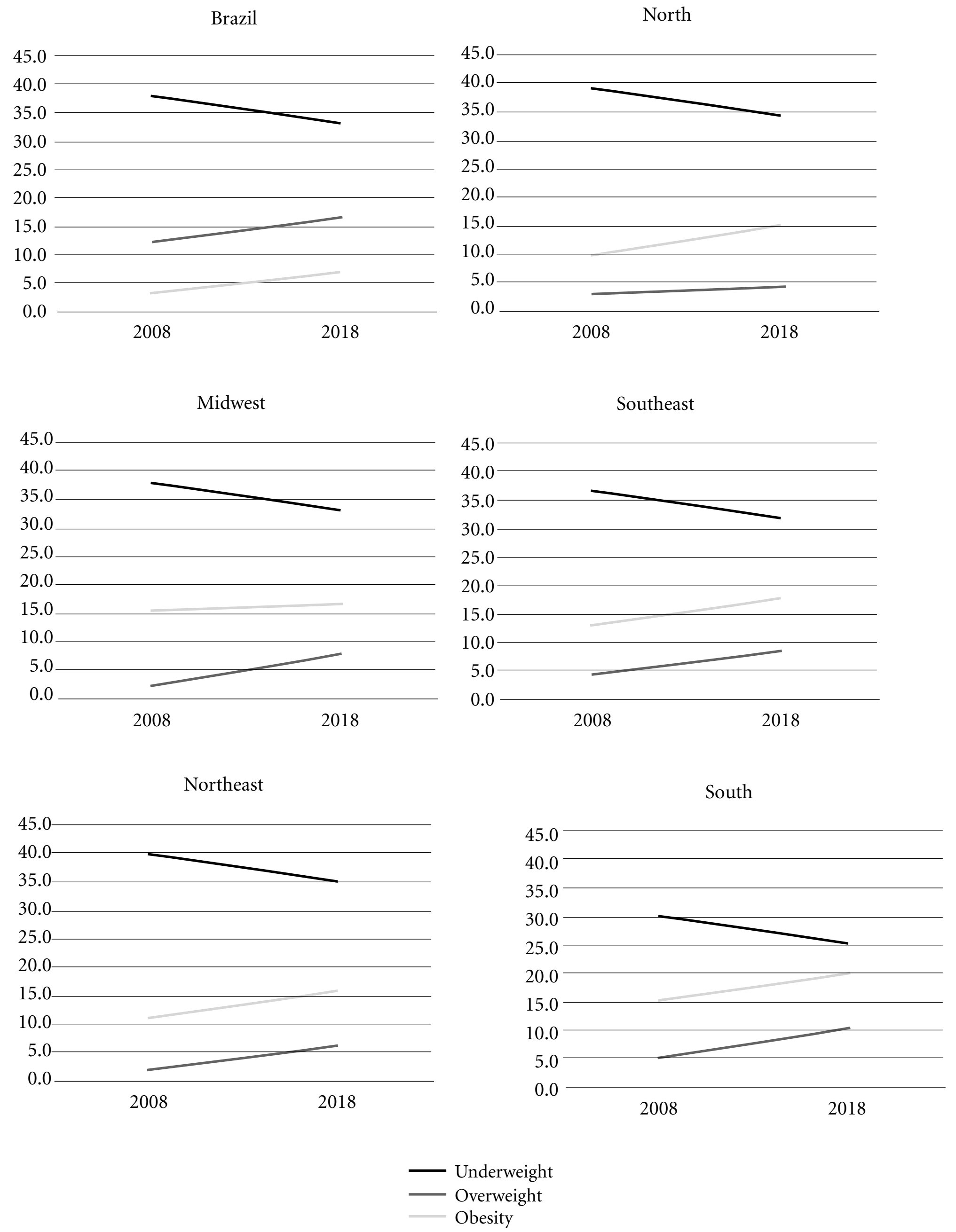

Figure 1. Crude prevalence of underweight, overweight, and obesity in pregnant adolescents who were beneficiaries of the Bolsa Família Program in 2008 and 2018, according to Brazilian macro-regions.

