Race Segregation in Brazil: a GIS Approach

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Abstract

In Brazil, a major problem is related to the population segregation by socioeconomic status in major cities. Some studies have been looking for this kind of segregation, using information on income and education level. However, these studies have been ignoring race characteristics of Brazilian population that could determine in which neighborhoods people are living. The main point of this research is the analysis of how Brazilian population is segregated by socioeconomic status and race in Recife, Belo Horizonte, and Porto Alegre. In general, results indicate that among those groups of census tracts that have majority of whites, there is a high proportion of the population with at least high school degree. On the other hand, among those groups of census tracts that have majority of black and brown population, most of the population has low education achievements. An improvement to this research would be the inclusion of spatial analysis and statistical models to better understand the relationship between race and socioeconomic indicators.

Introduction

In Brazil, a major problem is related to population segregation by socioeconomic status in major cities. Some studies have examined this kind of segregation, using information on income and education level. However, these studies have largely been ignoring race characteristics of the Brazilian population that could help determine in which neighborhoods people are living. The 2000 Brazilian Census provides a database with socioeconomic and demographic characteristics of its population. Moreover, the census bureau also organized maps for the Brazilian territory by groups of census tracts. Here, the main goal of this research project will be to analyze how the Brazilian population is segregated by both socioeconomic status and race. The analysis of these patterns will provide an interesting overview of the geographic composition of main cities in Brazil. Previous studies have been analyzing race in some specific cities in Brazil, such as Recife, Belo Horizonte, and Porto Alegre. These cities have different race compositions. The first city is located in the Northeast of the country and has a high proportion of black population. Belo Horizonte has a mixed population, in which white and "brown" people are the largest groups. However, studies have been showing that there is a high proportion of blacks in specific ghettos. The last city, Porto Alegre, is well-known for its large proportion of German and Italian descent populations. This configuration is a result of high levels of international immigration during the 1930s until the 1950s. This project will provide information on whether there is a significant segregation of the poorest population, compared to the wealthier groups, including information on both socioeconomic status and race.

Review of Literature

The Brazilian censuses have five main classifications of race and color for the population: Blacks (*Pretos*), Browns (*Pardos*), Whites (*Brancos*), Asians/Yellows (*Amarelos*), and Indigenous (*Indígenas*). This research will concentrate on the analysis of the first three categories, because the last two categories have little significance in the urban areas chosen for study. Daniel (2003) emphasizes, for example, that *Preto*, *Branco*, and *Mulato* are used in everyday phrasing to refer to Black, White, and multiracial individuals, respectively. *Pardo* (which literally means Brown) is more of an official term used to refer to multiracial individuals, particularly mulattoes. A vernacular term such as *moreno* (brunette), however, is a euphemism that can be used to describe a wide variety of "brunette" phenotypes, including those individuals who are designated as *Preto*, *Pardo*, or *Branco* (if the latter have dark hair and eyes). The complex issues surrounding multiracial identity in Brazil and the United States are by no means limited to the experience of individuals of African and European descent. Nevertheless, an examination of the history of African slavery and the unique legacy of attitudes and policies that have crystallized around the experience of individuals of African and European descent in Brazil who are often referred to as mulattoes make is particularly meaningful.

Moreover, Daniel (2003) indicates that in the 1950s and 1960s, Brazil's reputation as a racial democracy was marked by the weight of massive data complied by social scientists. However, on the claim that racial inequality did not exist in Brazil, further discussion on this problem was prohibited during the two decades of military rule (1964–1985). With the gradual return of civilian rule in the 1970s, the public and political debate on racial inequality was reopened in 1978 with the founding of the Unified Black Movement (*O Movimento Negro Unificado*). New studies by social scientists supported the idea that the divide between the privileged few and the less privileged masses coincides with the racial divide between Whites and *Negros* (Browns and Blacks) and only secondarily between Browns and Blacks. As a result of this social context, Blacks try to consider themselves Browns, rejecting any association with being African Brazilian in order to escape the social stigma of blackness. Consequently, one of the Black consciousness movement's goals has been to achieve unity in the struggle against this racial inequality by getting Black and particularly multiracial individuals to assume an identity as African Brazilian.

