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Sociodemographic characteristics of indigenous population according to the 2000 and 2010 Brazilian demographic censuses: a comparative approach

Características sociodemográficas de indígenas nos censos brasileiros de 2000 e 2010: uma abordagem comparativa

Características sociodemográficas de indígenas en los censos brasileños de 2000 y 2010: un enfoque comparativo

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Abstract

The sociodemographic profiles of different segments of the Brazilian population have been the object of multiple inter-census comparisons. This study compared the age distribution, number of household residents, formal schooling, and income of indigenous persons according to the population censuses of 2000 and 2010. There was an important decrease in the number of residents per occupied household, and slight aging of the indigenous population, except in the urban North. Meanwhile, there was a proportional increase in individuals with per capita household income up to one minimum wage, along with a reduction in the income bracket of more than two minimum wages in the country's five major geographic regions, in both urban and rural areas. Although schooling also increased, the increments differed according to geographic region and urban versus rural area; the urban Southeast showed larger gains in schooling, while the rural North and Central displayed smaller increases. The study emphasizes the need for more in-depth research focusing on specificities and backing the evaluation and implementation of public policies for the indigenous population.

Indigenous Population; Censuses; Population Surveys

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Introduction

Recent decades have witnessed a major increase in data uptake on indigenous populations in the official information systems of Latin American countries [1,2,3]. One factor in this expansion has been the inclusion of questions on indigenous ethnic identity in the population censuses. This process is part of the more overall social and political changes since the 1980s that have led to the revision of constitutional provisions in various countries, aimed at valorization of indigenous identities in the region [2,4].

In Brazil, the 1988 Federal Constitution was a watershed to the extent that it greatly expanded the recognition of indigenous peoples' rights by the Brazilian state. Since then, various public policies have been created and implemented in favor of indigenous peoples, including the establishment of the Subsystem for the Healthcare of Indigenous Peoples, in 1999 [5,6]. As for the production of population data, the category "indigenous" was included in the question on classification of color or race in the population censuses and in other nationwide surveys conducted by the Brazilian Institute of Geography and Statistics (IBGE) in the 1990s [7], which has significantly expanded knowledge on the social and demographic characteristics of indigenous populations in the country.

In recent history there have been three population censuses in Brazil (1991, 2000, and 2010) that have collected specific data on indigenous populations [7]. An important research issue in the field of demography of indigenous peoples has been to elucidate the indigenous population's characteristics across the various censuses, especially due to important variations in the size of the indigenous population that cannot be explained only by demographic factors [7,8,9,10]. For example, there was an increase over time in the number of indigenous persons identified by the censuses through the question on color or race (from 294,131 in 1991 to 734,127 in 2000 and 817,963 in 2010, that is, successively higher totals with each census, indicating that it is not only a matter of vegetative growth), and the growth patterns differed in urban versus rural areas. In rural areas, where most of the indigenous lands are located, the mean annual geometric growth rates were 5.6 from 1991 to 2000 and 3.7 from 2000 to 2010 [7], potentially explainable by the observed birth and death rates. In urban areas, there was a major population increase from 1991 to 2000 (a mean annual geometric growth rate of 23.3), but a decrease from 2000 to 2010 (-1.8) [7]. These variations were also reflected in the distribution of the indigenous population according to major geographic regions, particularly with an important drop in metropolitan areas in Brazil's Southeast and South from 2000 to 2010 [7].

With regard to the two most recent censuses (2000 and 2010), the potential reasons for the above-mentioned variations are still being debated, including differences in data collection procedures and changes in perspectives on ethnic and racial recognition [8,10]. For example, while in the 2000 Census the indigenous self-identification was based solely on the answer to the question on color or race, the 2010 Census included questions on specific ethnic affiliation (with a specific indigenous people or ethnic group) and languages spoken in the home [11], which may have influenced perceptions on indigenous self-identification. Whatever the reasons for such differences, they need to be understood, because they have important implications for official statistics. Beyond these differences, in nationwide epidemiological studies that explore ethnic and racial issues, census data are commonly used as indicators for health statistics.

