Association between ethnicity and population overweight/obesity in Brazil

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ABSTRACT

Introduction: Obesity is a multifactorial, chronic, and progressive disease that affects considerable portions of the world and Brazilian populations. Studies show that societies and environments with higher levels of structural racism can trigger higher levels of obesity prevalence in their marginalized populations. Thus, the greater vulnerability of populations of black ethnicity in Brazil, resulting from the structural and institutional racism established, leads to higher rates of overweight and obesity caused by the inability of such populations to guarantee food security. **Objective:** This study aimed to analyze the evolution of the prevalence of overweight and obesity in white and black populations in Brazil, evaluating eating habits with the potential to promote obesity. In addition, we aimed to relate the worsening of the populational BMI in Brazil with ethnicity and structural racism present in Brazilian society. **Method:** This investigation is a descriptive cross-sectional study. Twelve standardized questions from the VIGITEL survey were selected from 2011 to 2020. Data were analyzed using descriptive statistics, and Student's T-test was applied to compare ethnic groups. **Results:** The results, in general, show that individuals of the black ethnic group have a higher degree of BMI (Kg/m^2) compared to the white ethnic group. BMI (Kg/m^2) data for Brazilian capitals show that both in 2011 and 2020, the averages of the evaluated index were higher among the black population, presenting 26.03 Kg/m^2 and 27.07 Kg/m^2, respectively, while individuals declared white had averages of 25.7 Kg/m^2 and 26.45 Kg/m^2 in the same years. The average BMI in 2011 to 2020, of 25.99 Kg/m^2 for the white ethnicity, and of 26.50 Kg/m^2 for the black ethnicity, indicates overweight at the national level. In addition, the average consumption of vegetables was lower among black people, which showed a higher food frequency in the consumption of soft drinks or artificial juice than the white people, presenting, in general, a lower quality diet. **Conclusion:** The average BMI and the prevalence of overweight are increasing in the populations of the capitals of Brazil, being this increase more accentuated in the populations of black ethnicity. It was also observed that the populations of black ethnicity have a lower quality in their diet compared to the diet of the white population.

Keywords: Racial inequality in health, Obesity, Eating behavior, Body mass index, Overweight.

INTRODUCTION

Obesity is a multifactorial, chronic, and progressive disease that affects considerable portions of the world and the Brazilian population[1-3]. As it is a multifactorial disease, there are numerous causes related to caloric intake and burning that trigger obesity in individuals[4-7]. However, the existence of obesogenic environments exacerbates the issue of collective obesity since they foster and promote obesity[8,9]. In this sense, studies show that societies and environments with higher levels of structural racism can trigger higher levels of obesity prevalence in their marginalized populations[8,10].

Structural racism refers to the ways in which societies promote [racial] discrimination through [unfair] systems of mutual reinforcement (for example, in housing, education, employment, earnings, benefits, credit, media, health, criminal justice, etc.), which, in turn, reinforce discriminatory beliefs, values, and resources distribution reflected in the history, culture and interconnected institutions [11]. Along with the concept of structural racism, it was conventional to add the term "institutional" in the sense of the naturalness and functioning of the racial inequality propagation. In other words, institutional racism is not expressed explicitly but diffusely in the daily process of institutions and organizations [12]. Racism exists,

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not only in the beliefs and attitudes of some or many people but in the intrinsic social structure[13], given that this phenomenon triggers the effects of inequality in society as a whole.

Therefore, racism cannot be reduced to poverty and misery precisely because of its effects, whose complexity is proved by studies[14]. Consequently, denying the issue causes socio-economic inequality from segregation, raising questions about social commitment[15].

The consolidation of structural racism in Brazil has historical roots and can be observed not only in society but also in political, economic, and cultural relations between population minorities[16]. Racial democracy is a myth about parity conditions, considering that contemporary inequalities between whites and non-whites are evident in access to education, in the labor market, monetary conditions, and social experience[17]. Thus, it is reasonable to assume that the greater vulnerability of black populations in Brazil, resulting from the structural and institutional racism established, leads to higher rates of overweight and obesity caused by the inability of such populations to guarantee the four dimensions of food security (availability, access, consumption, and regularity)[18].

As an endemic disease, a predictor of hundreds of chronic diseases that affect 40% of the world's population, obesity is not specific to just one group of the population. Even so, it affects poorer populations restricted to health services and practices that promote them[19,20]. An example is the structural/institutional racism operationalized by racial residential segregation limited to scarcity and access to healthy food, corroborating that low socioeconomic neighborhoods with racial minority residents only have obesogenic environments to offer[8].

The goal of this study is to analyze the prevalence evolution of overweight and obesity in white and black populations in Brazil, also analyzing eating habits that potentially promote obesity, seeking to relate the worsening of overweight and obesity in Brazil with ethnicity and structural racism present in Brazilian society.