Source: Web Food and Nutrition Surveillance System.

South region had the highest annual variation (-1.5%; 95%CI: [-2.1; -0.9] p<0.01). An increasing trend was observed in the country regarding the prevalence of overweight (2.9%; 95%CI: [2.0; 3.7] p<0.01), it is noteworthy that the North region showed the highest annual variation be-

Table 2. Number of pregnant women located by health teams and percentage of pregnant women with nutritional data included in health information systems by Brazilian macro regions, in 2008 and 2018.

Location	2008			2018		
	Pregnant women identified	Pregnant women with nutritional data		Pregnant women identified	Pregnant women with nutritional data	
	n	n	%	n	n	%
North	9,946	6,648	66.8	66,916	60,057	89.8
Northeast	42,006	24,488	58.3	225,289	194,129	86.2
Midwest	4,455	2,396	53.8	24,424	20,457	83.8
Southeast	25,945	12,164	46.9	130,758	116,678	89.2
South	10,572	5,584	52.8	36,795	31,246	84.9
Brazil	92,924	51,280	55.2	484,182	422,567	87.3

Source: Bolsa Família in Health System and Bolsa Família System.

tween regions (4.1%; 95%CI: [3.1; 5.2] p<0.01). The prevalence of obesity also showed an increasing trend in the country (7.5%; 95%CI: [5.7; 9.3] p<0.01), and the Midwest (10.2%; 95%CI: [5.3; 15.3] p<0.01) and Northeast (10.1%; 95%CI: [7.8; 12.5] p<0.01) were the regions with the highest annual variations.

Discussion

The study found a decreasing trend in the prevalence of underweight among pregnant adolescents benefiting from BFP in the period evaluated, while the prevalence of overweight and obesity showed increasing trends in all macro-regions of the country. Regarding the coverage of the BFP, we observed an increase in the percentage of pregnant women with nutritional data entered in the information systems during the period evaluated. Although this study did not intend to compare the data of pregnant women in the systems with the coverage of the Family Health Strategy (FHS), it is admissible to believe that this fact is associated with higher FHS coverage throughout the national territory[23].

The findings that point to the growing trend in the prevalence of pregnant overweight adolescents in Brazil and its regions follow the same global pattern in children, adolescents, and adults[24]. Our results indicate that the conditionalities and income transfer currently carried out by the BFP were insufficient to ensure access to food and nutritional security and to reduce the nutritional problems of pregnant adolescent beneficiaries, requiring intersectoral measures geared to households and the community. This simultaneous increase in obesity in the life cycles and perpetuated high prevalence of underweight seems to be driven by changes in global food systems, observed in low- and middle-income countries, resulting from the food transition process that provides more processed, accessible, and energetically dense foods[24,25]. Studies describe that this situation leads to an increased risk for chronic non-communicable diseases, showing an intergenerational cycle of disadvantages, a condition that culminates in a high morbidity burden, such as the increase in cardiovascular diseases, type 2 diabetes mellitus, cancer, osteoarthritis, and work disability[24,26,27]. In women, exposure to this double burden of malnutrition throughout life can lead to major complications in childbirth[27]. Furthermore, obesity during pregnancy can increase the risk for several maternal and child complications, such as spontaneous abortion, gestational diabetes mellitus, pre-eclampsia, postpartum thromboembolism, breastfeeding problems, premature birth, stillbirth, macrosomia, and congenital abnormalities[28].

Fulfilling BFP conditionalities means, for the beneficiary, assuring the exercise of their social rights, especially those of health, education, and social assistance; accessing these services is a basic right and a fundamental condition for breaking with the intergenerational poverty cycle[17]. The prenatal monitoring data of pregnant women who are beneficiaries of the BFP are entered in SISVAN, a health information system that generates information on the population's food and nutritional situation, contributing to the knowledge of the nature and magnitude of nutritional problems, identifying geographic areas, social segments, and population groups most at risk of nutritional problems. It is crucial to collect data adequately and feed the system to support the formulation of public policies aimed at improving the patterns of food consumption and the nutritional status of the population[16].

