

Racial density and the socioeconomic, demographic and health context in Brazilian cities in 2000 and 2010

Densidade racial e a situação socioeconômica, demográfica e de saúde nas cidades brasileiras em 2000 e 2010

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ABSTRACT: *Introduction:* Racial density has not yet been explored in studies of racial inequalities in Brazil. This study identified categories of racial density in Brazilian cities and described the living and health context in these categories in 2000 and 2010, when demographic censuses were conducted. *Method:* Ecological study which used skin color or race information from the last two censuses to calculate racial density (the ratio of people aggregated to the same racial group) of the Brazilian cities each year. Four categories of racial density (Brown; Mixed-race, predominantly black; White/Caucasian; and Mixed-race, predominantly white). Socioeconomic, demographic and health indicators were described to each category. *Results:* The categories of racial density captured important inequalities throughout the census and also indicated the continuance of worse living and health conditions in the cities composed by Browns and mixed-race people, predominantly Black; better conditions were indicated in cities where White/Caucasians are predominant. The cities, composed mainly of Browns and mixed-race people, predominantly Black, presented younger age structure, worse human development indexes, greater social vulnerability, income concentration, infant and premature mortality (< 65 years) and lower life expectancy in both censuses, as compared to other cities. *Discussion:* Similarly to other countries, the racial density reflected inequalities in the Brazilian living and health context as well as a time lag among the cities. *Conclusion:* The categories of racial density may contribute to social epidemiology and race relations studies in Brazil.

Keywords: Health status disparities. Ethnic groups. Cities. Mortality. Race relations.

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RESUMO: *Introdução:* A densidade racial ainda não foi explorada nos estudos sobre desigualdades raciais no Brasil. Este estudo identifica categorias de densidade racial para as cidades brasileiras e descreve a situação de vida e saúde nessas categorias nos anos dos Censos Demográficos de 2000 e 2010. *Método:* Estudo ecológico em que a informação de cor/raça nos dois últimos censos foi usada para calcular a densidade racial (proporção de pessoas do mesmo grupo racial) nas cidades brasileiras em cada ano. Criaram-se quatro categorias de densidade racial (parda; mistos, mas com maioria negra; branca; e mistos, mas com maioria branca). Para quais foram descritos indicadores socioeconômicos, demográficos e de saúde. *Resultados:* As categorias de densidade racial captaram desigualdades importantes ao longo dos censos e apontaram a permanência de piores condições de vida e saúde nas cidades formadas por pardos e mistos, mas com maioria negra, e melhores onde predominaram brancos. As cidades predominadas por pardos e mistos, mas com maioria negra, em relação às demais, apresentam, nos dois censos, estrutura etária mais jovem, piores índices de desenvolvimento humano, maior vulnerabilidade social, concentração de renda, mortalidade infantil e prematura (< 65 anos) e menor esperança de vida de seus moradores. *Discussão:* Semelhantemente a outros países, a densidade racial espelhou desigualdades na situação de vida e saúde no Brasil, bem como defasagem temporal entre suas cidades. *Conclusão:* As categorias de densidade racial podem contribuir para os estudos sobre a epidemiologia social e sobre as relações raciais no país.

Palavras-chave: Desigualdades em saúde. Grupos étnicos. Cidades. Mortalidade. Relações raciais.

INTRODUCTION

Most research on racial inequalities uses color/race categories to establish, individually, social differentiation criteria^{1,2} and assess exposure to risk factors variation, protection and health outcomes^{1,3,4}; however, the aggregate analysis and spatial distribution of racial categories through the racial density construct^{1,2} is still little explored.

Racial density indicates the proportion of an ethnic-racial group within an area and is used to verify the relationship between contextual issues such as life materials³⁻⁷ and health of people living in areas with high concentration of the same racial group to which they belong⁵⁻⁸.

Evidence show a loss of health associated with areas with worse socioeconomic, demographic and sanitary conditions. However, racial groups living in areas where they are predominant show better health levels than those living in areas where they are minorities^{5,8}, indicating that living among racially similar individuals may favor community support and the social support network^{6,9,10}.

Racial density is commonly measured from population records of the Demographic Census, where self-reported color/race data are aggregated into the same geographical unit of interest. Next, they are related to socioeconomic, sanitary and health data to explore the ecological relationship between categories or levels of racial density with life and health situations inside neighborhoods, cities, states or countries^{4,5}.