The aim of this study is to present a comparative analysis of census data on indigenous persons from the population censuses of 2000 and 2010. The study aims to verify whether changes in the numbers and distribution of the indigenous population in Brazil between the two censuses were reflected in other characteristics, such as age composition, number of household residents, schooling, and income, among others. We will pay special attention to the urban context, where there was an unexpected drop in the indigenous population between the two censuses, suggesting specific changes in the relevant social and demographic profiles.

Methods

Brazil held its first population census in 1872, and censuses have been held on a more regular basis since 1940 [12,13]. In the censuses in recent decades, including the most recent ones in 2000 and 2010,

the interviews have included the simultaneous application of two types of questionnaires for the data production: the basic questionnaire, administered to the total Brazilian population and which covers the characteristics of the households, in addition to the resident's social and demographic characteristics; and the sample questionnaire, which includes both the questions addressed in the basic questionnaire, plus items on occupation, childbirth, and migration, among others [14].

The indigenous persons included in this study are those identified by the item on color/race in the sample questionnaires from 2000 and 2010. In other words, the study did not analyze individuals that were classified as indigenous with the question "Do you consider yourself indigenous?", a question applied to individuals living on indigenous lands but who were classified as white, black, yellow, or brown on the race/color item. Invariably, the option to work with data from the sample survey (rather than from the total survey) from the 2000 and 2010 censuses implies limitations for the analyses, especially considering the lower frequency of indigenous individuals in urban versus rural households. However, the comparisons performed in the current study (and described below) could only be based on data from the sample survey, to the extent that they provided more detail for the socioeconomic variables considered in the analyses and allowed greater comparability between the two target years.

The individual data from the 2000 and 2010 Censuses included in this analysis were those that define the sample structure and weights. The analysis also included the following dependent variables (i.e., outcome variables in the regression models described below): total number of household residents, age, per capita household income, and schooling. Other variables included urban/rural location, major geographic region of residence, sex, type of respondent (to the extent that previous analyses [15] had demonstrated its effect on the estimated number of children in indigenous populations, a variable that bears a close relationship to the number of household residents, for example), and migration pattern. This last set of variables was included as a predictor in the regression models, on the assumption that it would affect the outcomes of the estimated regression models.

Total residents consisted of a count of the individuals residing in the occupied indigenous households (ranging from 1 to 26, but categorized in the tables as 1, 2, 3, 4, and 5 or more residents); age was divided into five-year brackets (0-4, 5-9, ..., and ≥ 80 years and later regrouped in ten-year categories in some of the analyses); per capita household income, or total household income divided by the number of residents in the household both in 2000 and 2010, corresponding to four income categories – none, < 1, 1-2, and > 2 minimum wages; and schooling was analyzed according to the categories (1) incomplete primary schooling or less, (2) complete primary schooling or more, and (3) undetermined. Meanwhile, geographic region of residence included Brazil's five major geographic regions (North, Northeast, Southeast, South, and Central); type of respondent (target or proxy) indicated whether the census interview data were provided by the questions' target individual; and finally migration was analyzed as (1) born and always resided in the municipality (county) in which the census interview was held, (2) had resided in some other municipality or country but had returned to the person's native municipality, and (3) was not born in the municipality where the interview was held.

The above-mentioned variables were keyed into a single database in Stata, version 14.2 (StataCorp LP, College Station, USA), indicating the respective census year. The first step in the statistical analysis was estimation of the relative distribution (percentage) of indigenous persons in contingency tables with stratification by census year and urban/rural location, for each of the following variables: geographic region of residence, age, schooling, per capita household income, and number of household residents. Next, the same relative frequencies were calculated for each of Brazil's five major geographic regions, divided into urban and rural areas.

Next, we calculated the predicted or estimated distribution of number of household residents, age brackets, schooling, and per capita household income with multivariate regression models, which were used for the inter-census comparisons such that the comparisons would not be biased, i.e., affected by confounding factors. For example, it is not recommended to compare the schooling profile of two populations with tangibly different age structures. The models are a viable alternative in the context of the current study. The choice of these models took into account the nature of the dependent variable – whether defined by a count, by multiple or scarce nominal or ordinal categories –, the size of the residuals produced by attempts to adjust different regressions indicated for the specific cases, as well as the results of indicators of the model overall fit, including the Akaike Information

Criterion (AIC) and Bayesian Information Criterion (BIC), according to recommendations by Long & Freese [16].