METHOD

This cross-sectional ecological study analyzes data from the Surveillance System for Risk and Protection Factors for Chronic Diseases by Telephone Survey (VIGITEL) carried out from 2011 to 2020. The VIGITEL study is based on a systematic data collection annually carried out by the Ministry of Health, starting in 2006. This survey creates annual data on the adult population (18 years and older) residing in the 26 Brazilian capitals and the Federal District. It is worth noting that VIGITEL defines the minimum sample size in each of the capitals as at least 2,000 telephone interviews. Thus, the system estimates the frequency of the variables investigated with a 95% confidence coefficient and a 2% sampling error. In order to achieve the goals of this research[12], standardized questions from the VIGITEL survey were selected. Table 1 shows details about the variables addressed in this study.

Data referring to height and weight enabled the calculation of the BMI (Body Mass Index), used as an indicator of a health risk factor. BMI was calculated for each of the records using the standard BMI equation [eq. 1] as follows:

$$IMC = \frac{[weight\ (in\ kg)]}{[height\ (in\ m)]^2} \quad \text{(Eq. 1)}$$

The values obtained were classified according to the categories provided by the World Health Organization (WHO), as follows: (1) normal [BMI<25]; (2) overweight [BMI≥25]; (3) obesity I [BMI≥30]; (4) obesity II [BMI≥35]; and (5) obesity III [BMI≥40]. The study results were analyzed in an interpretive way, using descriptive statistics of central tendency and dispersion to analyze the evolution of the variables investigated in the study. The study also adopted the Student's t-test analysis to compare ethnic groups.

It should be noted that the VIGITEL system was approved by the National Commission on Ethics in Research for Human Beings of the Brazilian Ministry of Health. As this was a telephone interview, verbal consent was obtained instead of an informed consent form.

RESULTS

This section presents the study results for the average BMI, as well as the consumption frequency of selected foods. Table 2 presents the means and the respective BMI standard deviations of the populations of white and black ethnicities in the Brazilian capitals

Table 1

VIGITEL survey variables selected for this study

Code	Description	Answers (recoded)
Q 6	Age	Value in years.
Q 7	Gender	(1) Male; and (2) Female.
Q 8	Education	(1) Elementary School; (2) Admission; (3) Junior High School; (4) Elementary or Supplementary School; (5) High School, Technical School or Supplementary School; (6) Higher Education; (7) Graduation (Specialization, Master's, Doctorate); (8) Never studied; (9) Does not know; and (10) Did not answer.
Q 9	Weight [in kilograms (kg)]	Value in kilos.
Q 11	Height [in meters (m)]	Value in meters.
Q 14	Pregnancy status	(1) Yes; (2) No; and (3) Does not know.
Q 16	How many days a week do you usually eat at least one type of vegetable [lettuce, tomato, cabbage, carrot, chayote, eggplant, zucchini (disregard potato, cassava or yam)]?	(1) Never; (2) Rarely; (3) Once or twice a week; (4) Three to four days a week; (5) Five to six days a week; and (6) Every day.
Q 17	How many days a week do you usually eat lettuce and tomato salad or any other raw vegetable salad?	
Q 19	How many days a week do you usually eat cooked vegetables with food or in soup, such as cabbage, carrots, chayote, eggplant, zucchini, disregarding potatoes, cassava or yams?	
Q 27	How many days a week do you usually eat fruit?	
Q29	How many days a week do you usually drink soda or artificial juice?	
Q36	Frequency of alcohol consumption	(1) Less than a day a month; (2) Less than a day a week; (3) Once or twice a week; (4) Three to four days a week; (5) Five to six days a week; (6) Every day.
Q 69	Color or race	(1) White; (2) Black; (3) Yellow; (4) Brown; (5) Indigenous; (6) Does not know; and (7) Did not answer.

from 2011 to 2020, considering the age group between 20 and 59 years old.

It is observed that five out of 27 cities related to black ethnicity reduced the average BMI between 2011 and 2020, with the sharpest decline in João Pessoa (-1.54), Rio Branco (-1.22), and Manaus (-0.28). Regarding the white ethnicity, it was observed that only the sample from Goiânia (-0.22) showed a decreased analyzed variable. The prevalence of higher BMI means for black ethnicity was noted, with the highest rates being obtained in Curitiba (28.9), Florianópolis (28.69), and Rio de

Janeiro (28.61) in 2020. In that same year, it was possible to verify that the white ethnicity had lower BMI averages compared to the black ethnicity in nineteen capitals.