Quality prenatal care is essential for maternal and newborn health. From this perspective, nutritional care consists of nutritional guidelines and continuous monitoring of nutritional status and contributes to the ideal weight gain during pregnancy, avoiding nutritional deviations at this stage[29,30]. A study carried out with adolescent and adult pregnant women who were undergoing prenatal care at a primary health care unit in Rio Grande do Sul sought to investigate the impact of a dietary guidance program on the control of gestational weight gain. It was observed that this procedure was effective in reducing weight gain and clinical complications such as gestational diabetes, pre-eclampsia, underweight, and prematurity[31].

Adolescent pregnant women alone make up a vulnerable group for nutritional deviations and this is due to several reasons, such as the increased demand for nutrients to subsidize the growth and development of mothers and children in the intrauterine environment and inadequate eating habits. From this perspective, the presence of nutritional deviations in this population is not uncommon. Similar to our findings, a Colombian study carried out with 294 pregnant adolescents, in which 80% of them were in the lowest socioeconomic strata, found 33.7% of underweight and 14.3% of overweight pregnant women[32]. In contrast, data from a survey conducted in Rio de Janeiro showed that about 13% of adolescent mothers accompanied at the maternity ward of a public hospital started their pregnancy with some nutritional deviation, where 1.0% were underweight and 12.0% overweight[33].

Teenage pregnancy seems to bring unfavorable outcomes, where preterm birth is one of them and is more frequent in adolescents under 15 years of age, according to Karatasli et al.[34], who, as in another study carried out in Turkey, found a high rate of hospitalization in the neonatal intensive care unit for the offspring of these adolescents[35]. Also, teenage pregnancy seems to have negative repercussions for the adolescent's growth, as shown by Rah et al.[7], where pregnant adolescents had a height difference of 0.35±0.85

Table 3. Analysis of the trend in the prevalence of underweight. overweight. and obesity in pregnant adolescents who were beneficiaries of the Bolsa Família (Family Aid) Program in the 2008-2018 period. Brazilian macro-regions.

Location	2008 % [95%CI]	2009 % [95%CI]	2010 % [95%CI]	2011 % [95%CI]	2012 % [95%CI]	2013 % [95%CI]	2014 % [95%CI]	2015 % [95%CI]	2016 % [95%CI]	2017 % [95%CI]	2018 % [95%CI]	Annual variation % [95%CI]	p[a]	Trend
Underweight														
North	39.3 [37.0; 41.6]	39.2 [37.2; 41.3]	42.3 [40.6; 44.1]	38.4 [36.9; 39.9]	37.4 [36.1; 38.8]	39.5 [38.3; 40.7]	39.3 [38.2; 40.4]	37.7 [36.7; 38.7]	36.3 [35.6; 37.0]	35.1 [34.3; 35.8]	34.2 [33.4; 34.9]	-1.4 [-2.3; -0.6]	< 0.01	Declining
Northeast	40.1 [38.7; 41.4]	39.2	39.4 [38.4; 40.5]	37.0 [36.1; 37.8]	37.5 [36.8; 38.2]	38.5 [37.9; 39.2]	38.3 [37.7; 38.9]	38.1 [37.5; 38.7]	36.0 [35.6; 36.4]	36.2 [35.7; 36.6]	34.9 [34.5; 35.4]	-1.2 [-1.9; -0.6]	< 0.01	Declining
Midwest	37.8 [34.1; 41.4]	42.3	37.8 [35.1; 40.4]	36.8 [34.4; 39.2]	34.6 [32.4; 36.7]	34.8 [33.0; 36.6]	34.0 [34.2; 37.8]	35.3 [33.6; 37.1]	32.7 [31.6; 33.9]	34.7 [33.4; 35.9]	33.3 [32.0; 34.6]	-1.4 [-1.9; -0.9]	< 0.01	Declining
Southeast	36.6 [34.9; 38.4]	38.4	34.2 [32.8; 35.5]	34.1 [32.9; 35.3]	34.6 [33.5; 35.6]	33.1 [32.3;33.9]	33.3 [32.5; 34.0]	32.6 [31.9; 33.3]	33.2 [32.7; 33.8]	32.9 [32.3; 33.5]	31.5 [30.9; 32.2]	-1.3 [-1.8; -0.8]	< 0.01	Declining
South	30.3 [27.9; 32.6]	37.4	27.6 [25.9; 29.3]	28.5 [26.9; 30.1]	29.1 [27.7; 30.5]	27.1 [25.9; 28.3]	28.4 [27.2; 29.6]	28.2 [26.9; 29.4]	26.4 [25.6; 27.3]	26.4 [25.5; 27.4]	24.9 [23.9; 25.8]	-1.5 [-2.1; -0.9]	< 0.01	Declining
Brazil	37.8 [36.9; 38.6]	39.5	37.0 [36.3; 37.6]	35.6 [35.0; 36.1]	35.7 [35.2; 36.2]	35.6 [35.2; 36.1]	35.9 [35.5; 36.3]	35.5 [35.1; 35.9]	34.2 [33.9; 34.5]	34.3 [34.0; 34.6]	33.1 [32.8; 33.4]	-1.2 [-1.6; -0.8]	< 0.01	Declining