By the 1990s, the debate in Brazil had also crystallized around changing procedures for studying official data on race, collected particularly on the decennial census. The census still has the five race categories mentioned above. However, studies by Wood and Carvalho (1994) and Carvalho, Wood and Andrade (2003) emphasize that the goal is to replace the distinct color categories of *Preto* and *Pardo* with the single racial category of *Negro*. The net result of these new trends has been to move Brazilian race relations toward a greater emphasis on the *Negro/Branco* (Black and Brown versus White) dichotomy. The public and political debate has also increasingly included discussions about the importance of race, quite apart from questions of class and culture, in determining social stratification.

Using the 1976, 1982, 1986, 1996, and 1999 Brazilian National Household Survey (PNAD), 1996-1997 Index of Human Development (IHD), 1999 statistics for unemployment presented by Unions' Department for Statistics and Socio-Economic Studies (*Departamento Intersindical de Estatística e Estudos Sócio-Econômicos* – DIEESE), 1940, 1950, 1960, 1980, and 1991 Brazilian censuses, and 1996-1997 Survey of Life Patterns (*Pesquisa sobre Padrões de Vida* – PPV), Telles (2004) thoroughly analyses racial inequality and development in Brazil. He concludes that the Brazilian socioeconomic structure is largely divided along racial lines. Nonwhites have lower levels of socioeconomic status in Brazil compared to Whites. Nonwhites, on average, have persistently earned less than half the incomes of White Brazilians since the 1970s. Thus, Brazil's racial gap is greater than in the United States, because Brazil's Nonwhite population is less likely to be in the middle class and because of its greater income inequality in general.

Moreover, Telles indicates considerable male-female and Brown-Black differences among the Nonwhite population. Gender inequalities among the Nonwhite population continue to decrease, like they do for the White population. Racial inequality continues to exist, even with better levels of development, and in the case of the middle class, racial inequality continues to increase. Browns tend to be slightly better off than Blacks, although Brown-Black differences in income and wealth become clearer when occupational differences are considered. In general, White-Nonwhite differences are generally greater than those between Blacks and Nonblacks, making the former the primary racial divide in Brazil.

During the 1950's and 1960's, Brazil experienced great economic growth, making it one of the largest industrial economies in the world. During these years and after, illiteracy fell, Brazil went from predominately rural to urban, and its higher education system expanded. Despite these advances, racial disparities have increased at the top of the social structure. The expansion of higher education during the period led to the sizable growth of a professional middle class, but by disproportionately benefiting Whites, it produced a growing racial gap in access to a university education. Thus, the Brazilian case demonstrates that industrial development may increase racial inequality in the top part of the class structure, contrary to the traditional liberal or more modern perspectives, which argue that industrialization either reduces or does not affect racial inequality. During this period, the Brazilian state decided to invest heavily in higher education, while ignoring education at the primary or secondary level, as well as for Nonwhites. Consequently, Brazilian development has brought greater racial inequality. Despite this new literature on race in Brazil, little or no work has examined residential segregation by race in Brazil.

Data and Methods

For this research, the 2000 Brazilian 10-percent census microdata will be used. This census provides a database with socioeconomic and demographic characteristics of its population. A spatial analysis is done with the use of maps organized by the census bureau (Brazilian Institute of Geography and Statistics – IBGE), which display the Brazilian territory by groups of census tracts. Since those maps only have a polygon layer with group of census tracts, other maps will be used to provide data on roads and elevation. Those layers were also organized by the census bureau, and is called Integrated Cartographic Database of Brazil (*Base Cartográfica Integrada do Brasil ao Milionésimo Digital*).

The census microdata and maps will be used to analyze race and socioeconomic segregation, using Geographic Information Systems (GIS) techniques. The microdata will be analyzed using the software SAS and the maps will be analyzed using ArcMap GIS.