Studies on racial density are mainly conducted in the United States (USA) and the United Kingdom, and report on the association between socioeconomic and sanitary measures of places with health outcomes, including: all-cause and child mortality, health self-assessment,

life expectancy, chronic and emotional diseases, and health behaviors⁴⁻⁶. However, the racial categories used and the findings observed cannot be generalized to other national contexts of different racial formative characteristics⁸, methodologies and racial classification systems^{1,2}.

Proposals of racial density categories for Brazilian cities have not yet been made, which makes it impossible to know if these groups capture contextual socioeconomic, infrastructure and health inequalities in the country. These questions are important for Brazil, since data from the Demographic Censuses of 2000 and 2010 show that the country is racially diverse and geographically extensive, presenting socio-economic, demographic, sanitary and racial changes among its cities with different population sizes and densities, which have made the country less unfair¹¹⁻¹⁴. However, despite these improvements in the redistribution of socioeconomic and health resources, inequalities still persist^{12,15}. This reduction did not occur in the same intensity between individuals and places. Therefore, the relations between racial density and socioeconomic and health indicators need to be interpreted in the context of Brazilian cities.

This study identified categories of racial density for Brazilian cities and explored the socioeconomic, demographic and health status in these categories of cities in the years of the 2000 and 2010 Demographic Censuses.

METHOD

This is an exploratory ecological study conducted with secondary data aggregates available online by Brazilian research institutions¹¹⁻¹⁴. The units of analysis were the Brazilian cities existing in the years of the Demographic Censuses conducted by the Brazilian Institute of Geography and Statistics (IBGE) in 2000 ($n = 5,507$) and 2010 ($n = 5,565$).

Using the self-reported color/race information of the population, the racial density was calculated for Brazilian cities in both years of the census. In Brazil, only in census years, color/race information is collected and made available by IBGE^{11,16,17} for each city in the country. In 2000, she composed the sample questionnaire (applied to almost 11% of the country's population) and, in 2010, the basic questionnaire, covering the entire Brazilian population^{11,16,17}.

The proportion of racial density was obtained by dividing the number of residents who were classified as belonging to a racial group in each city by the total population residing in it. The calculation was made separately for White/Caucasian, Brown, Black and for the sum of Yellows with Indian (considered racial minorities) people. From the parameters available in Inagami et al. and Gibbons and Yang, four groups of predominant racial density structure were created: White/Caucasian, Brown, Black and minorities. The categories were obtained when each racial group had a proportion of $\geq 60.0\%$ in the population and proportions of other racial groups, respectively, less than 20.0% . The cities that did not present predominance of one racial group over the others were later stratified into two new groups: mixed races, but mostly White/Caucasian (proportion of white population simply greater than the proportion of black population [Brown plus Black]) and mixed races, but

mostly Black (proportion of black population [Brown plus Black] simply higher than the proportion of Whites/Caucasians).

The geographical distribution of Brazilian cities according to the six categories of racial density in 2000 and 2010 was presented in maps. However, in the analysis phase (because of the low frequency), in 2000, a city with a majority of Blacks was not included and two cities with the majority of racial minorities. In 2010, four cities dominated by racial minorities were also not included, and there were no predominantly Black cities.

Thus, only four categories of racial density (Brown, mixed races, but mostly Black, mixed races, but mostly White/Caucasian and White/Caucasian) were used, for which characteristics of interest were described in the years 2000 and 2010. Among the demographic and geographical variables used: male population proportion and age (in years): 0 to 4, 5 to 14, 15 to 24, 25 to 64 and ≥ 65 ; macro-regions of the country (North, Northeast, Midwest, Southeast and South).

The following socioeconomic measures were presented: median Human Development Index (HDI), Social Vulnerability Index (SVI) and the Gini Index (measures income concentration). These contextual indicators synthesize the levels of well-being, life situation and socioeconomic level of populations and places^{12,14,15,18}, and can assume any value between 0 and 1. SVI and Gini values closer to 1 indicate worse disadvantages, while for the HDI, higher levels of human development. From the cut-off points established in the literature^{12,17}, the proportions of HDI (low, medium and high), Gini (low and extreme) and SVI levels (very low, low, medium, high and very high) were also presented.

The ratio of racial density to health was measured using the mean global health indicators: Infant Mortality Rate (IMR) (< 1 year of age), Premature Mortality Rate (PMR) (in < 65 years of age), adjusted for age, per 100,000 inhabitants, and life expectancy at birth (LEB) (in years). PMR was adjusted for age by the direct method¹⁹, using as reference the Brazilian population of the 2000 and 2010 Censuses.