it continues

Table 3. Analysis of the trend in the prevalence of underweight, overweight, and obesity in pregnant adolescents who were beneficiaries of the Bolsa Família (Family Aid) Program in the 2008-2018 period, Brazilian macro-regions.

Location	2008 % [95%CI]	2009 % [95%CI]	2010 % [95%CI]	2011 % [95%CI]	2012 % [95%CI]	2013 % [95%CI]	2014 % [95%CI]	2015 % [95%CI]	2016 % [95%CI]	2017 % [95%CI]	2018 % [95%CI]	Annual variation % [95%CI]	p[a]	Trend
Overweight														
North	9.8 [8.4; 11.1]	10.2 [8.9; 11.4]	9.5 [8.5; 10.6]	11.7 [10.7; 12.7]	12.4 [11.5; 13.4]	11.1 [10.4; 11.9]	12.0 [11.2; 12.7]	12.8 [12.1; 13.5]	13.6 [13.1; 14.1]	13.6 [13.1; 14.1]	14.8 [14.3; 15.4]	4.1 [3.1; 5.2]	< 0.01	Increasing
Northeast	11.1 [10.2; 11.9]	11.2 [10.5; 11.9]	11.8 [11.1; 12.5]	13.6 [13.0; 14.2]	13.4 [12.9; 14.0]	13.1 [12.6; 13.6]	13.6 [13.1; 14.0]	14.1 [13.7; 14.5]	14.4 [14.1; 14.7]	15.0 [14.7; 15.4]	15.8 [15.4; 16.1]	3.4 [2.4; 4.4]	< 0.01	Increasing
Midwest	15.6 [12.8; 18.4]	12.8 [10.8; 14.9]	14.9 [13.0; 16.8]	14.3 [12.5; 16.0]	14.8 [13.2; 16.4]	17.0 [15.6; 18.4]	15.1 [13.8; 16.5]	14.9 [13.6; 16.2]	15.6 [14.8; 16.5]	15.2 [14.3; 16.2]	16.3 [15.3; 17.3]	1.1 [0.1; 2.2]	0.03	Increasing
Southeast	13.0 [11.7; 14.2]	13.9 [12.8; 14.9]	14.1 [13.1; 15.0]	15.1 [14.2; 16.0]	15.7 [14.9; 16.5]	15.9 [15.3; 16.5]	16.3 [15.7; 16.8]	16.6 [16.1; 17.2]	16.4 [15.9; 16.8]	16.6 [16.1; 17.0]	17.7 [17.1; 18.2]	2.9 [1.9; 3.8]	< 0.01	Increasing
South	15.2 [13.3; 17.0]	15.3 [13.9; 16.7]	16.7 [15.3; 18.1]	18.2 [16.9; 19.6]	18.0 [16.9; 19.2]	17.8 [16.7; 18.8]	18.4 [17.4; 19.5]	18.8 [17.7; 19.8]	18.2 [17.5; 19.0]	18.6 [17.7; 19.4]	19.6 [18.7; 20.5]	2.4 [1.1; 3.6]	< 0.01	Increasing