In the Brazilian census, there are five categories of race and color identification, as explained above: Blacks (*Pretos*), Browns (*Pardos*), Whites (*Brancos*), Asians/Yellows (*Amarelos*), and Indigenous (*Indígenas*). Following the suggestion of previous studies, the characterization of race will be dichotomized (Wood and Carvalho 1994; Carvalho, Wood and Andrade 2003; Telles 2004). Whites will be compared to Brown and Black together, also known as *Negros*. Since Asians/Yellows and Indigenous do not represent a significant percentage of the population in the cities under consideration, they will not be analyzed in the present research.

The three selected urban areas are Recife, Belo Horizonte and Porto Alegre. Those municipalities are state capitals of Pernambuco (in the Northeast region), Minas Gerais (in the Southeast region), and Rio Grande do Sul (in the South region). Since current analysis of the Brazilian territory has been showing that lower classes have been moving to surrounding municipalities around the main municipalities, this research will analyze segregation patterns in the microregions of those urban areas. Microregions are groups of municipalities defined by IBGE, and are similar to counties in the US context.

The microregion of Recife includes eight municipalities. The municipality of Recife itself has 1,422,905 inhabitants. The microregion of Recife has 2,991,948 inhabitants, and 117 groups of census tracts defined by IBGE. The microregion of Belo Horizonte includes 24 municipalities. The municipality of Belo Horizonte has 2,238,526 inhabitants, and the microregion of Belo Horizonte has 4,259,163 inhabitants. However, only 13 of those 24 municipalities have maps provided by IBGE, with a total of 126 groups of census tracts. The microregion of Porto Alegre has 21 municipalities. The municipality of Porto Alegre has 1,360,590 inhabitants, and the microregion of Porto Alegre has 3,425,044 inhabitants. But only 15 of those 21 municipalities have maps provided by the Brazilian census bureau, with 147 groups of census tracts in total. Only those municipalities with spatial data will be analyzed in this research.

The proportion of Whites was calculated as a percentage of the total population within each group of census tract (GCT), ignoring Asians and Indigenous. The 4 categories in Figures 1 to 6 were divided by quartiles. In other words, ArcMap created those groups with the same amount of group of census tracts in each one. In the case of Recife, 3 classes have 29 GCT's, and 1 category has 30 GCT's (117 in total). For Belo Horizonte, 2 divisions have 31 GCT's, and 2 classes have 32 GCT's (126 in total). For Porto Alegre, 3 categories have 37 GCT's, and 1 division has 36 GCT's (147 in total).

Information on years of schooling was also taken from the 2000 Brazilian census. This variable is not presented in the figures of this paper, but they were analyzed in conjunction with proportion of Whites by group of census tracts in the next section. This variable is a more favorable measure of socioeconomic status than income of individuals. For instance, the education variable was used by Telles (2004) as a proxy for socioeconomic status in the study of race inequality. The income variable tends to be quite biased in the census microdata provided by the census bureau.

Results and Discussion

Data for the microregion of Recife is shown in Figure 1. This map and others not included in this article show that groups of census tracts with a majority of the White population are located within 6.25

miles (10 Km) from the coast. GCT's with majority of White population are concentrated in the core of the municipality, within the highway limits. GCT's with a majority Black and Brown populations are concentrated in the periphery of the city, outside the highway limits. This provides some evidence that the wealthiest population is living close to the coast and within the area that has better infrastructure conditions, which is the municipality of Recife, comparing to other municipalities around it.

Among the group of census tracts that are majority White (29 of 117 GCT's), almost 80% have the majority of population with at least high school degree (23 of 117 GCT's). Among GCT's that have majority brown and black population (29 of 117 GCT's), none have the majority of population with at least high school degree (education variable is not shown in the map). This is strong support for the findings of Telles (2004), who emphasizes large socioeconomic and educational differentials between Whites and *Negros*.