The BMI data among the Brazilian capitals disclosed in Table 2 made it possible to infer that the averages of the evaluated index were higher among the black ethnic population in 2011 and 2020, representing 26.03 and 27.07, respectively, while the declared white individuals had averages of 25.7 and 26.45 in the same years. It is important to note that the increase in the BMI average occurred for the two ethnic groups analyzed, although the difference was higher for the black ethnicity (1.04) than for the white ethnicity (0.75). There was an increase in 22 capitals in the average BMI of the declared black population, with the most expressive numbers referring to Florianópolis (3.39) and Goiânia (3.08).

Table 2

Average (standard deviation) BMI of the populations of white and black ethnicities in the Brazilian capitals between 20 and 59 years old.

Capitals	2011		2020		Difference	
	White	Black	White	Black	White	Black
Aracaju	25.69 (4.89)	25.48 (4.77)	26.03 (4.45)	28.08 (5.08)	0.34	2.6
Belém	25.86 (4.84)	26.07 (4.44)	26.39 (5.6)	27.51 (5.26)	0.53	1.44
Belo Horizonte	25.34 (4.85)	26.13 (4.31)	25.5 (4.67)	27.23 (5.67)	0.16	1.1
Boa Vista	25.92 (4.84)	25.88 (4.4)	27.35 (5.73)	27.95 (5.85)	1.43	2.07
Campo Grande	25.78 (4.84)	25.55 (5.15)	26.85 (4.79)	26.48 (5.59)	1.07	0.93
Cuiabá	26.37 (5.64)	25.88 (4.81)	26.62 (5.26)	27.56 (4.72)	0.25	1.68
Curitiba	25.66 (4.45)	26.48 (5.73)	26.09 (4.71)	28.9 (4.67)	0.43	2.42
Distrito Federal	25.44 (4.4)	26.21 (4.74)	25.83 (4.61)	26.68 (4.09)	0.39	0.47
Florianópolis	25.41 (4.82)	25.3 (4.48)	26 (4.67)	28.69 (5.12)	0.59	3.39
Fortaleza	25.97 (4.96)	26.84 (5.81)	26.77 (4.4)	27.55 (4.62)	0.8	0.71
Goiânia	25.79 (4.93)	25.22 (4.26)	25.57 (4.31)	28.3 (11.39)	-0.22	3.08
João Pessoa	25.79 (4.83)	26.95 (5.89)	26.55 (5.2)	25.41 (5.04)	0.76	-1.54
Macapá	26.14 (4.83)	26.21 (5.05)	27.18 (4.99)	27.87 (5.75)	1.04	1.66
Maceió	25.64 (5.04)	26.31 (5.06)	26.46 (5.96)	26.06 (4.8)	0.82	-0.25
Manaus	26.13 (4.68)	26.74 (5.53)	27.04 (5.36)	26.46 (4.87)	0.91	-0.28
Natal	25.91 (4.93)	26.05 (4.8)	26.8 (5.12)	27.26 (5.85)	0.89	1.21
Palmas	25.14 (4.41)	25.71 (5.12)	26.31 (4.42)	25.79 (4.76)	1.17	0.08
Porto Alegre	25.98 (4.91)	27.08 (5.37)	26.89 (4.66)	26.89 (6.35)	0.91	-0.19
Porto Velho	25.94 (5)	26.6 (5.31)	26.18 (4.98)	26.92 (4.99)	0.24	0.32
Recife	25.58 (4.44)	26.17 (5.02)	26.3 (5.63)	28.3 (5.72)	0.72	2.13
Rio Branco	25.87 (4.89)	27.73 (6.79)	26.66 (5.21)	26.51 (4.97)	0.79	-1.22
Rio de Janeiro	26.13 (4.95)	26.25 (4.96)	26.93 (4.98)	28.61 (5.41)	0.8	2.36
Salvador	25.11 (4.27)	25.99 (4.91)	26.33 (4.41)	26.54 (4.78)	1.22	0.55
São Luís	25.15 (4.22)	25.5 (4.48)	25.53 (4.1)	25,75 (4.9)	0.38	0.25
São Paulo	25.78 (4.58)	26.55 (6.38)	27.28 (4.87)	28.08 (6.62)	1.5	1.53
Teresina	24.96 (4.31)	24.76 (4.61)	26.46 (4.93)	26.35 (5.17)	1.5	1.59
Vitória	25.3 (4.76)	25.42 (5.07)	26.38 (5.37)	26.42 (4.75)	1.08	1
BRAZIL	**25.7 (4.78)**	**26.03 (5.05)**	**26.45 (4.95)**	**27.07 (5.47)**	0.75	1.04

Note: Women who declared they were pregnant at the time of the interview conducted by the VIGITEL team were disregarded.

However, Goiânia was the only city that showed a decrease in the average BMI of the white ethnic group in the period studied, from 25.79 in 2011 to 25.57 in 2020. On the other hand, João Pessoa and Rio Branco showed a significant BMI decrease in black ethnicity, contrasting with the BMI increase in white ethnicity.

