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ARTICLE

Undernutrition and obesity trends in Brazilian adults from 1975 to 2019 and its associated factors

Tendências de subnutrição e obesidade em adultos brasileiros entre 1975 e 2019 e fatores associados

Tendencias de desnutrición y obesidad en adultos brasileños desde 1975 a 2019 y sus factores asociados

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Abstract

Nutritional status has evolved in a dual trend worldwide: underweight has become a minor or local issue while overweight or obesity has risen to play a major role in the global burden of disease. In 2014, Brazil was ranked as the third country with the highest absolute number of obese men. Our aim was to estimate trends of underweight and obesity among Brazilian adults using a comprehensive set of surveys from 1974 to 2019. The data used in the study originate from subjects aged ≥ 18 in six Brazilian national surveys, presented in chronological order: Brazilian National Survey on Household Expenses (*ENDEF 1974-1975);* Brazilian National Survey on Health and Nutrition *(PNSN 1989);* Brazilian Household Budget Survey (*POF 2002-2003, 2008-2009); and* Brazilian National Health Survey (*PNS 2013 and 2019). All six surveys were designed to sample household complexes that were representative of the Brazilian population. Body mass index was calculated (kg/m2). The nutritional status of individuals was classified following the standards. We have modeled obesity trend according to income and education strata. The trajectories of underweight and obesity over time in Brazil draw the classical "X" of nutrition transition. From 1975 to 2019 underweight has decreased from 9.1% to 2.5% among men and 12.2% to 3.4% among women. On the other hand, obesity trajectories have scaled up from 3% to 22% among men and from 9% to 30% among women. The increase in obesity rate is directly and negatively proportional to income quintiles. Sociodemographic (income and education) improvement is associated with an increase in obesity. All public policies intending to stop the obesity spread in Brazil have been ineffective or too small to be effective.*

Nutritional Transition; Obesity; Malnutrition

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Introduction

Nutritional status has evolved in a dual trend worldwide: underweight has become a minor or local issue while overweight or obesity has risen to play a major role in the global burden of disease [1,2]. According to the World Health Organization (WHO), in 2016, more than 1.9 billion adults were overweight, out of which 650 million were obese people worldwide (11% of men and 15% of women) [3]. In this scenario, it is projected that by 2030, 58% of the world's adult population will be pre-obese or obese, totaling 3.3 billion overweight individuals [4].

Overweight is associated with negative effects on longevity, disability-free life-years, quality of life, and productivity [5]. The WHO has classified obesity as a disease itself besides being a risk to other noncommunicable diseases [6]. High body mass index (BMI) values are associated with increased morbidity and mortality, being a risk factor for chronic noncommunicable diseases, such as: type II diabetes, cardiovascular diseases, musculoskeletal disorders, and some types of cancer [7].

Aside from inequalities in health, obesity affects the economy, accounting for 2%-7% of the total health care expenditure in countries such as the United States, the Netherlands, Australia, and France. The higher the proportion of the population that is overweight and obese, the greater the use of health services and lost productivity, resulting in higher treatment costs for the many obesity-related diseases [5]. The continued rise in obesity is projected to add 5.5 billion pounds in medical costs to the United Kingdom healthcare system by 2050 [8].

The facts fueling the worldwide continuous increase in BMI and obesity values, and their impacts over the global burden of noncommunicable disease, have redirected obesity issue to a very wider context. The global syndemic of obesity, undernutrition and climate change concept connects nutrition, economics, and environmental indicators into a wider web of causation and effects that better address present and future challenges in health and environment [9]

In Brazil, data from regional and national surveys suggest that nutritional trends go in line with global trends. In 2014, Brazil was ranked as the third country with the highest absolute number of obese men (11.9 million) [10]. Among women, we saw a flat trend interval for obesity from 1989 to 2003, soon reversed to an increasing trend in the next period from 2003 to 2009 [10]. A drop by 5% of mean BMI across population could save USD 273 billion over 40 years in Brazil [11].

Deficiency of energy intake resulting undernutrition is associated with poverty and mostly affects children [12]. Undernutrition was a severe burden for Brazilians [11] and nowadays it is not a public health concern compared to obesity [13]. Between 1975 and 1997 the proportion of underweight to obese women changed from 2:1 to 1:2 [14]. Worldwide, undernutrition has declined as well, whereas the rate of decline has been unbalanced across regions and very slow to achieve by 2030 the established targets in the *Sustainable Development Goals* (SDG) [15].

Our aim was to estimate trends of underweight and obesity among Brazilian adults using a comprehensive set of surveys from 1974 to 2019.