The research was done with aggregates of secondary data available online, which do not contain confidential information and required approval by the Research Ethics Committee. The study was conducted in accordance with Resolution No. 466 of the National Health Council of December 12, 2012.

RESULTS

In the geographic maps of Brazil, in 2000 and 2010, the racial density categories were distributed associated with the regions of the country. Despite a significant substitution in racial composition within cities and among the regions of the country, the majority of White/Caucasian-dominated cities still occupied the South and Southeast Regions, ethnic minorities remained restricted to the Northern Region; the ones mainly composed of Browns predominated in the Northeast and in the rest of the country predominated cities with a population classified as mixed, though with a Black majority (Figure 1).

The cities predominated by mixed races, but of Black majority were predominant in relation to other types of city (42.0% in 2000 and 47.6% in 2010), while those with Browns were the least frequent ones (7.6% in 2000, and 10.2% in 2010). There was a reduction in the presence of cities dominated by Whites/Caucasians and an increase for all other categories in the same period. Cities classified by mixed but with Black majority harbored the largest population volume and those with Browns, the lowest in the two years of census. The proportion of population in cities predominated by whites decreased from 26.9%, in 2000, to 16.6%, in 2010 (Table 1).

Age structure in the cities changed over the censuses: there was a reduction in the young population (< 24 years) and an increase in the adult (25 to 64 years) and the elderly population (≥ 65 years). The proportion of the latter two groups increased with the predominance

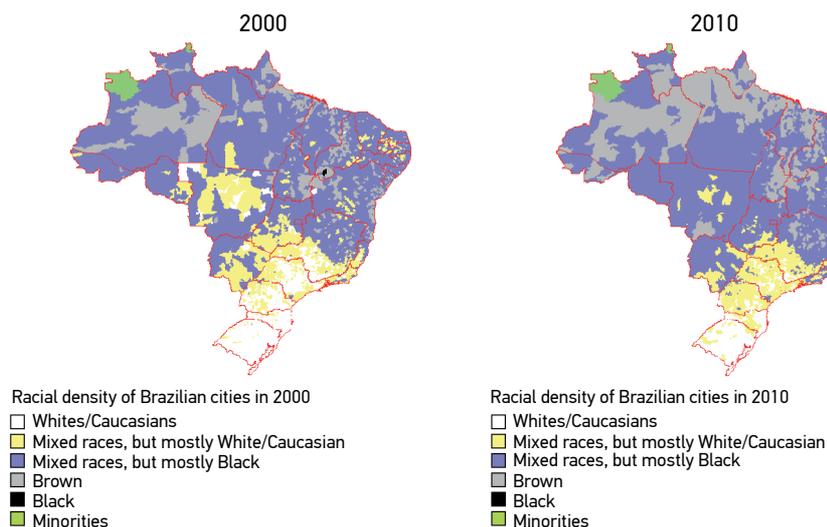


Figure 1. Geographic maps of Brazil, according to the racial density of Brazilian cities in the years of Demographic Census (2000 and 2010).

Table 1. Number and proportion of cities and total population in Brazilian cities, according to racial density in 2000 and 2010.

Census	Racial Density											
	Browns			Mixed races, but mostly Black ^c			Mixed races, but mostly White/Caucasian			Whites/Caucasians		
	Cities			Cities			Cities			Cities		
	n	%	Population ^d	n	%	Population ^d	n	%	Population ^d	n	%	Population ^d
2000 ^a	420	7.6	6,768,879	2,313	42.0	70,236,651	1,293	23.5	53,847,892	1,478	26.9	38,979,362
2010 ^b	570	10.2	9,827,334	2,645	47.6	94,331,370	1,422	25.6	62,240,274	924	16.6	24,294,929

^ain 2000, of the total number of existing municipalities (5,507), a majority of Blacks and two racial minorities (Indians or yellows) were not included; ^bin 2010, of the total number of existing municipalities (5,565), four municipalities with a majority of racial minorities (Indians or yellows) were not included and there were no predominantly Black municipalities; ^cBlacks represent the sum of the self-referred Brown and Black population; ^dtotal of White/Caucasian, Brown and Black population.

of the White/Caucasian population. However, the adult population still remained the majority in both censuses (Table 2).