Table 3 below presents the results of the Student's t-test performed to verify a significant difference between the average BMIs of the populations of white and black ethnicities, aged between 20 and 59 years old, from 2011 to 2020 in the Brazilian capitals.

The data presented in Table 3 consider the demographic factor as the mean difference between white and black ethnicities to evaluate the statistical significance between the samples. From the comparison of the means between the evaluated ethnicities, significant differences were identified between the levels of overweight and obesity in these groups of individuals in some capitals analyzed. The results suggest that

Table 3

Comparison of the average BMI in capitals and Brazil considering the populationsof (1) white and (2) black ethnicities aged 20 to 59 years old from 2011 to 2020

	Average BMI (1)	Average BMI (2)	T-value	p-value	N (1)	N (2)	Standard Deviation (1)	Standard Deviation (2)
Aracaju	25.97	26.25	-1.62	0.1048	3106	1171	4.90	5.47
Belém	26.20	26.47	-1.35	0.1786	2787	817	4.90	5.07
Belo Horizonte	25.56	26.33	-4.73	0.0000 ***	4251	1124	4.74	5.26
Boa Vista	26.20	26.10	0.51	0.6096	3301	681	4.70	4.89
Campo Grande	26.38	26.86	-2.08	0.0373 *	4577	526	5.03	5.29
Cuiabá	26.23	26.90	-3.91	0.0001 ***	3624	1179	4.97	5.38
Curitiba	25.95	27.07	-4.46	0.0000 ***	7298	359	4.62	5.23
Distrito Federal	25.65	26.79	-4.94	0.0000 ***	7459	439	4.66	5.08
Florianópolis	26.16	27.13	-4.70	0.0000 ***	3868	627	4.77	4.97
Fortaleza	25.71	26.11	-2.00	0.0451 *	4496	653	4.72	5.09
Goiânia	26.03	27.07	-5.18	0.0000 ***	4260	692	4.84	5.26
João Pessoa	26.36	26.75	-2.15	0.0313 *	2561	1107	4.87	5.23
Macapá	26.04	26.67	-3.31	0.0010 ***	3886	861	4.91	5.39
Maceió	26.73	27.38	-2.66	0.0078 ***	2916	534	5.23	5.24
Manaus	26.06	26.74	-3.51	0.0004 ***	4770	752	4.92	5.10
Natal	25.70	25.81	-0.62	0.5346	5319	933	4.61	4.69
Palmas	26.14	27.20	-5.50	0.0000 ***	6454	723	4.85	5.64
Porto Alegre	26.26	26.65	-2.15	0.0319 *	3510	1007	5.14	5.08
Porto Velho	26.10	26.88	-4.36	0.0000 ***	3889	970	4.95	5.21
Recife	26.37	26.75	-1.77	0.0770	2919	649	4.91	5.04
Rio Branco	26.29	27.21	-4.92	0.0000 ***	4289	894	5.06	5.36
Rio de Janeiro	25.54	26.11	-3.74	0.0002 ***	1639	2710	4.68	4.92
Salvador	25.60	25.53	0.44	0.6585	3400	1420	4.71	4.76
São Luis	26.20	26.69	-2.77	0.0056 **	5949	932	4.91	5.22
São Paulo	25.64	26.01	-2.27	0.0231 *	3036	1248	4.72	5.05
Teresina	25.54	26.58	-6.06	0.0000 ***	3919	908	4.55	5.07
Vitória	25.57	26.30	-3.96	0.0001 ***	4699	725	4.51	5.19
BRAZIL	25.99	26.50	-14.89	0.0000 ***	112182	24641	4.83	5.16

Note: Women who declared they were pregnant at the time of the interview conducted by the VIGITEL team were disregarded. * p < 0,05; ** p < 0,01; *** p < 0,001.

individuals of black ethnicity tend to have a higher BMI degree in most cases compared to white individuals.

As it was possible to observe, three capitals, namely the cities of Salvador, Natal and Boa Vista, showed a significant difference, with t- and p-values similar to the main capitals that have high BMI averages for the black ethnic population (Florianópolis and Goiânia). The results also suggest that the Brazilian BMI average of the two ethnicities indicates overweight at the national level, in view of the values recommended by the WHO and used as a parameter in this study, being 25.99 for the white ethnic group, and 26.50 for the black ethnic group.

The average frequency of consumption of specific foods by the populations of white and black ethnicity in the Brazilian capitals within the age groups from 20 to 59 years old from 2011 to 2020 is represented in Figure 1. These specific foods are represented by the Q16, Q17, Q19, Q27, Q29, and Q36 variables.