Methods

Data

The data used in this study came from subjects aged 18 years or more in six Brazilian national surveys presented in chronological order: *Brazilian National Survey on Household Expenses* (ENDEF), carried out in 1974-1975 [16]; *Brazilian National Survey on Health and Nutrition* (PNSN) conducted in 1989 [17]; *Brazilian Household Budget Survey* (POF) in two editions. The first one was conducted in 2002-2003 and the second one in 2008-2009 [18]; finally, *Brazilian National Health Survey* (PNS) in two editions, the first one in 2013 [19] and the second one in 2019 [20]. All six surveys were designed to sample household complexes that were representative of the Brazilian population. The two surveys accomplished before the 2000s ignored the scarcely populated rural census sectors in the Northern Region of Brazil, of which surveys from 2002-2003 included. The PNS 2019 survey has performed anthropometric measurement only for 7% of its sample; we used that subsample in our analysis. All the surveys are representative of the Brazilian population and enable direct comparisons at least at national level across

the analyzed period. Complete information about sampling schemes, variables, number of individuals in sample, data collection procedures, and data imputation are described in the respective publication referenced at each survey. All surveys were conducted by the Brazilian Institute of Geography and Statistics (IBGE). All datasets are available for downloading form on IBGE site (http://www.ibge.gov.br). The 2013 PNS was approved by the Brazilian National Ethics Research Committe (CONEP) in June 2013 (n. 328,159) and the 2019 PNS in August 2019 (n. 3,529,376).

BMI was calculated as weight (kg) divided by squared height (m^2). The nutritional status of individuals aged ≥ 18 years was classified as underweight when their BMI (kg/m^2) was < 18.5 and as obese when their BMI was ≥ 30 [3]. BMI values inferior to $12kg/m^2$ or above $60kg/m^2$ were considered biologically implausible and discarded (3%). The percentage of values excluded was low and did not affect the prevalence estimative at national level. Ordinarily, IBGE has measured for each survey a new sample weighing based only in case with anthropometric data. Since we used that anthropometric weight variable provided by IBGE, we thought that perform a new post stratification weighing was unnecessary.

The initial pooled data was 774,189 individuals and after removing all missing or biologically implausible (outliers), the sample selected for analysis was 467,927: 63,018 male and 68,799 female in 1975; 16,788 male and 17,901 female in 1989; 55,666 male and 56,373 female in 2002-2003; 62,025 male and 65,689 female in 2008-2009; 25,920 male and 33,478 female in 2013; 3,298 male and 3,272 female in 2019.

We have selected income and education as social strata characteristics that modulate nutrition status. We measured the household per capita income as the mean of the income values of all household dwellers, then household per capita income was converted into quintiles in every survey. Information on education was harmonized among inquiries and stratified as schooling level at survey time. Harmonized school categories are: (a) never attended; (b) 1st-9th grade; (c) high school; (d) higher education.

Analysis

All estimations of underweight and obesity were age standardized to age distribution in 2019, the last available survey. A statistical model for obesity prevalence with Poisson regression was fitted in every gender. The incidence rate ratio (IRR) values for obesity were estimated using year of survey, age, income quintiles, and schooling level as independent variables. Finally, we used the previous Poisson regression to estimate a latent variable describing obesity prevalence as predicted for all independent variables included in the model. For the lack of latent structure effect among surveys, multiple Poisson regressions were chosen.

The annual growth rate was calculated as an exponential series by dividing the obesity prevalence in that survey by that in the previous one, with the ratio raised to the power measured as the inverse of the time span between surveys.

P-values showed in the tables are functions of density generated based on the z-test. All survey data were pooled into a single datafile. All indicators and statistics were estimated by considering sample strata, cluster, and weighing structure. Analyses were performed using svy prefix commands in Stata version 15.1 (https://www.stata.com).

Results

The trajectories of underweight and obesity over the last 45 years in Brazil draw the classical X of nutrition transition. From 1975 to 2019 underweight has decreased from 9.1% to 2.5% among men and from 12.2% to 3.4% among women. In the 2010's only among the youngest and the oldest adults underweight reached prevalence above 2%. Underweight trend showed its last expressive decline from 2003 to 2009. From 2009, underweight prevalence has virtually flattened for female and male with a slightly increase in 2019 (Table 1).

Obesity trajectories, conversely, scale up from 3% to 22% among men and from 9% to 30% among women. In both sexes, age range 40-59 years showed the highest prevalence over the observed time. In the 2010's, at the age group 60 years or above, approximately one in every four individual has obesity (Table 2).

Table 1

Prevalence (%) of adult underweight according to gender and age (years) in six surveys. Brazil, 1975-2019.