The map for the microregion of Belo Horizonte can be seen in Figure 2. Groups of census tracts with a majority of Whites are concentrated in the municipality of Belo Horizonte. GCT's with majority Black and Brown populations are located in municipalities around Belo Horizonte, mainly along the Northern border. Among these groups of census tracts that have majority of Black and Brown population (31 of 126 GCT's), almost 71% of them have only up to 16% of the population with at least high school education (22 of 126 GCT's). The GCT's with more White population are located in areas with low elevation (elevation is not shown in the map). The GCT's with more Black and Brown population are located in areas with at least 0.5 miles (800 meters) of elevation. In some cases, those GCT's are located in areas with 0.625 miles (1,000 meters) of elevation. This means that those people tend to live on hills and mountains around the city, where the public infrastructure is worse than in the core of this urban area.

Figure 3 illustrates racial composition for the microregion of Porto Alegre. First of all, it is necessary to indicate that in this microregion the percent of the White population is much higher than in the case of the two previous urban areas. The groups of census tracts with lower percent of Whites have between 67.2% and 82.5% of Whites. This is caused by a historical pattern of immigration from Germany and Italy back in the 1930s and 1940s. This different pattern is important for this research. The important point is that even in Porto Alegre, an urban area with higher percent of White population comparing to other areas in Brazil, those groups of census tracts with lower percent of Whites have worse socioeconomic characteristics in relation to the other ones.

Another interesting aspect about the microregion of Porto Alegre is that the main highways make the connection among the groups of census tracts with a majority of White population. This is the case of the highway that goes from the South of the microregion to the North part of this area. The most elevated areas in the South of this microregion (at least 0.0625 miles or 100 meters) have a higher proportion of Black and Brown population (elevation is not shown in the map). GCT's with a lower proportion of White population are concentrated in the East part of the city.

On the one hand, among GCT's with majority of White population (37 of 147 GCT's), almost 68% of them have the majority of population with at least high school degree (26 of 147 GCT's). On the other hand, among those GCT's with majority of Black and Brown population (37 of 147 GCT's), only 1.4% of them have the majority of population with at least high school degree (2 of 147 GCT's). Those two groups of census tracts are located on the Eastern border of White GCT's. The education variable was analyzed separately with the maps, and then it was not added in the map.

These results presented in Figures 1 to 3, including percent of Whites and roads by group of census tracts, were analyzed with information about years of schooling, as a proxy of socioeconomic status. In general, the spatial analysis for the microregions of Recife, Belo Horizonte and Porto Alegre indicated a significant spatial segregation in those urban areas, by both race and socioeconomic status. Moreover, flat areas are more likely to have a higher proportion of Whites. On the other hand, more elevated areas, which tend to have worse infrastructural conditions, have a higher proportion of *Negros.* The analysis of main roads in those microregions also helped in the study of race segregation. Main roads tend to link White neighborhoods in the case of Porto Alegre, and tend to separate White from *Negro* groups of census tracts in the case of Recife.