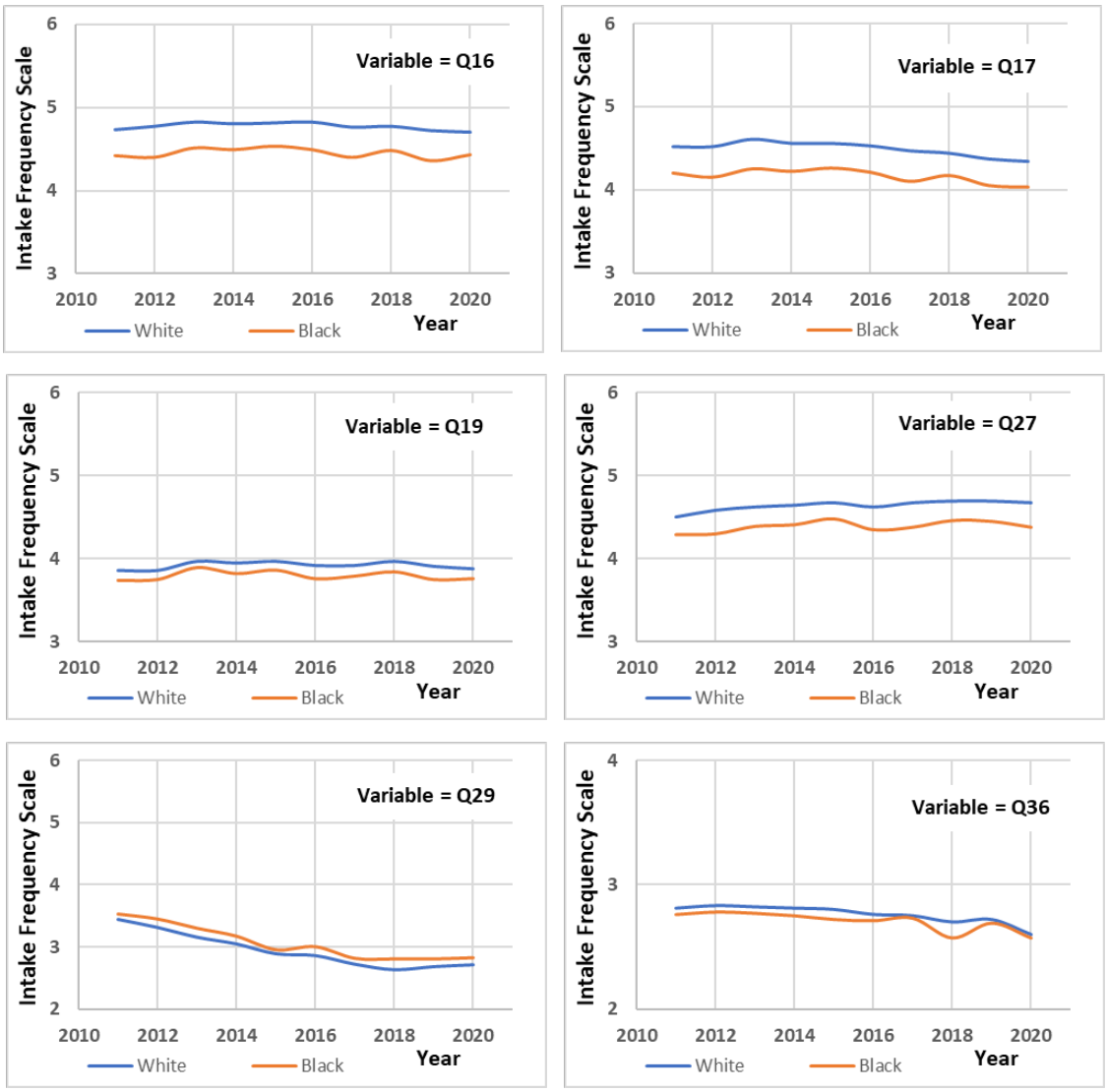

Figure 1: Average frequency of consumption of specific foods by populations of white and black ethnicities in the Brazilian capitals for the age groups from 20 to 59 years old from 2011 to 2020.

Note: Q16 = Vegetable consumption (lettuce, tomato, cabbage, carrot, chayote, eggplant, zucchini); Q17 = Consumption of lettuce and tomato salad or any other raw vegetable salad; Q19 = Consumption of cooked vegetables with food or in soup, such as cabbage, carrots, chayote, eggplant, zucchini; Q27 = Consumption of fruits; Q29 = Consumption of soda or artificial juice; Q36 = Consumption of alcohol.

When considering the results of the six variables together, Figure 1 shows that the average consumption of vegetables (cooked and raw), salad, fruits, and alcohol by the white ethnic population is higher than that of the black ethnic population. Basically, the average consumption of vegetables did not change for the two ethnic groups, with both claiming that they usually eat at least one type of vegetable (lettuce, tomato, cabbage, carrot, chayote, eggplant, zucchini), between three to six days a week.