Gender and age (years)	Survey years					
	1975	1989	2003	2009	2013	2019
Men *						
18-29	9.3	5.8	4.6	3.4	3.6	5.9
30-39	5.6	2.3	2.2	1.1	1.8	2.1
40-49	6.6	4.0	1.8	0.9	1.1	1.4
50-59	8.8	4.0	2.6	1.6	1.1	0.3
60-79	12.9	7.4	3.8	2.5	2.2	2.3
80 +	16.0	8.4	12.2	3.0	4.0	2.2
Women *						
18-29	13.7	8.5	11.1	7.3	5.8	11.1
30-39	9.4	4.2	4.4	2.9	1.7	1.1
40-49	10.0	4.2	3.4	2.1	1.3	0.7
50-59	10.7	5.9	3.0	2.1	1.5	0.8
60-79	15.7	7.8	4.9	3.3	2.4	2.3
80 +	19.3	10.8	9.3	6.4	4.0	6.8

* National values are age standardized to 2019.

Table 2

Prevalence (%) of adult obesity according to gender and age in six surveys. Brazil, 1975-2019.

Gender and age (years)	Survey years					
	1975	1989	2003	2009	2013	2019
Men *						
18-29	0.8	2.2	3.7	6.5	10.6	10.1
30-39	2.5	5.4	9.4	13.1	17.1	20.9
40-49	4.0	7.6	11.3	14.9	20.8	30.5
50-59	4.5	7.2	13.1	16.6	21.3	29.9
60-79	3.4	6.1	9.7	13.7	18.8	20.2
80 +	1.5	1.1	2.7	9.8	12.0	27.2
Women *						
18-29	0.2	4.2	4.7	7.4	14.1	20.3
30-39	0.7	10.4	11.5	14.8	23.7	26.0
40-49	1.0	17.2	15.4	19.3	28.1	39.8
50-59	1.3	20.0	19.9	24.9	32.7	36.9
60-79	1.1	19.1	18.5	23.2	29.0	28.0
80 +	0.6	7.1	14.7	14.9	18.6	25.0

* National values are age standardized to 2019.

Obesity prevalence among men increased exponentially over time, in 2019 the prevalence was almost seven times that observed in 1975. The increase in obesity prevalence is especially high from 2003 to 2013 surveys, in that period prevalence has been increased by about 1% a year. Among women, obesity prevalence has tripled from 1975 to 2019 as women start from a higher prevalence level in 1975. From 1989 to 2003 obesity prevalence among women has flattened across ages, except for older individuals. From 2003, obesity prevalence increases continually among women (Table 2).

While underweight is virtually stabilized at very low prevalence since 2009, obesity has been increasing over all the period. Therefore, we present the analysis of factors associated to obesity only.

After multiple adjusting using Poisson regression, we see different associations of obesity with socioeconomic factors for male and female. Among male, obesity is directly and positively related to income and education. The prevalence difference from the highest to the lowest categories is about 12%. Among women, the relationship between obesity prevalence and income quintiles or schooling level is shaped like a small wave with the intermediate categories showing prevalence values higher than that in extreme categories (Table 3).

Table 3

Adjusted prevalence (%) and incidence rate ratio (IRR) of adult obesity * according to income and education level in six surveys. Brazil, 1975-2019.

Gender/Categories	Prevalence	95%CI	IRR	95%CI
Men				
Year				
1975	3.0	2.8-3.2	1.00	-
1989	5.6	5.0-6.2	1.85	1.6-2.1
2003	9.3	8.8-9.8	2.89	2.6-3.2
2009	13.1	12.6-13.5	3.99	3.7-4.3
2013	17.5	16.6-18.3	5.39	4.9-5.9
2019	21.9	18.7-25.1	6.69	5.6-8.0
Income quintile				
1	8.5	7.4-9.5	1.00	-
2	10.7	9.3-12.1	1.22	1.0-1.4
3	13.3	11.2-15.4	1.43	1.2-1.8
4	17.3	15.0-19.6	1.82	1.5-2.2
5	18.4	16.8-20.0	1.86	1.6-2.2
Schooling level				
Never attended	7.5	6.7-8.2	1.00	-
1st-9th grade	12.9	11.5-14.3	1.49	1.3-1.7
High school	16.5	15.0-18.0	1.50	1.3-1.8
Higher education	19.3	16.9-21.7	1.52	1.3-1.8
Women				
Year				
1975	8.9	8.6-9.2	1.00	-
1989	14.5	13.7-15.4	1.64	1.5-1.8
2003	14.8	14.2-15.4	1.66	1.6-1.8
2009	18.6	18.1-19.2	2.18	2.1-2.3
2013	26.0	25.1-26.8	3.12	2.9-3.3
2019	29.6	26.2-33.0	3.67	3.2-4.2
Income quintile				
1	19.2	17.6-20.8	1.00	-
2	21.3	19.2-23.5	1.10	1.0-1.3
3	22.1	20.4-23.8	1.12	1.0-1.3
4	22.3	20.0-24.7	1.17	1.0-1.3
5	20.2	18.3-22.1	1.14	1.0-1.3
Schooling level				
Never attended	17.3	16.3-18.3	1.00	-
1st-9th grade	23.9	22.7-25.1	1.29	1.2-1.4
High school	19.9	17.9-22.0	0.95	0.8-1.1
Higher education	18.7	15.6-21.8	0.86	0.7-1.0