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FIGURE 1

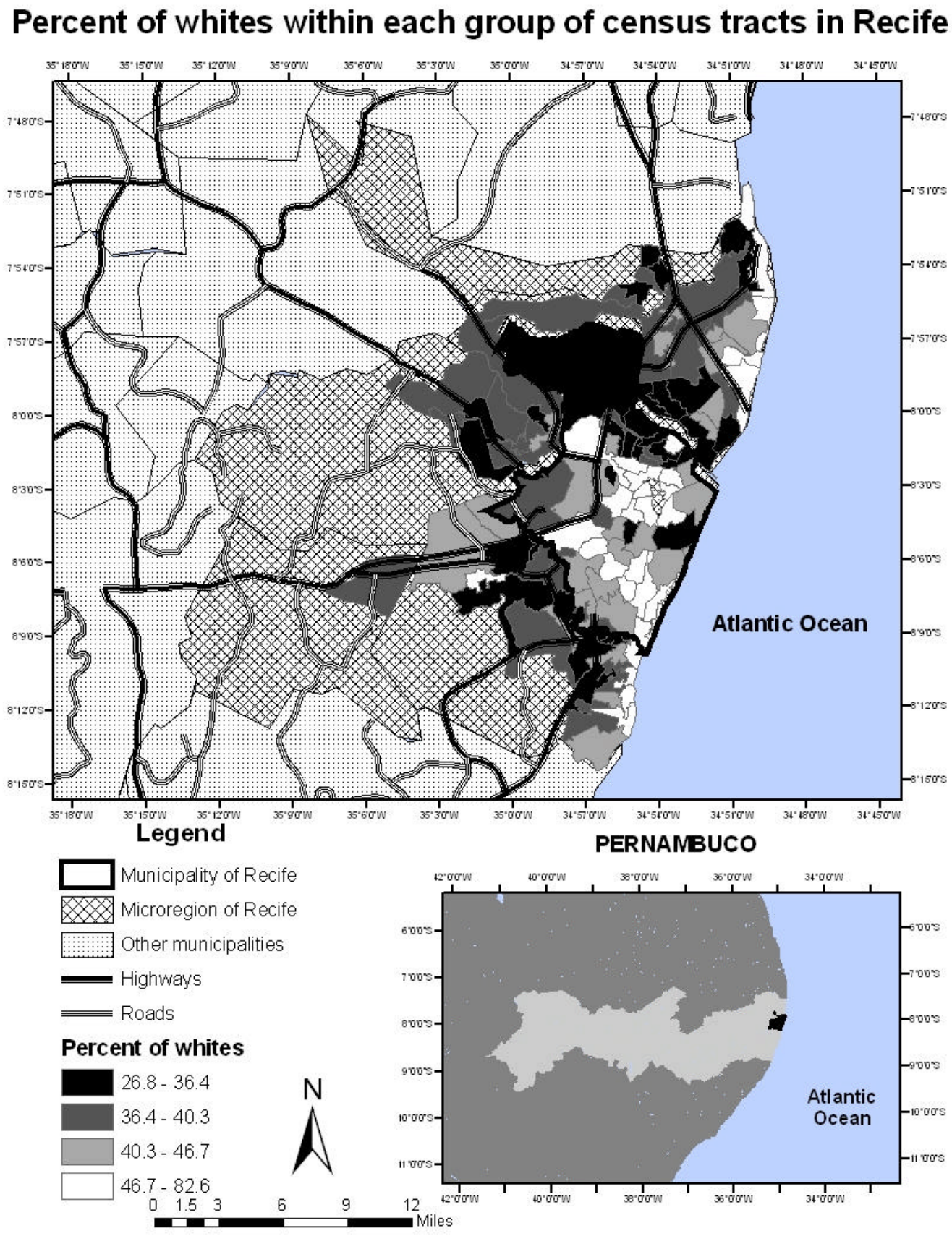

Percent of whites within each group of census tracts in Recife
Atlantic Ocean
Legend
Municipality of Recife
Microregion of Recife
Other municipalities
Highways
Roads
Percent of whites
26.8 - 36.4
36.4 - 40.3
40.3 - 46.7
46.7 - 82.6
N
0 1.5 3 6 9 12
Miles
PERNAMBUCO
Atlantic Ocean