Brazil	12.1 [11.5; 12.7]	12.4 [11.9; 12.9]	12.8 [12.4; 13.3]	14.2 [13.8; 14.6]	14.4 [14.0; 14.8]	14.4 [14.1; 14.7]	14.7 [14.4; 15.0]	15.1 [14.8; 15.4]	15.3 [15.0; 15.5]	15.5 [15.2; 15.7]	16.4 [16.1; 16.6]	2.9 [2.0; 3.7]	< 0.01	Increasing
Obesity														
North	2.7 [1.9; 3.4]	2.4 [1.8; 3.1]	2.2 [1.6; 2.7]	2.7 [2.2; 3.2]	2.9 [2.4; 3.3]	3.1 [2.7; 3.5]	3.1 [2.7; 3.5]	3.8 [3.4; 4.2]	3.8 [3.5; 4.1]	3.8 [3.5; 4.1]	4.4 [4.1; 4.8]	6.4 [4.4; 8.4]	< 0.01	Increasing
Northeast	2.3 [1.9; 2.7]	2.6 [2.3; 3.0]	3.0 [2.6; 3.3]	3.6 [3.3; 4.0]	4.0 [3.7; 4.3]	4.3 [4.0; 4.5]	4.7 [4.4; 4.9]	4.8 [4.5; 5.1]	5.3 [5.1; 5.5]	5.5 [5.3; 5.7]	6.2 [5.9; 6.4]	10.1 [7.8; 12.5]	< 0.01	Increasing
Midwest	2.6 [1.4; 3.9]	3.9 [2.7; 5.1]	3.9 [2.8; 4.9]	5.0 [3.9; 6.1]	5.6 [4.6; 6.6]	6.4 [5.5; 7.3]	6.9 [5.9; 7.8]	6.9 [5.9; 7.8]	6.5 [5.9; 7.0]	6.6 [5.9; 7.2]	7.7 [7.0; 8.5]	10.2 [5.3; 15.3]	< 0.01	Increasing
Southeast	4.4 [3.7; 5.2]	4.4 [3.8; 4.9]	5.1 [4.4; 5.7]	5.8 [5.2; 6.3]	5.8 [5.3; 6.4]	6.5 [6.1; 6.9]	7.0 [6.6; 7.4]	7.8 [7.4; 8.2]	7.3 [7.0; 7.6]	7.6 [7.2; 7.9]	8.5 [8.2; 8.9]	6.9 [5.7; 8.5]	< 0.01	Increasing
South	5.2 [4.0; 6.3]	6.3 [5.4; 7.2]	5.7 [4.8; 6.6]	6.9 [6.0; 7.7]	7.2 [6.4; 8.0]	8.2 [7.4; 8.9]	8.6 [7.8; 9.3]	9.0 [8.2; 9.8]	8.4 [7.9; 8.9]	8.9 [8.3; 9.5]	10.2 [9.5; 10.9]	6.2 [4.6; 7.8]	< 0.01	Increasing
Brazil	3.3 [2.9; 3.6]	3.7 [3.4; 3.9]	3.7 [3.5; 4.0]	4.4 [4.2; 4.7]	4.7 [4.5; 4.9]	5.3 [5.1; 5.5]	5.6 [5.4; 5.8]	6.0 [5.8; 6.1]	6.0 [5.8; 6.1]	6.0 [5.9; 6.2]	6.8 [6.6; 7.0]	7.5 [5.7; 9.3]	< 0.01	Increasing

aPrais-Winsten linear regression.