For example, the total household resident count could be analyzed with truncated Poisson or truncated negative binomial regression, since this dependent variable does not allow null values. Thus, the decision to model this dependent variable with truncated Poisson regression was based on the size of the residuals it produced vis-à-vis the truncated negative binomial regression model, in addition to the results of the overall fit, based on AIC and BIC. Age, a categorical dependent variable and divided into 17 five-year groups, could be analyzed with Poisson, negative binomial, zero-inflated Poisson, or zero-inflated negative binomial regression. Preliminary attempts showed that the negative binomial model produced the best fit, suggested by more favorable AIC and BIC values. In the case of the categorical dependent variables (schooling and per capita household income), the analytical possibilities included the following regression models: ordinal logistic, partially proportional ordinal, and multinomial. Still, violation of the assumption of proportionality in the first two model options – verified with the Brant's test – led to the use of multinomial regression [16]. Table 1 shows the models used for each of the above-mentioned dependent variables, as well as the independent variables that comprised the respective regression equations.

All the above-mentioned models were estimated for the country as a whole and separately for the five major geographic regions, as well as disaggregating them by urban/rural location and census year. The probabilities or relative frequencies for each outcome category or specific count were then estimated with the commands developed by Long & Freese [16] and presented as graphs for better viewing. The analyses were limited to individuals who had complete data for all the variables included in the database (this procedure meant the exclusion of 1% or 15,848 individuals out of the total respondents). All the analyses took into account the sampling weights and complex sampling design, according to official IBGE recommendations.

As for ethical issues, the IBGE provides public access to census data. Thus, and according to Brazil's prevailing legislation on research with human subjects using secondary data in the public domain (*Resolution n. 466/2012* of the Brazilian National Health Council), there was no need for prior approval of the study by a research ethics committee.

Results

The current analysis covered 1,539,780 indigenous persons in the two censuses (726,705 in 2000 and 813,075 in 2010). These individuals were distributed by major geographic region and census year, as follows: North, 211,009 in 2000 and 302,071 in 2010; Northeast, 168,604 in 2000 and 207,303 in 2010; Southeast, 159,634 in 2000 and 100,249 in 2010; South, 83,958 in 2000 and 74,460 in 2010; and Central, 103,500 in 2000 and 128,991 in 2010.

The results shown in Table 2 indicate that the proportion of indigenous persons increased in the North of Brazil, from 29% in 2000 to 37.2% in 2010. The other regions maintained similar percentages in 2000 and 2010, except for the Southeast and South, where there were decreases in the relative share, from 22% to 12.3% and from 11.6 to 9.2%, respectively. The differences were even larger in the urban indigenous population in the major geographic regions – from 12.1% to 19% in the North and from 36.7% to 25.5% in the Southeast, as well as in the urban Northeast, which showed a proportional increase in indigenous persons between the two censuses, from 27.6% to 33.8%. No important differences were detected from 2000 to 2010 in the proportion of indigenous persons located in rural areas in any of the major geographic regions.

Meanwhile, the age distribution changed very little between censuses, both in the country as a whole and disaggregated by urban versus rural areas (Table 2). The principal change, although small, was a slight aging trend in the age structure, especially in urban areas. The indigenous population located in rural areas showed a younger age profile when compared to those in urban areas; e.g., while 13% of the indigenous persons in urban areas belonged to the 0-9-year bracket in 2000 and 2010, 30% belonged to the same age group in rural areas.

Table 2 also shows a major gain in schooling among Brazil's indigenous persons, both in urban and rural areas. The relative share of individuals with at least complete primary schooling increased

Table 1

Dependent and independent variables and regression models used in the statistical analyses.

Regression model	Dependent variable	Independent variables
Truncated Poisson	Total household residents	Major geographic region, per capita household income, sex, schooling, migration pattern, age, and type of respondent
Negative binomial	Age	Major geographic region, per capita household income, sex, schooling, migration pattern, type of respondent, and total household residents
Multinomial	Per capita household income	Major geographic region, sex, schooling, migration pattern, age, and total household residents
Multinomial	Schooling	Major geographic region, per capita household income, sex, migration pattern, age, and total household residents

5, 10, and 7 p.p. (percentages points) in the country as a whole and in urban and rural areas, respectively. This increase was accompanied by a reduction in the percentage of individuals with incomplete primary schooling or less. Importantly, the share of indigenous persons with incomplete primary schooling or less was higher in rural areas (from 89.1% to 95.6%), when compared to urban areas (61.7% to 70.9%).