95%CI: 95% confidence interval.

* Age standardized;

** Adjusted for age and remain variables in table; age standardized.

The annual growth rate for obesity between surveys varies inversely with income quintiles for men and women. The period 1989-2003 has the lowest rates across the analyzed period. From 2009 to 2013 prevalence of obesity increases by a rate near to 8% a year and it is as highest over time as almost doubled rates in other comparisons. The differences top-bottom income quintiles for growth rate are larger among women than among men (Table 4).

Figure 1 summarizes all analysis performed and shows the latent trajectory of obesity in Brazil over 45 years if socioeconomic and demographical variables were balanced across the time. The latent trajectory of obesity in men remains similar to the observed trajectory, showing continuous step up among periods. On the other hand, the latent obesity among women shows a singular trajectory with a flat period followed by two exponential growth periods. Furthermore, this singular trajectory starts from a point three times the latent prevalence in men.

Discussion

Our analysis of Brazilian national-wide surveys has covered a time span of 45 years. Our outcomes suggest that: (a) underweight is no longer a public health issue among adults in Brazil; (b) obesity shows a growing trajectory while have different growth rates over time; (c) the growth rate of obesity prevalence is inversely related to income quintiles; and (d) the prevalence of obesity among woman is almost 1.4 times that observed among men, without expressive difference in that trend.

Brazil has faced a huge demographical, social, and economic transformation over the 45 years covered in our analysis. Urban population increased from 60% to 89%; life expectancy at birth increased from 53.5 to 75.5 years [21]; the share of gross domestic product of industry sector changed from 38.3% to 28% while services sector changed from 56.2% to 65.3% [22]. Brazil has been under nutrition transition throughout the last 50 years. Their major determinants are the socioeconomical and political changes experienced at that period. From 2003 to 2013, for example, 44.7 million people ascended to the middle class. Besides that, extreme poverty was reduced approximately 50% in an inclusive economic growth model based in trade openness, technological, and financial development [23,24]. Those more recent changes add to a widest trend of changes in Brazilian public health system conducted under civil society influence [11,12,25].

Table 4

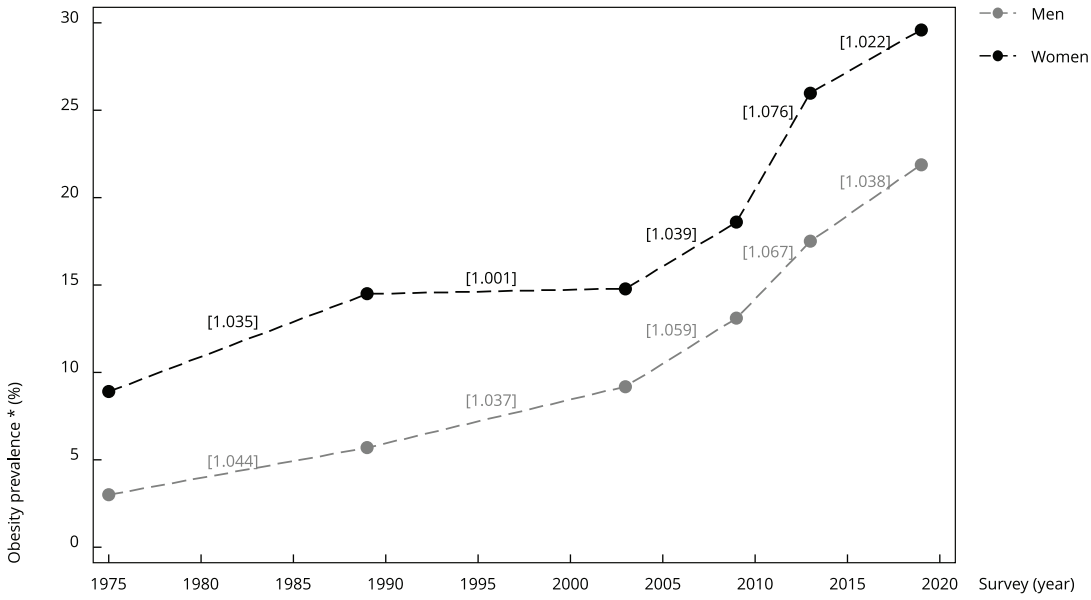
Obesity annual growth rate between surveys of adult according to income quintiles in five periods. Brazil, 1975-2019.