The HDI, Gini and SVI levels in all racial densities between 2000 and 2010 were improved. The HDI showed a gradient according to racial density, but cities predominated by Whites/Caucasians had higher levels (0.619, in 2000, and 0.730, in 2010) than the other cities. Cities dominated by Browns were those with the worst levels (0.403, in 2000, and 0.579, in 2010). This pattern of evolution and positive gradient according to the racial density between the years was also observed for the Gini and SVI. The Gini showed a more uneven income concentration as the proportion of non-Whites/Caucasians increased. On the other hand, the SVI, although decreasing in all racial densities, remained more vulnerable to populations in cities with a lower proportion of Whites, as there was a decrease in SVI according to the increase of Whites/Caucasians in the racial composition of the cities. In relation to the proportions of these three indicators, there was a substantial reduction in the proportion of cities with a low HDI and an increase in the average level, but most of the cities predominated by Browns or mixed races, but mostly Black, still had a large proportion of low HDI. The condition of extreme income

Table 2. Relative distribution of demographic and geographic characteristics according to the racial density of Brazilian cities in 2000 and 2010.

Variables	Racial Density							
	Browns		Mixed races, but mostly Black ^a		Mixed races, but mostly White/Caucasian		Whites/Caucasians	
	2000	2010	2000	2010	2000	2010	2000	2010
Gender Male	50.8	51.0	49.3	49.0	48.8	48.7	49.4	49.0
Country Macroregion								
North	28.3	31.4	13.1	10.1	1.9	0.0	0.1	0.0
Northeast	64.3	56.7	58.8	53.1	11.2	4.4	0.7	0.2
Midwest	1.4	1.7	9.7	13.8	15.9	6.4	0.6	0.0
Southeast	6.0	10.2	17.9	21.7	52.7	59.7	36.9	20.3
South	0.0	0.0	0.5	1.3	18.3	29.5	61.7	79.5
Age range (years)								
0 to 4	12.5	10.1	10.7	7.7	8.8	6.5	8.4	6.1
5 to 14	25.5	22.8	22.0	17.9	18.1	15.1	18.0	14.6
15 to 24	21.7	20.0	21.2	18.8	19.3	16.8	18.7	16.8
25 to 64	35.2	40.8	40.9	48.9	47.6	53.4	48.3	53.9
≥ 65	5.1	6.3	5.2	6.7	6.2	8.2	6.6	8.6

^aBlacks represent the sum of the Brown and Black self-referred population.

concentration ($Gini \geq 0.5$) also declined in the period, but still remained more prevalent in cities predominated by non-Whites/Caucasians, reaching, in 2010, values above 85% in cities with a majority of Browns against 25.5% in which White/Caucasian people prevail. The proportion of mean SVI became predominant in all racial densities between 2000 and 2010, but the proportion of low SVI was still small in all cities (Table 3).

The analysis of global health indicators showed that, between 2000 and 2010, cities predominated by Browns had a greater reduction in IMR and an increase in LEB, while cities with a majority of Whites/Caucasians were the only ones that had a reduction in PMR. However, the measures of these indicators worsened with the reduction of the White/Caucasian population, with the cities predominated by Browns those with the highest PMR in 2010 (261.2/100 thousand inhabitants). Similar LEB levels observed in 2000 in mixed density cities, but with a majority of White/Caucasian (70.0), and White/Caucasian (72.0), were only reached in cities with Brown (70.7) and mixed races density, but mostly Black (71.9) 10 years later, in 2010 (Table 3).

DISCUSSION

This research proposed the classification of racial density for Brazilian cities in the years of Census (2000 and 2010), through which an important pattern of racial distribution within these cities was observed. There were four main categories, which express a continuum of racial concentration between them, ranging from cities dominated by Browns, followed by mixed races, but mostly Black, and mixed races, but mostly White/Caucasian, to those predominantly White/Caucasian. The contemporary presence and spatial distribution of these categories indicated that the racial formation of Brazilian cities reflects historical trends of colonization, inheritances of the slave industry, settlement policies, residential lease choices, land connections, fertility patterns, influence of racial classification, migration and immigration occurred between and within the great regions of the country^{20,21}. The cities predominated by mixed races, but mostly Black, were predominant in the two years of census as well as they harbored the largest volume of population in the same period. The absolute and relative reduction of cities and the White/Caucasian population in White/Caucasian density cities, as well as their increase in other types of municipalities suggest that the racial composition of the growing Brazilian population presented itself dynamically and, similarly to other countries, Brazil has increasingly become more racially heterogeneous^{5,22,23}, though this reduction observed may be more related to changes in social relations in Brazil at the beginning of this century than to factors that changed the demographic structure of the population. It is possible that the greater debate in Brazil about affirmative policies, access to its benefits and the fluidity of racial classification have influenced racial perception and its change over time in the country.