Table 2 also suggests that there was no change in the proportion of respondents with no income, ranging from 4.3% to 4.8% in the country as a whole. This stability was also seen in the income bracket of 1-2 times the minimum wages. Meanwhile, the share of indigenous persons with an income of less than one minimum wage increased by approximately 8 p.p. from 2000 to 2010. However, there was a relative drop of 9 p.p. in the share of individuals with more than 2 minimum wages in per capita household income. Unlike the findings for schooling, there were no major differences in income categories between urban and rural areas (Table 2). As for total household residents, Table 2 further shows a consistent decrease throughout the country in both urban and rural areas: households with 5 or more residents decreased their share from 30% to 20% between 2000 and 2010.

An analysis of the same socioeconomic and demographic characteristics disaggregated by major geographic region, urban/rural location, and census year (Tables 3 and 4) showed results that were consistent with those of the country as a whole. Age distributions showed relative stability across the two periods. Meanwhile, all these strata showed the following: (1) a relative increase in schooling (an increase of 6 to 10 p.p. in complete primary schooling or more); (2) growth of 8-9 p.p. in the income bracket up to 1 minimum wage; (3) a decrease of 9-10 p.p. in the income bracket greater than 2 minimum wages; and (4) a decrease of 10 p.p. in the share of households with 5 or more residents.

The proportions of schooling also varied between 2000 and 2010 according to geographic region. Importantly, the Southeast as a whole (data not shown in table form), experienced a decrease of approximately 11 p.p. in the share of incomplete primary schooling or less between 2000 and 2010 (from 70.4% to 58.9%), while the other geographic regions showed a decrease of 5 to 7 p.p. Considering only the urban areas in the five geographic regions (Table 3), the Southeast, South, and Central showed higher relative gains in schooling when compared to the North and Northeast. While the Southeast, South, and Central showed a decrease of 10-14 p.p. in the share of individuals with incomplete primary schooling or less, the North and Northeast showed decreases of some 5 to 7 p.p., respectively. Meanwhile, in rural areas in the major geographic regions, the relative increase in complete primary schooling or more was less intense in the North and Central (6 p.p.) than in the Northeast, Southeast, and South, where the gain in schooling reached 10 p.p.

Neither income nor the number of residents per household varied importantly, comparing the five geographic regions and their urban and rural areas. For example, the relative share of indigenous persons with an income of 1 minimum wage or less was 48% in 2000 and 56% in 2010 in all the geographic regions, in both urban and rural areas. The same was true for number of household residents; the proportion of households with 2 individuals was 16% in 2000 and 22% in 2010 in all the geographic regions, both in urban and rural areas.

Table 2

Relative distribution of indigenous persons according to socioeconomic and demographic characteristics and census year. Population censuses, Brazilian Institute of Geography and Statistics (IBGE), Brazil, 2000 and 2010.

Characteristics	Brazil		Urban Brazil		Rural Brazil	
	2000	2010	2000	2010	2000	2010
Region						
North	29.0	37.2	12.1	19.0	47.6	48.8
Northeast	23.2	25.5	27.6	33.8	18.4	20.2
Southeast	22.0	12.3	36.7	25.5	5.9	3.8
Southeast	11.6	9.2	13.6	10.9	9.3	8.1
Central	14.2	15.9	10.0	10.9	18.8	19.1
Age (years)						
0-9	21.9	24.4	12.5	13.4	32.3	31.5
10-19	21.2	21.7	18.8	17.4	23.9	24.5
20-29	17.0	16.6	18.4	17.5	15.5	16.1
30-39	13.9	13.0	16.9	16.1	10.7	10.9
40-49	10.5	9.3	14.1	13.4	6.6	6.7
50-59	6.9	6.7	9.1	10.5	4.6	4.2
60-69	4.8	4.6	5.8	6.7	3.6	3.3
70+	3.6	3.7	4.3	5.1	2.9	2.8
Schooling						
Incomplete primary schooling or less	82.7	78.3	70.9	61.7	95.6	89.1
Complete primary schooling or more	16.4	21.2	28.2	37.9	3.5	10.5
Undetermined	0.9	0.4	1.0	0.4	0.9	0.4
Per capita household income (minimum wage)						
No income	4.8	4.3	4.8	4.3	4.8	4.3
< 1	48.3	56.7	48.2	56.8	48.3	56.5
1-2	21.0	22.7	21.0	22.6	20.9	22.8
> 2	25.9	16.3	25.9	16.2	25.9	16.4
Number of household residents						
1	8.6	11.7	8.6	11.6	8.6	11.8
2	16.6	22.3	16.6	22.6	16.6	22.1
3	21.7	24.7	21.8	24.4	21.6	24.9
4	23.1	21.2	23.0	21.3	23.2	21.1
5+	30.0	20.2	30.0	20.2	30.0	20.2
Total	100.0	100.0	100.0	100.0	100.0	100.0
n	726,705	813,075	379,560	318,769	347,145	494,306