Gender and income (quintiles)	Survey intervals				
	1975-1989	1989-2003	2003-2009	2009-2013	2013-2019
Male					
1	1.040	1.011	1.047	1.077	1.030
2	1.038	1.011	1.046	1.075	1.033
3	1.038	1.013	1.048	1.074	1.030
4	1.037	1.010	1.046	1.073	1.026
5	1.036	1.010	1.044	1.075	1.028
Female					
1	1.041	1.011	1.049	1.076	1.034
2	1.040	1.011	1.046	1.076	1.030
3	1.040	1.012	1.049	1.076	1.033
4	1.037	1.011	1.046	1.073	1.023
5	1.036	1.010	1.044	1.071	1.030

Note: adjusted for age and remain variables in Table 3; age standardized.

Figure 1

Adjusted prevalence * (%) and annual growth rate of male and female adult obesity over six surveys. Brazil, 1975-2019.



Source: Brazilian surveys (1975-2019).

Note: values inside brackets are annual growth rate for the time interval.

* Adjusted for age, income quintiles and schooling level.

All of that has changed how people have access to health services and how such services are provided to the citizens. Brazil has achieved expressive results in *Millennium Development Goals*, mixed outcomes in control of infectious disease, expressive advances at social participation in management of public health system, and has successfully innovated health-policy, while some challenges remain open today [26].

Underweight tend to reduce as demographical, social, economic, and health conditions change within societies that improve wealth and income share [27]. Brazil has reduced undernutrition and other poverty-associated disease among children and adults on its transition [28,29]. In 2019, the underweight prevalence increased slightly for all genders. That increase is not easy to interpret. It can be an effect from changes in economic and health public politics underway in Brazil since 2015 or it can be attributable to the statistical fluctuation, especially in 2019 survey in which anthropometric subsample is small. We have performed an analysis using annual data of *Risk and Protective Factors Surveillance System for Chronic Non-Comunicable Diseases Through Telephone Interview* (Vigitel), conducted among Brazilian adults living in state capitals, found out prevalence of underweight is below of 3% from 2006 to 2020, even if stratified by schooling level (data not showed here). Based on available evidence, underweight is considered a secondary burden for adults compared to obesity and is more prevalent in vulnerable specific groups like older people [30,31].

Our results indicates that, for adults, one of every five men and one of every four women is obese in Brazil. Previous household surveys analysis indicates greater vulnerability of women to the dynamics of obesity in the context of exclusion and poverty. Besides, obesity moves forward among adolescent as much as adult population and has an important impact on the low-income social groups [28]. That context give prominence to decreasing the spread of obesity as a major challenge in Brazil, either as nutritional goal or as reduction of risk factors for noncommunicable diseases.

In Brazil, correlation of obesity with income is different for men and women. Among men we observe a positive correlation, while for women the correlation is weak and has a concave shape. Despite that, obesity spread accelerate more among the low-income adults than among the wealthiest ones. Worldwide, the complex relationship between obesity and income is mediated by social development level, income inequality, national behaviors (cycling, dieting, among others) and health policies [27,32]. Brazilian government has created a national strategy to fight noncommunicable diseases; intended to evolve from 2011 to 2022, one of its goals was stop growing obesity [33]. Our results from 2013 to 2019 indicates that spread of obesity has slowed down, but it is still far from meeting the goal. The role of health policies or the population's behavior in that deacceleration remain to be analyzed.

The obesity pandemic has been fueled mainly by a blend of global drivers and local environments. Such blend induces drivers' interaction and generate local patterns that affect vulnerable social groups within countries. As an example, the raise in elaboration of ultra-processed foods and a huge distribution system came together to supply cheap, palatable, and energy-dense foods [34]. In Brazil data from 2019 edition of Vigitel indicates that one of every two adults are sedentary ; and that one of every five adults has eaten up to five or more ultra-processed foods the day before [35]. The Brazilian blend of global drivers and local environment – add to economic and health inequalities – help to understand national obesity trends.