The results pointed out that the proposal of categories of racial density, as observed in other countries^{3-8,24}, reflected aggregates of socioeconomic, demographic and social

infrastructure attributes of the places, which are related to the pattern of spatial distribution of living conditions, health and well-being of the various racial groups within these spaces. In general, racial density categories captured inequalities and pointed to

Table 3. Distribution of socioeconomic characteristics and global health indicators according to the racial density of Brazilian cities in 2000 and 2010.

Variables	Racial Density							
	Browns		Mixed races, but mostly Black ^a		Mixed races, but mostly White/Caucasian		Whites/Caucasians	
	2000	2010	2000	2010	2000	2010	2000	2010
Socioeconomic characteristics								
HDI (median)	0.403	0.579	0.448	0.621	0.587	0.712	0.619	0.730
HDI levels ^b (%)								
Low	92.6	2.3	71.9	0.6	16.5	0.1	2.8	0.0
Medium	7.4	97.7	28.1	99.2	83.5	98.8	97.1	97.9
High	0.0	0.0	0.0	0.2	0.0	1.1	0.1	2.1
Gini index (median)	0.572	0.558	0.573	0.521	0.547	0.474	0.524	0.459
Gini levels								
(%)Extreme concentration of income (0.5 to 1.0)	89.0	85.3	88.4	63.6	77.4	31.4	64.6	25.5
SVI (median)	0.646	0.511	0.587	0.411	0.399	0.258	0.331	0.216
SVI levels ^c (%)								
Very low	0.0	0.0	0.1	0.0	0.0	0.0	2.5	0.0
Low	0.0	6.8	0.2	15.0	9.4	14.6	31.4	10.1
Medium	0.2	87.7	4.8	76.5	41.9	77.6	43.4	71.0
High	4.8	0.7	15.4	4.3	30.0	2.6	19.4	7.1
Very high	95.0	4.8	79.5	4.3	18.6	5.2	3.3	11.8
Global health indicators								
IMR	45.6	25.7	42.4	22.4	27.2	15.00	21.2	12.7
PMR (< 65years)	179.0	261.2	203.1	259.8	253.3	258.6	252.5	244.1
Life Expectancy at Birth (in years)	64.5	70.7	65.9	71.9	70.0	74.7	72.0	75.6

^aBlacks represent the sum of the Brown and Black self-referred population.; HDI: Human Development Index; ^bvalues of HDI levels: low (0.5), medium (0.5 to 0.8) and high (> 0.8); SVI: Social Vulnerability Index; ^cvalues of SVI levels: very low (0 to 0.200), low (0.201 to 0.300), medium (0.301 to 0.400), high (0.401 to 0.500), very high (≥ 0.501); IMR: Infant Mortality Rate; PMR: Premature Mortality Rate, adjusted by age using the Brazilian population of Censuses 2000 and 2010 as standard.

the persistence of worse material conditions of life, health and quality of life in the cities predominated by Browns and mixed races, but mostly Black, and better ones where predominantly White/Caucasian. There was a significant time lag in the cities predominated by Browns and mixed races, but mostly Black, in relation to the others, as they presented younger age structure, worse HDI, SVI and Gini estimates, higher IMR and PMR estimates, and smaller LEB of its residents.

The general conditions of life and health of Blacks in Brazil have always been worse than those of the White/Caucasian population²⁰⁻²². Browns and Blacks, since the enslavement period, were subjected to a greater burden of tropical diseases and illnesses, high infant and maternal mortality, low life expectancy, precarious sanitary and social infrastructure in the places where they lived, as well as lack of access to goods and social services, such as schools, formal labor and access to health, even after the abolition of slavery in 1888^{20,21}. This socio-economic exclusion, abandonment, disinvestment and racial discrimination have occurred throughout life and generations and, successively, exposed these groups to a number of disadvantages that are still observed in social and health indicators^{21,22}.