Source: Web Food and Nutrition Surveillance System.

cm/year compared to adolescents who never became pregnant. This height deficit associated with underdeveloped pelvic bones and, therefore, a contracted pelvis, may explain the increased risk of pregnant adolescents requiring cesarean delivery[34,36].

Methods for anthropometric assessment of pregnant women are fragile, especially when considering that the instruments developed by the Institute of Medicine[37,38] and the Atalah et al.[20] nomogram have been scarcely validated in Latin American countries, which suggests caution in the process of comparability to epidemiological contexts with different socio-environmental phenotypes and conditions[20,37-41]. The Atalah et al.[20] nomogram can interpret high prevalence for the diagnosis of nutritional deficit/underweight, with lower sensitivity to identify overweight/obesity cases due to their adequate BMI range in the tenth gestational week (20.3 to 25.2 kg/m²), when compared with the other methods of anthropometric assessment of pregnant women[42].

The lack of an existing gold standard to define overweight and underweight in pregnancy hinders studies on the diagnostic accuracy of instruments based on the weight-height relationship, mainly due to the lack of specific curves for evaluating pregnant adolescents. Thus, the concern in the evaluation of pregnant adolescents is even more aggravated, since it refers to the convergence of two nutritional and metabolically critical situations, pregnancy and adolescence[43,44].

This study has some limitations that must be considered when assessing the results. First, health conditionality coverage data and, consequently, the percentage of pregnant women whose nutritional data were included in the information systems, are data for pregnant women in any age group, and not specific for pregnant adolescents, which may underestimate or overestimate the percentage of pregnant adolescents whose information was included in the system. Another relevant limitation is that prevalence levels were generated from the observations registered in the BFP Health Management System of the Ministry of Health, and were a sample of the universe of pregnant adolescent beneficiaries of the BFP, not allowing extrapolation to pregnant adolescents who are not beneficiaries of the program. Moreover, some SISVAN limitations should be considered. The system generates reports of data and information referring to the nutritional status as of 2008, which prevents the comprehensive evaluation of the trends of the nutritional status since the onset of the BFP in the beneficiary population. Finally, the tool used for the classification of nutritional status by the BFP was not developed for the population of pregnant adolescents, as previously discussed, but it is the tool indicated by the Ministry of Health for monitoring pregnant women in this age group.

One of the strengths of this study is that data represent the national outlook of the nutritional status of pregnant adolescents benefiting from the BFP, that is, all states and macro-regions were represented in this work. Also, we are unaware of other studies that aimed to determine the trend in the prevalence of nutritional deviations in this population in an assessment at the national level, which makes it the first study to outline the national setting of these conditions in pregnant adolescents who are beneficiaries of the BFP.

Conclusion

We can conclude that the prevalence of underweight among pregnant adolescents who are beneficiaries of the BFP had a decreasing trend in all Brazilian regions, while the prevalence of overweight and obesity shows an increasing trend throughout the country in the period. Finally, we highlight the importance of studies with methods identifying the determinants of pregnancy in adolescence and the change in the nutritional profile of this population to support the formulation of public policies aimed at this condition, given the repercussions of nutritional deviations at this stage of the life cycle and the unfavorable outcomes of pregnancy.

Collaborations

AE Silva Júnior participated in the design of the study, construction of the database, analysis and interpretation of data, writing of the paper, and critical review of the content. ML Macena participated in the construction of the database, analysis and interpretation of data, writing of the paper, and critical review of the content. LGL Vasconcelos, NB Almeida, DRS Praxedes, IROM Pureza, NB Bueno and APG Clemente participated in the writing of the paper and critical review of the content. All authors read and approved the final version of the content.

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