The question related to the frequency of soda or artificial juice consumption was the variable under which the average consumption of the population of black ethnic was higher than that of the white ethnic group. There was a decrease in the average consumption in both ethnicities, since it was declared as being on average from one to four days a week from 2010 to 2012, with a decrease in 2014 and a stable variation until 2020, with an average consumption of one to two days a week. It was also found that the average consumption of alcohol is similar for the two ethnicities, except in 2018 when the black ethnicity presented an average consumption slightly lower than that of the white ethnicity.

Complementary to Figure 1, Table 4 presents the comparison results of the average BMI and the frequency of consumption of selected foods among the populations of white and black ethnicities, considering the severity of obesity in the age group from 20 to 59 years old from 2011 to 2020.

When all BMI classifications were considered, the frequency of food consumption between ethnicities showed statistical differences. Among the items analyzed, it was found that the black ethnicity had a higher food frequency in the consumption of soda or artificial juice than the white ethnicity. The same consumption pattern was observed for individuals classified as "overweight".

For individuals classified with degree 1 obesity, higher consumption of vegetables (lettuce, tomato, cabbage, carrot, chayote, eggplant, zucchini), raw or cooked vegetables and fruits was identified by the white ethnicity. Additionally, the white ethnic group also presented a higher consumption of raw vegetables and fruits among those with degree 2 obesity. Among those with degree 3 obesity, a statistical difference was observed among items Q16, Q17, and Q29, in which the white ethnicity showed the highest consumption.

Also, based on the data in Table 4, the black ethnicity presented a lower or equal consumption than the white ethnicity regarding fruits or vegetables in all BMI classifications analyzed. It was observed that the higher the BMI classification, the smaller the difference between food consumption among the ethnicities considered for the present study, with the exception of item Q16, which only shows no statistical difference among individuals with degree 2 obesity.

DISCUSSION

This study shows the prevalence of overweight and degree 1 obesity, with more expressive numbers related to black ethnicity. The number of people out of the proper body weight range is constantly growing around the world. Worldwide, it is estimated that about 1.9 billion people are overweight and that 650 million people are obese[21]. Changes in dietary patterns are relevant factors to explain the weight gain in the world population. Currently, there is an increase in the production of processed foods, and people with a higher consumption of hypercaloric foods, rich in fats, free sugars, and salt/sodium; and on the other hand, people with low consumption of fruits, vegetables, and fibers[20].

When analyzing the eating habits of the population studied in this study, it is observed that the food quality of the black ethnic population with overweight and degree 1 obesity is lower than that of the white population. The black ethnicity consumes soft drinks or artificial juice more frequently, which is not the case for fruits and vegetables. Dietary characteristics are important explanatory factors of overweight and obesity. In fact, individuals with eating patterns that mimic relatively healthy dietary models tend to have a lower BMI[22]. In contrast, some studies show a positive association between the consumption of ultra-processed foods, high in fat or sugar, with a higher risk of being overweight and obesity[23,24].

Furthermore, this study shows that the prevalence of degrees 2 and 3 obesity does not differ significantly between white and black ethnicities, and diet does not seem to be a predictor for obesity at higher BMI levels (above 35 kg/m²). Obesity is complex pathogenesis of multifaceted etiology, resulting from the combination of causes and individual

Table 4

Comparison of the average BMI and the frequency of consumption of selected foods considering the populations of (1) white and (2) black ethnicities and the severity of obesity in the age group from 20 to 59 years old, from 2011 to 2020