FIGURE 2

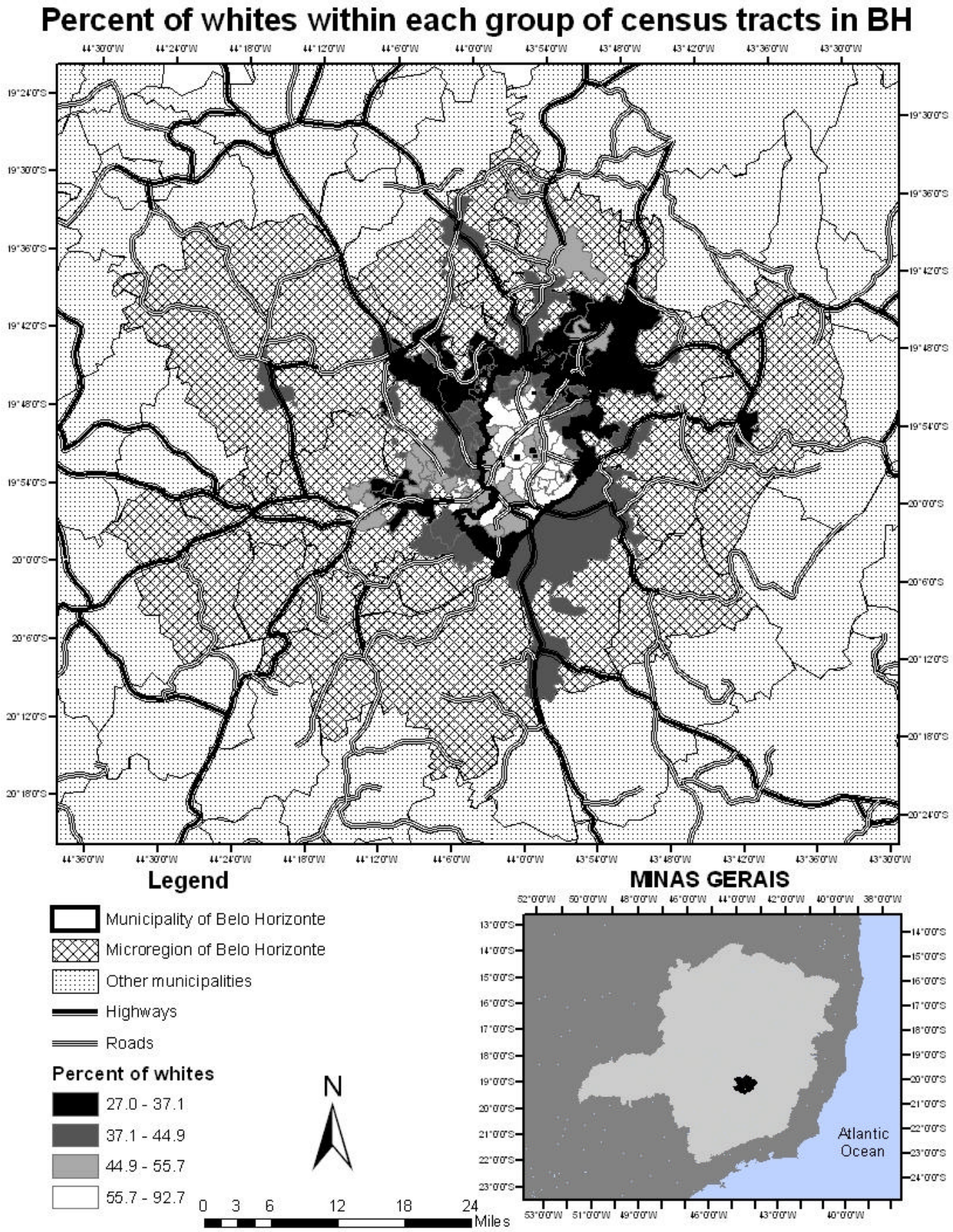
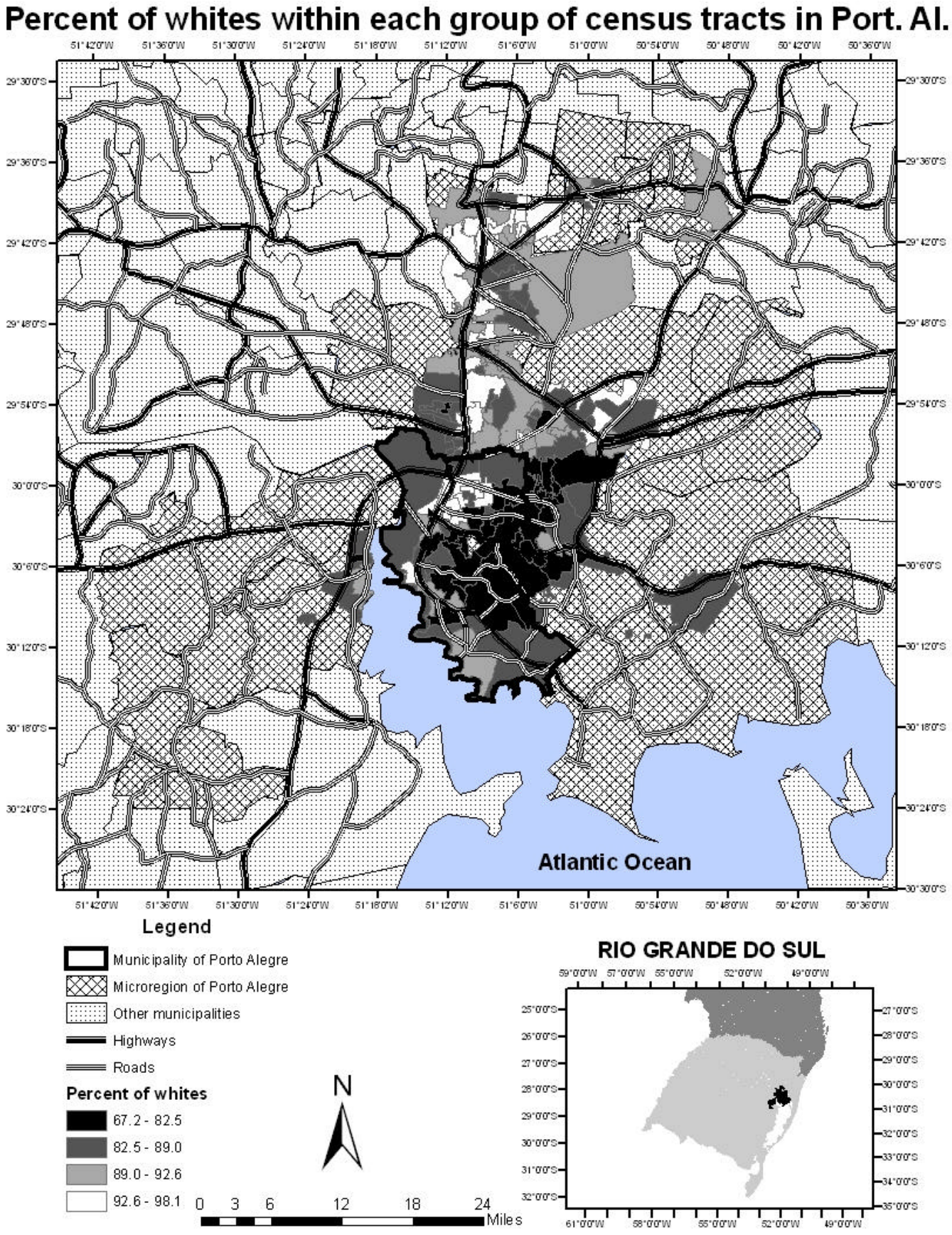

Percent of whites within each group of census tracts in BH
Legend
Municipality of Belo Horizonte
Microregion of Belo Horizonte
Other municipalities
Highways
Roads
Percent of whites
27.0 - 37.1
37.1 - 44.9
44.9 - 55.7
55.7 - 92.7
N
0 3 6 12 18 24
Miles
MINAS GERAIS
Atlantic Ocean

FIGURE 3


Percent of whites within each group of census tracts in Port. Al.
Atlantic Ocean
Legend
Municipality of Porto Alegre
Microregion of Porto Alegre
Other municipalities
Highways
Roads
Percent of whites
67.2 - 82.5
82.5 - 89.0
89.0 - 92.6
92.6 - 98.1
N
0 3 6 12 18 24
Miles
RIO GRANDE DO SUL