Figures 1, 2, 3, and 4, based on the parameters or coefficients from the regression models, largely confirmed the patterns discussed thus far. In particular, the age distributions, illustrated in Figure 1, are consistent with the results presented so far. However, the age distribution in 2010, compared to 2000, showed a slightly older profile, especially in the Southeast, but also in the South and Central. There were no differences from 2000 to 2010 in the Northeast; in the North, specifically in the urban area, the age distribution was slightly younger in 2010 than in 2000.

As shown in Figure 2, schooling among indigenous persons in Brazil increased from 2000 to 2010, with a larger relative share of complete primary schooling and thus a smaller share of the group with incomplete primary schooling or less. The figure illustrates the variations between geographic regions and urban and rural areas, shown in the tables. Income (Figure 3) showed stability in individuals with no income, a proportional increase in the category up to 1 minimum wage, maintenance of

Table 3

Relative distribution of indigenous persons in urban areas according to socioeconomic and demographic characteristics, census year, and major geographic region of residence. Population censuses, Brazilian Institute of Geography and Statistics (IBGE), Brazil, 2000 and 2010.

Characteristics	North		Northeast		Southeast		South		Central	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Age (years)										
0-9	20.0	21.7	13.4	14.5	9.9	7.5	10.8	10.2	12.9	12.3
10-19	21.6	22.3	21.2	18.3	17.0	14.0	15.9	15.4	19.3	15.8
20-29	19.7	17.3	18.7	17.3	17.9	17.1	17.5	17.2	19.0	19.9
30-39	15.3	14.0	16.1	16.1	17.5	17.5	17.9	15.9	18.0	16.6
40-49	9.8	9.8	12.5	13.0	16.0	15.5	15.9	15.3	13.9	13.8
50-59	6.5	6.5	8.5	10.0	10.1	13.6	10.2	12.3	8.4	10.3
60-69	4.2	4.7	5.4	5.9	6.6	8.5	6.7	8.2	4.8	6.5
70+	2.8	3.7	4.2	4.8	4.9	6.4	5.0	5.5	3.7	4.7
Schooling										
Incomplete primary schooling or less	75.6	70.4	70.8	62.9	67.5	53.4	73.8	63.1	73.5	60.4
Complete primary schooling or more	23.2	29.2	28.1	36.8	31.8	46.0	25.1	36.4	25.4	39.0
Undetermined	1.2	0.4	1.1	0.3	0.7	0.6	1.1	0.5	1.0	0.6
Per capita household income (minimum wage)										
No income	4.5	4.2	4.8	4.4	4.9	4.2	5.4	5.2	4.5	3.9
< 1	47.8	56.4	47.9	57.3	48.3	57.0	48.1	56.5	48.8	56.2
1-2	21.6	22.6	21.4	22.3	20.9	22.9	20.6	21.8	20.6	23.5
> 2	26.0	16.7	26.0	16.0	25.8	16.0	25.8	16.5	26.1	16.5
Number of household residents										
1	9.3	12.2	8.4	11.6	8.7	11.6	8.2	10.7	8.4	11.7
2	15.8	22.0	16.8	23.0	16.5	22.1	17.3	24.3	16.7	21.8
3	21.8	23.9	21.6	24.5	21.6	24.9	22.3	24.0	21.9	23.7
4	23.8	21.5	22.7	20.5	22.9	21.2	22.8	21.2	22.9	23.5
5+	29.4	20.4	30.5	20.4	30.2	20.2	29.4	19.8	30.0	19.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n	45,845	60,478	104,619	107,698	139,272	81,356	51,732	34,613	38,091	34,622

the share for the group with 1-2 minimum wages, and a percentage drop in the bracket with more than 2 minimum wages. Again, there were negligible differences between urban and rural areas in all the country's major geographic regions.