		Average Value (1)	Average Value (2)	T-value	p-value	N (1)	N (2)	Standard Deviation (1)	Standard Deviation (2)
All	IMC	25.990	26.502	-14.892	0.0000 ***	112182	24641	4.825	5.156
	Q16	4.772	4.450	36.975	0.0000 ***	118389	26832	1.276	1.347
	Q17	4.503	4.167	37.358	0.0000 ***	113791	25280	1.289	1.314
	Q19	3.921	3.796	15.163	0.0000 ***	113791	25280	1.187	1.189
	Q27	4.624	4.379	26.016	0.0000 ***	118389	26832	1.380	1.436
	Q29	2.986	3.106	-12.041	0.0000 ***	118389	26832	1.478	1.488
	Q36	2.770	2.714	5.271	0.0000 ***	49416	11337	1.018	1.012
25 < IMC < 30	IMC	27.195	27.292	-6.001	0.0000 ***	39509	8913	1.377	1.373
	Q16	4.791	4.497	19.862	0.0000 ***	39509	8913	1.252	1.307
	Q17	4.513	4.202	20.406	0.0000 ***	38146	8512	1.269	1.286
	Q19	3.901	3.808	6.632	0.0000 ***	38146	8512	1.168	1.173
	Q27	4.638	4.439	12.400	0.0000 ***	39509	8913	1.363	1.405
	Q29	3.010	3.080	-4.127	0.00004 ***	39509	8913	1.456	1.467
	Q36	2.822	2.737	4.892	0.0000 ***	17949	4143	1.008	0.998
30 < IMC < 35	IMC	31.939	31.978	-1.539	0.1238	14515	3623	1.372	1.381
	Q16	4.703	4.422	11.506	0.0000 ***	14515	3623	1.302	1.367
	Q17	4.426	4.172	10.227	0.0000 ***	13885	3384	1.293	1.308
	Q19	3.860	3.752	4.777	0.0000 ***	13885	3384	1.184	1.192
	Q27	4.516	4.313	7.759	0.0000 ***	14515	3623	1.405	1.447
	Q29	3.108	3.131	-0.833	0.405	14515	3623	1.483	1.462
	Q36	2.808	2.781	0.954	0.34	6200	1618	1.025	1.003
35 < IMC < 40	IMC	36.834	36.972	-2.868	0.0041	3562	1051	1.359	1.408
	Q16	4.657	4.462	4.135	0.00004	3562	1051	1.327	1.385
	Q17	4.395	4.154	5.009	0.0000 ***	3384	980	1.313	1.359
	Q19	3.845	3.831	0.331	0.7405	3384	980	1.198	1.253
	Q27	4.526	4.298	4.490	0.00001 ***	3562	1051	1.438	1.493
	Q29	3.229	3.249	-0.374	0.7081	3562	1051	1.531	1.557
	Q36	2.711	2.758	-0.836	0.4034	1367	463	1.055	1.022
IMC > 40	IMC	45.141	45.223	-0.230	0.8180	1365	404	6.323	6.167
	Q16	4.678	4.347	4.159	0.00003 ***	1365	404	1.387	1.481
	Q17	4.415	4.199	2.670	0.0077 **	1279	367	1.361	1.391
	Q19	3.863	3.785	1.042	0.2976	1279	367	1.285	1.221
	Q27	4.418	4.238	2.161	0.0309 *	1365	404	1.458	1.512
	Q29	3.263	3.297	-0.378	0.7051	1365	404	1.596	1.560
	Q36	2.767	2.628	1.332	0.1835	481	145	1.107	1.105

Notes: Q16 = Vegetable consumption (lettuce, tomato, cabbage, carrot, chayote, eggplant, zucchini); Q17 = Consumption of lettuce and tomato salad or any other raw vegetable salad; Q19 = Consumption of cooked vegetables with food or in soup, such as cabbage, carrots, chayote, eggplant, zucchini; Q27 = Consumption of fruits; Q29 = Consumption of soda or artificial juice; Q36 = Consumption of alcohol. Women who declared they were pregnant at the time of the interview conducted by the VIGITEL team were disregarded.* $p < 0,05$; ** $p < 0,01$; *** $p < 0,001$.

factors beyond a simplified view of the imbalance between calories consumed and energy spent 25 The development of obesity is usually a long process of weight gain, which involves several factors, including genetic phenotypes, neuroendocrine disorders (hypothyroidism, hypogonadism, Cushing's disease, etc.), behavioral factors (excessive consumption of fast food products, excessive alcohol consumption, little physical activity), environmental factors (urbanization and pollution), epigenetic changes, and some classes of obesogenic drugs (antidepressants, antiepileptics, or antipsychotics)[22,26,27].

Considering the black ethnicity population has a significantly higher prevalence of overweight and obesity, and lower values of food quality, this study highlights that structural racism may promote or enhance such differences, as such a social phenomenon affects the economic condition of black populations. Structural racism reflects the difficulty that the black ethnic population faces in the process of guaranteeing elementary rights, such as quality education, decent employment, housing, equal treatment and access to public health[28]. In addition, structural racism may have public health implications, as it can be associated with residential segregation, promoting a poor diet, physical inactivity, inadequate public health promotion practices, and residential perimeters without access to healthy foods[29]. Such social disparities, which are more present in black ethnicity populations, tend to contribute to the worsening of obesity, which is more severe in the population of black ethnicity, despite being an endemic disease[30].

The disadvantages of black people regarding most of the social indicators assume that ethnic factors are predictors of socioeconomic situations[22]. Thus, the inequality of access to citizenship rights creates vulnerabilities in people who suffer from the disparities inherited from consensual racism years ago. This fact corroborates with racial residential segregation implemented by a macro-level system (ideologies, institutions, and society) that harms black people for the benefit of the white population 8.