Our analysis has some drawbacks. The first one is the limited number of information (variables) to explore causal factors associated to the nutritional status transition in Brazil as surveys conducted by IBGE collected few information about events or factors associated to disease (weight history, eating habits, physical activity practices, for example). The second one is the asymmetric age composition across survey that have been restricted our analysis to the adult age, which is common to all surveys. The major drawback is the small subsample with anthropometric data in PNS 2019. This limited number of individuals in 2019 survey has contraindicated the stratification by geographic regions or small categories in socioeconomic level. Finally, from 2015 to 2021, Brazil has experienced a political and economic turmoil which can reverse many of positive trend observed in underweight decreasing. Our last analyzed survey is from 2019 and we have restricted analysis to the adult people. Thus, we are not able to detect any reverse effect in that trend until then. More recent data, or data from children, probable will be able to identify such reversion if it exists.

Our study allows no conclusion about causation of obesity trend as it uses data from surveys. Therefore, we are cautious enough to avoid indicating which factors could fuel the changing spread of obesity in Brazil. However, the huge datasets used allow us claim consistency of estimators and relationships showed in our study.

Conclusion

The trajectory of nutritional transition among Brazilian adults seems consolidate underweight as no longer a public health concern and obesity as a major concern for nutrition and public health. Obesity trajectory in Brazil predicts prevalence levels similar to the United States or Mexico within 20 years. Besides being a disease itself, obesity plays a role in onset of other noncommunicable diseases as hypertension, diabetes, and more than 10 types of cancer.

All public policies created intending to stop the obesity spread in Brazil have been ineffective or small range of effectiveness as signalized in our analysis. The trajectory of obesity from 2013 to 2019 is conclusive about that. The relationship between obesity and socioeconomic context highlighted in our results suggest that Brazil must intensify the adoption of successful experiences of management of obesity within public health service, to rebuilt environments to support new healthy behaviors in large cities and developing national policies to empowering production and supply of healthy foods in the country.

Contributors

W. L. Conde contributed to the project design, data analysis and interpretation, writing and critical review of the article. I. V. Silva and F. R. Ferraz contributed to data analysis and interpretation, writing and critical review of the article. All authors have approved the final version for publication, and are responsible for all aspects of the work in ensuring the accuracy and integrity of any part of the work.

Additional informations

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References

1. Abarca-Gómez L, Abdeen ZA, Hamid ZA, Abu-Rmeileh NM, Acosta-Cazares B, Acuin C, et al. Worldwide trends in body-mass index, underweight, overweight, and obesity from 1975 to 2016: a pooled analysis of 2416 population-based measurement studies in 128·9 million children, adolescents, and adults. Lancet 2017; 390:2627-42.
2. Malik VS, Willett WC, Hu FB. Global obesity: trends, risk factors and policy implications. Nat Rev Endocrinol 2013; 9:13-27.
3. World Health Organization. Obesity: preventing and managing the global epidemic. Geneva: World Health Organization; 2000. (WHO Technical Report Series, 894).
4. Kelly T, Yang W, Chen C-S, Reynolds K, He J. Global burden of obesity in 2005 and projections to 2030. Int J Obes 2008; 32:1431-7.
5. Wang YC, McPherson K, Marsh T, Gortmaker SL, Brown M. Health and economic burden of the projected obesity trends in the USA and the UK. Lancet 2011; 378:815-25.
6. Aghili SMM, Ebrahimpur M, Arjmand B, Shadman Z, Pejman Sani M, Qorbani M, et al. Obesity in COVID-19 era, implications for mechanisms, comorbidities, and prognosis: a review and meta-analysis. Int J Obes 2021; 45:998-1016.
7. Hruby A, Manson JE, Qi L, Malik VS, Rimm EB, Sun Q, et al. Determinants and consequences of obesity. Am J Public Health 2016; 106:1656-62.
8. Kopelman P, Jebb SA, Butland B. Executive summary: foresight 'Tackling Obesities: Future Choices' project. Obes Rev 2007; 8 Suppl 1:vi-ix.
9. Kleinert S, Horton R. Obesity needs to be put into a much wider context. Lancet 2019; 393:724-6.
10. Gomes DCK, Sichieri R, Verly Junior E, Boccolini CS, Moura Souza A, Cunha DB. Trends in obesity prevalence among Brazilian adults from 2002 to 2013 by educational level. BMC Public Health 2019; 19:965.
11. Rtveladze K, Marsh T, Webber L, Kilpi F, Levy D, Conde W, et al. Health and economic burden of obesity in Brazil. PLoS One 2013; 8:e68785.
12. Monteiro CA. A dimensão da pobreza, da fome e da desnutrição no Brasil. Estud Av 1995; 9:195-207.
13. Coutinho JG, Gentil PC, Toral N. A desnutrição e obesidade no Brasil: o enfrentamento com base na agenda única da nutrição. Cad Saúde Pública 2008; 24 Suppl 2:S332-40.
14. Monteiro CA, Conde WL, Popkin BM. The burden of disease from undernutrition and overnutrition in countries undergoing rapid nutrition transition: a view from Brazil. Am J Public Health 2004; 94:433-4.
15. Swinburn BA, Kraak VI, Allender S, Atkins VJ, Baker PI, Bogard JR, et al. The global syndemic of obesity, undernutrition, and climate change: the Lancet Commission report. Lancet 2019; 393:791-846.