Finally, Figure 4 shows that the average total household resident count decreased between the censuses. The figure also suggests that the distributions of total household residents did not differ when comparing urban and rural areas internally in each census year.

Discussion

Since publication of the 2010 Census data, comparative analyses with previous censuses have been published, especially with the 2000 Census [7,8,11]. The important increase in the indigenous population from 1991 to 2000, as mentioned in the *Introduction*, has been attributed to a broader scenario involving the (re)emergence of indigenous identities in a context of valorization and recognition of Brazil's social diversity during the decade following enactment of the 1988 Federal Constitution. Meanwhile, when comparing 2000 and 2010, one of the main questions addressed in social and demographic studies has been the search for explanations for the unexpected variation in the size of the indigenous population between the two censuses, in particular the decrease in the urban area [11]. One line of

Table 4

Relative distribution of indigenous persons in rural areas according to socioeconomic and demographic characteristics, census year, and major geographic region of residence. Population censuses, Brazilian Institute of Geography and Statistics (IBGE), Brazil, 2000 and 2010.

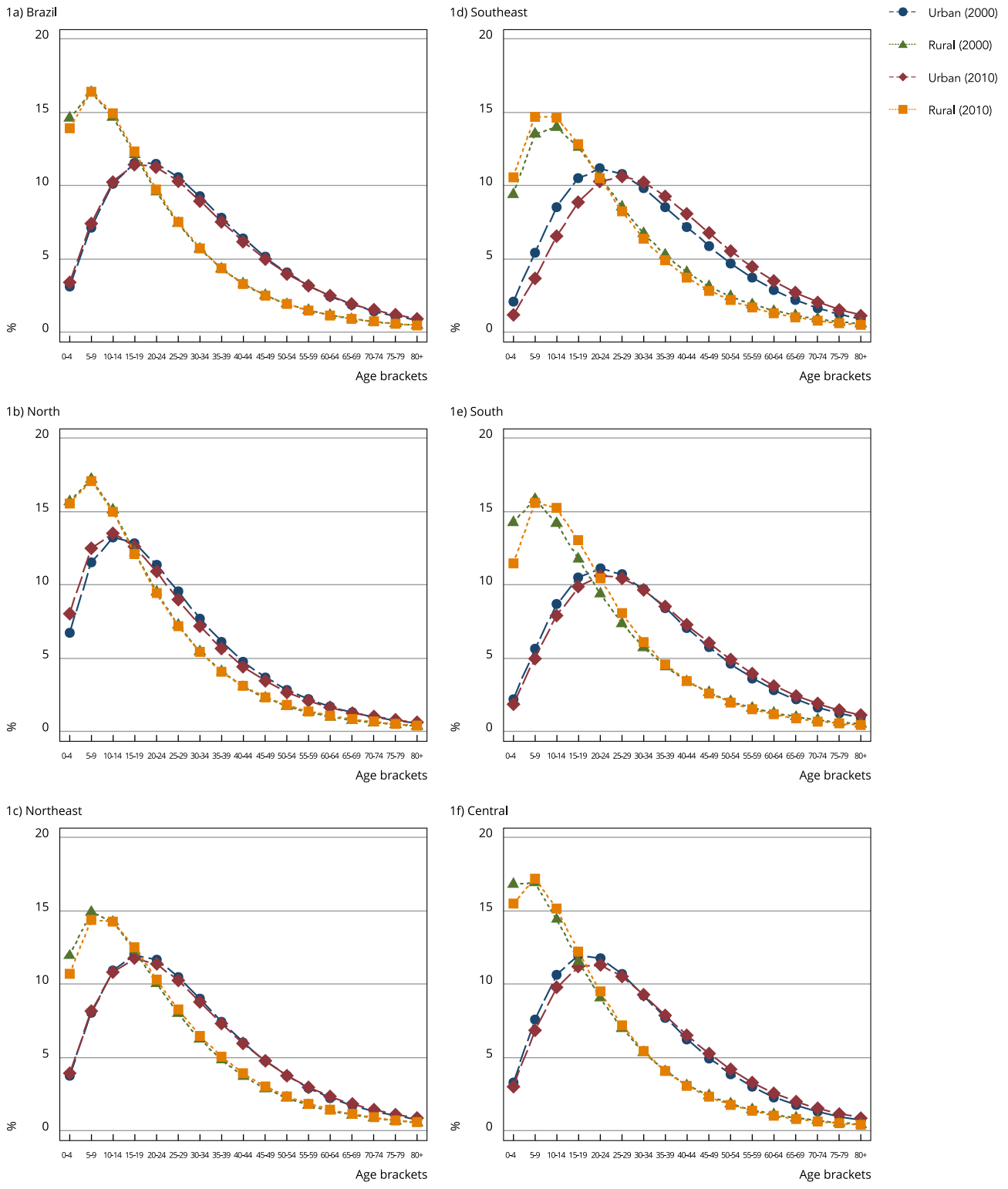
Characteristics	North		Northeast		Southeast		South		Central	
	2000	2010	2000	2010	2000	2010	2000	2010	2000	2010
Age (years)										
0-9	34.6	33.7	27.4	26.3	24.4	26.2	30.7	28.0	34.3	33.7
10-19	23.9	24.2	25.2	23.8	22.2	23.3	22.6	26.7	23.5	25.3
20-29	15.5	15.7	15.1	16.9	14.8	17.7	15.6	16.4	16.2	15.7
30-39	11.0	10.3	10.3	12.2	12.8	11.6	10.8	11.5	9.6	10.7
40-49	6.3	6.6	7.2	7.8	10.7	7.8	7.8	6.7	5.1	5.8