In view of this, Assari (2018) defends three mechanisms that determine racial disparities in obesity, which are: (1) socioeconomic status in health; (2) behavioral differences; and (3) environmental differences. Therefore, the idea that obesity is self-inflicted is demystified, as there are flaws exposed in the public and private sectors that provide barriers in people's lives. Still, public authorities foster the prevalence perception of obese and overweight people from the black ethnicity while ignoring the structural factors that generate this pattern[31].

Even if the peripheries provide healthy food, it is also worth noting that the most vulnerable populations will still not be able to afford such food economically, which may result in the purchase of processed foods that generally have an acquisition value that is more suitable for the low income of residents 19. Another relevant factor that connects obesity to structural racism is the SARS-COV-2 (Covid-19) pandemic crisis, which has significantly increased food insecurity, illustrating a context with glaring ethnic disparities regarding the lack of access to safe and cheap food[28].

Racism generates behaviors that underlie inequalities among social groups based on race or ethnicity as a social determinant of health since it exposes black people to more vulnerable situations of illness and death[32]. The COVID-19 ethnic implication is closely related to this exposure, given that the black population occupies places of greater poverty in the western world, depending on public policies for access to health, education and citizenship[33]. Furthermore, different forms of malnutrition, such as obesity and other chronic diseases, are part of the list of the pandemic impacts on food and nutrition security. Both the fear of lack of food due to income or access, and the concern about their health safety generate insecurity for consumers[34], especially for people of black ethnicity who tend to be more economically vulnerable, which affects the ability to choose, acquire and maintain inputs in terms of quantity and nutritional quality.

According to research carried out previously to analyze the effects of the pandemic on food and the food safety situation in Brazil, it was found that the highest percentages were declared among households whose heads are black people (23.4%) and also brown people (18.9%) in the case of severe food unsafeness[35]. Severe food unsafeness is classified as a "...disruption in eating patterns resulting from a lack of food among all residents, including children. In this situation, hunger becomes an experience lived at home"[36]. Regarding food consumption, the data showed the seriousness of the lack of access to healthy products, which mainly affects some strata of the Brazilian population:

women, people of black and brown ethnicities, residents of the North and Northeast regions, and rural areas, households with children and with lower per capita income[35].

The prevalence of overweight and obesity, especially cases of morbid obesity, is associated with other diseases, such as cardiovascular diseases, diabetes, and some types of cancer[37], consequently aggravating the epidemiological picture of the population and consequently increasing the costs to public health 38. The present study shows that the condition of overweight and obesity affects the black population more sharply, and is still possibly triggered by a less healthy diet promoted by a less favored economic condition. Previous studies show that overweight and obesity may affect economically vulnerable populations more severely[39], possibly due to factors associated with dietary patterns, educational level and access to information, home conditions and lifestyle[29,40]. Consequently, it is reasonable to suggest that the populations of black ethnicity in Brazil, economically disadvantaged and more affected by obesity, are likely to need hospital and outpatient care, possibly via the Unified Health System (SUS), due to the development of associated comorbidities to obesity.

It is also important to consider that obesity has numerous economic, social, and environmental implications. In addition, eating behavior is complex and suffers from different interferences, such as environmental, nutritional, psychological, social, and cultural factors. Within the Brazilian policies of the Ministry of Education that aim to guarantee the food and nutrition safety of the population, the National Fund for School Development (FNDE), through the National School Feeding Program (PNAE), defends the right to food for the public basic education students. In addition to those who are socially vulnerable, the program seeks to serve students equally, offering meals that partially meet the students' daily nutritional needs during the school year. Furthermore, the National Pact for Healthy Eating was established to expand the conditions of supply, availability, and consumption of healthy foods and combat overweight, obesity, and diseases resulting from the poor diet of the Brazilian population.

CONCLUSION

In general terms, the results show that the average BMI and the prevalence of obesity are increasing in the populations of the Brazilian capitals, with this increase being more accentuated in the black ethnicity populations. It is also observed that these populations have a lower-quality diet when compared to the white population.

Considering the results achieved, this study emphasizes that the greater economic and social vulnerability observed in Brazil for black ethnicity populations, aggravated by historical factors and traces of structural racism socially impregnated, worsens the situation of public health for this population. Therefore, it is important that greater efforts be adopted by the State through more efficient public policies to combat racial inequality and structural racism, promoting better conditions of economic access and healthier food for the most vulnerable populations.

The study has important limitations to be highlighted, such as the fact that the profile of populations residing in inland cities or rural areas was not analyzed. It is also important to consider that diagnoses of overweight and obesity are the result of numerous factors in a complex dynamic of causal relationships. Thus, additional studies are needed to identify real opportunities for State intervention to promote the fight against structural racism and reduce the prevalence of overweight and obesity in Brazilian populations, especially in black populations.

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