16. Instituto Brasileiro de Geografia e Estatística. Estudo Nacional da Despesa Familiar – ENDEF: consumo alimentar – despesas das famílias. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 1978.
17. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional Sobre Saúde e Nutrição: resultados preliminares. https://biblioteca.ibge.gov.br/visualizacao/livros/liv81879.pdf (accessed on 05/Jan/2021).
18. Instituto Brasileiro de Geografia e Estatística. Pesquisa de Orçamentos Familiares 2008-2009. Antropometria e estado nutricional de crianças, adolescentes e adultos no Brasil. http://www.ibge.gov.br/home/estatistica/populacao/condicaodevida/pof/2008_2009/POFpublicacao.pdf (accessed on 05/Jan/2021).
19. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saúde 2013: manual de entrevista. https://biblioteca.ibge.gov.br/visualizacao/instrumentos_de_coleta/doc2963.pdf (accessed on 06/Jun/2021).
20. Instituto Brasileiro de Geografia e Estatística. Pesquisa Nacional de Saúde 2019: manual de entrevista de saúde. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2021.
21. Figueiredo AH. Brasil: uma visão geográfica e ambiental no início do século XXI. Rio de Janeiro: Instituto Brasileiro de Geografia e Estatística; 2016.
22. Instituto de Pesquisa Econômica Aplicada. O Brasil em 4 décadas. http://repositorio.ipea.gov.br/handle/11058/1663 (accessed on 16/Jun/2021).
23. Neri MC. A nova classe média: o lado brilhante da base da pirâmide. São Paulo: Saraiva Uni; 2012.
24. Ferreira de Mendonça H, Martins Esteves D. Income inequality in Brazil: what has changed in recent years? CEPAL Review 2014; (112):107-23.
25. Paim J, Travassos C, Almeida C, Bahia L, Macinko J. The Brazilian health system: history, advances, and challenges. Lancet 2011; 377:1778-97.
26. Victora CG, Barreto ML, Leal MC, Monteiro CA, Schmidt MI, Paim J, et al. Health conditions and health-policy innovations in Brazil: the way forward. Lancet 2011; 377:2042-53.
27. Prentice AM. The double burden of malnutrition in countries passing through the economic transition. Ann Nutr Metab 2018; 72:47-54.
28. Conde WL, Monteiro CA. Nutrition transition and double burden of undernutrition and excess of weight in Brazil. Am J Clin Nutr 2014; 100:1617S-22.
29. Barreto ML, Teixeira MG, Bastos FI, Ximenes RA, Barata RB, Rodrigues LC. Successes and failures in the control of infectious diseases in Brazil: social and environmental context, policies, interventions, and research needs. Lancet 2011; 377:1877-89.
30. Flegal KM, Graubard BI, Williamson DF, Gail MH. Excess deaths associated with underweight, overweight, and obesity. JAMA 2005; 293:1861-7.
31. Veronese N, Cereda E, Solmi M, Fowler SA, Manzato E, Maggi S, et al. Inverse relationship between body mass index and mortality in older nursing home residents: a meta-analysis of 19,538 elderly subjects. Obes Rev 2015; 16:1001-15.
32. Monteiro CA, Conde WL, Lu B, Popkin BM. Obesity and inequities in health in the developing world. Int J Obes 2004; 28:1181-6.
33. Malta DC, Morais Neto OL, Silva Junior JB. Apresentação do plano de ações estratégicas para o enfrentamento das doenças crônicas não transmissíveis no Brasil, 2011 a 2022. Epidemiol Serv Saúde 2011; 20:425-38.
34. Swinburn BA, Sacks G, Hall KD, McPherson K, Finegood DT, Moodie ML, et al. The global obesity pandemic: shaped by global drivers and local environments. Lancet 2011; 378:804-14.
35. Monteiro C, Macário E, Sardinha L, Gouvea E, Silva L, Oliveira M, et al. Vigitel Brasil 2019 : vigilância de fatores de risco e proteção para doenças crônicas por inquérito telefônico: estimativas sobre frequência e distribuição sociodemográfica de fatores de risco e proteção para doenças crônicas nas capitais dos 26 estados brasileiros e no Distrito Federal em 2019. Brasília: Ministério da Saúde; 2020.