In some countries, there are proposals for ethnic-racial density categories for their respective populations. In general, the strata reflect the conceptions and concepts about race and ethnicity, the methodologies of racial classification in each country and the main racial groups present in these spaces, which national surveys or censuses can capture^{1,2}. In the United States, the most used categories are Whites/Caucasians, non-Whites/Caucasians, Blacks and Latinos⁹, or there may also be a comparison between Hispanics, non-Hispanic Blacks and non-Hispanic Whites^{5,10} or an interest only in different groups of Latinos (Cubans, Puerto Ricans and Mexicans)⁷. In Canada, the focus is on non-White/Caucasian groups such as Blacks, people from the Far East (Chinese, Koreans and Japanese), Filipinos, Arabs, people from West Asia and Latin Americans⁵. In the United Kingdom, comparisons can occur among African Blacks, Caribbean Blacks, Indians, Pakistanis and Bengalese^{3,6}; other studies also include British and Irish Whites/Caucasians²⁵ or Whites/Caucasians, Caribbeans, Indian and groups of Pakistanis with Bengalese²⁶, with less interest in the category of people from the Far East⁵. In Estonia²⁷ and New Zealand⁸ the interest is in comparing ethnic minorities to the rest of the population.

Regarding the relationship between racial density and health, Bécaries et al.⁵ identified among the 57 articles included in the systematic review, that the majority of the analyses focused on Blacks (n = 42) and Hispanic Americans (n = 15) and the smallest part of them, in ethnic minorities in the United Kingdom (n = 6) and other populations (n = 5), suggesting particular interest in this subject in a few racial groups that reside mainly in the United States and the United Kingdom. It was observed that the measurement of racial density in both countries varies substantially, reflecting differences in the percentage levels to form categories of racial density³. In comparison, our study used the racial categories of the country used by IBGE (Whites/Caucasians, Browns and Blacks, Yellows, Indigenous) and collected individually to define categories of racial density for Brazilian cities. Although there are variations among categories, percentages and methods used to measure racial density between

studies, this research also managed to capture wide inequalities between cities and their populations, pointing out in temporal and ecological perspective the relation between racial density and precarious socioeconomic conditions, social exclusion and worse health^{3-5,8,10,24}.

Among the studies evaluating the influence of racial density on health, discrepancies between its results can also be attributed to differences in cut-offs that define racial density, in the racial or ethnic groups used, in analytical approaches, geographical units, sample sizes, covariates considered in adjustment, variations among countries, cultural contexts, racial classification methods, and health measures examined^{1,4-7}. Researches conducted in the USA, compared to the UK, have been more successful in their analyses. Considering mortality indicators, there was an association between racial density among Blacks in the USA, but this effect depended, in some cases, on the age and gender of the death⁵, as it was observed that mortality in the first years of life was more sensitive to the precariousness of socioeconomic indicators^{3,5}, while among the elderly (≥ 65 years) it was related to diseases and chronic-degenerative diseases more related to health behaviors⁵. For other ethnic groups (inside and outside the United States), racial density presented a detrimental effect, but in some cases presented null associations⁵, which suggests that the effects of racial density on health are still complex.

Despite the results, reservations should be made about them. Ecological studies may have biased results, since the relationships observed in aggregate form do not necessarily reproduce in the same way individually. However, the considerable number of cities in each category makes it possible to identify marked inequalities that have persisted over the years. Regarding the color/race variable, it is possible that the differences observed are due to changes in the mode of collection of the variable in the period, since, in 2000, the totals observed represent an expansion of the collected sample and, in 2010, the total for the entire population of the country^{16,17}. The official Brazilian racial classification scheme diverges from the popular system or even from the one created by demands of the social movements in the country^{21,28}. This may lead individuals to arbitrarily classify themselves into racial categories different from those they would like to classify. Therefore, it is possible that racial classification is not fixed, that individuals do not definitively belong to racial groups over time and that racial categories do not form such homogeneous groups. Another issue is that racial classification in Brazil occurs through a fluid and dynamic race/color line, creating an intermediate, inaccurate, and subjective zone that can lead the "Brown" racial category to lose people to the "White/Caucasian" category or receive many "Blacks". Finally, racial classification is contextual and can change over time and according to different places. It suffers from the influence of psychosocial, geographic, economic, political and cultural factors existing in each society^{21,28,29}. However, despite these issues, the official Brazilian racial classification system in five categories allows greater comparability with other national studies and over time, in addition to using the most frequent racial categories in the country²⁹. Thus, although the pattern of racial composition in the country presents itself in a dynamic way, the racial inequalities that arise between these categories still persist throughout the years 2000.

CONCLUSION

This study presented categories of racial density for Brazilian cities and described in an exploratory way the inequalities in the situation of the general conditions of life and health among them in the early 2000s, pointing out that these categories are proxies of deprivation and deterioration of the conditions of life and health that occur within cities. Future analyzes of racial inequalities in the country from these city aggregates can offer important contributions to the field of social epidemiology and racial relations in Brazil.

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