Resumo

O estado nutricional tem evoluído em duas direções no mundo: o baixo peso se tornou uma questão menor ou local, enquanto o sobrepeso ou obesidade passou a ter papel preponderante na carga global de doença. Em 2014, o Brasil ocupou terceiro lugar no mundo em número absoluto de homens obesos. O estudo teve como objetivo estimar as tendências nas taxas de baixo peso e obesidade entre adultos brasileiros, tendo como base um conjunto abrangente de inquéritos entre 1974 e 2019. Os dados utilizados no estudo se referem a indivíduos com 18 anos ou mais em seis pesquisas nacionais, apresentadas em ordem cronológica: Estudo Nacional de Despesa Familiar *(ENDEF 1974-1975);* Pesquisa Nacional sobre Saúde e Nutrição *(PNSN 1989);* Pesquisa de Orçamentos Familiares *(POF 2002-2003, 2008-2009) e* Pesquisa Nacional de Saúde *(PNS 2013 e 2019). Todos os 6 inquéritos foram desenhados para obter amostras de complexos de domicílios que fossem representativas da população brasileira. O índice de massa corporal foi calculado (kg/m²). O estado nutricional dos indivíduos foi classificado de acordo com as normas da Organização Mundial da Saúde. Modelamos a tendência da obesidade de acordo com as faixas de renda e escolaridade. As trajetórias de baixo peso e obesidade no Brasil ao longo do tempo mostram a forma clássica em "X" da transição nutricional. Entre 1975 e 2019, a taxa de baixo peso diminuiu de 9,1% para 2,5% entre homens e de 12,2% para 3,4% entre mulheres. Inversamente, as trajetórias da obesidade aumentaram de 3% para 22% entre homens e de 9% para 30% entre mulheres. O incremento na obesidade está relacionado diretamente e de maneira negativamente proporcional aos quintis de renda. A melhoria sociodemográfica (de renda e escolaridade) está associada ao aumento da obesidade. Todas as políticas públicas para interromper a expansão da obesidade no Brasil têm sido ineficazes, ou pequenas demais para ser eficazes.*

Transição Nutricional; Obesidade; Desnutrição

Resumen

*El estatus nutricional ha evolucionado en una doble tendencia alrededor del mundo: el bajo peso se ha convertido en un problema menor o local, mientras que el sobrepeso o la obesidad ha aumentado desempeñando un papel importante en la carga global de la enfermedad. En 2014, Brasil se situó como el tercer país con la mayor carga absoluta de hombres obesos. Nuestro objetivo fue estimar las tendencias de bajo peso y obesidad entre brasileños adultos, utilizando un conjunto completo de encuestas desde 1974 a 2019. Los datos usados en el estudio procedieron de individuos con ≥18 años en 6 encuestas nacionales brasileñas, presentadas en orden cronológico: E*studio Nacional sobre Gasto Familiar *(ENDEF 1974-1975);* Encuesta Nacional de Salud y Nutrición *(PNSN 1989);* Encuestas sobre Presupuesto Familiar *(POF 2002-2003, 2008-2009); y* Encuesta Nacional de Salud *(PNS 2013 y 2019). Las 6 encuestas se diseñaron para las muestras complejas de hogares que eran representativas de la población brasileña. Se calculó el indice de masa corporal (kg/m²). El estatus nutricional de los individuos se clasificó siguiendo los estándares de la Organización Mundial de la Salud. Hemos modelado la tendencia a la obesidad según el nivel de ingresos y educación. Las trayectorias de bajo peso y obesidad a lo largo del tiempo en Brasil dibujaron la clásica "X" de transición nutricional. Desde 1975 a 2019, ha decrecido el bajo peso de 9,1% a 2,5% entre hombres y de 12,2% a 3,4% entre mujeres. Las trayectorias de obesidad, en cambio, escalan desde el 3% al 22% entre hombres, y desde el 9% al 30% entre mujeres. El incremento en la tasa de obesidad es directamente y negativamente proporcional a los quintiles de ingresos. La mejora sociodemográfica (ingresos y educación) está asociada con un incremento en la obesidad. Todas las políticas públicas puestas en práctica para intentar detener la propagación de la obesidad en Brasil han sido inefectivas o demasiado pequeñas para ser efectivas.*

Transición Nutricional; Obesidad; Desnutrición

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