50-59	3.9	4.0	6.2	5.1	6.5	5.8	4.6	4.7	4.0	3.4
60-69	3.0	3.1	4.6	4.2	5.2	4.4	3.7	3.2	3.6	2.4
70+	1.9	2.4	4.0	3.7	3.4	3.2	4.1	2.8	3.6	3.0
Schooling										
Incomplete primary schooling or less	96.8	91.3	93.8	85.7	90.0	82.6	94.5	85.6	96.3	89.8
Complete primary schooling or more	2.4	8.3	4.3	14.0	8.6	17.0	4.8	14.0	3.5	9.6
Undetermined	0.8	0.4	1.9	0.3	1.4	0.4	0.7	0.4	0.2	0.6
Per capita household income (minimum wage)										
No income	4.7	4.3	5.2	4.5	4.8	3.5	4.7	4.1	5.0	4.4
< 1	48.5	56.2	48.6	56.7	46.4	57.1	49.0	57.5	48.0	56.7
1-2	20.9	23.2	21.2	22.1	20.8	23.7	19.9	21.8	21.0	22.5
> 2	25.9	16.3	25.0	16.7	28.0	15.7	26.5	16.5	26.0	16.3
Number of household residents										
1	8.7	11.7	8.5	11.9	9.0	11.9	8.4	12.3	8.5	11.8
2	16.5	22.2	17.0	22.2	16.0	20.5	16.8	22.1	16.5	22.0
3	21.5	25.0	21.7	24.6	22.0	25.9	22.0	24.4	21.3	24.7
4	23.1	21.2	23.2	21.0	23.6	20.0	22.9	21.1	23.4	21.2
5+	30.1	19.9	29.6	20.4	29.5	21.7	29.9	20.0	30.4	20.3
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
n	165,165	241,592	63,985	99,604	20,361	18,893	32,226	39,846	65,409	94,368

explanation is that with the inclusion of questions on ethnicity and language spoken at home in 2010, it is possible that fewer respondents (especially in urban areas in the South and Southeast) opted for the indigenous category on the color/race question. There are no detailed anthropological studies on the issue, but one could assume that in the context of the census, the notion of indigenous self-identification was linked to having a specific indigenous ethnic identity and/or speaking an indigenous language. At any rate, beyond the understanding of variation in these population contingents, another line of research, less emphasized, involves comparative investigation of the demographic and socioeconomic characteristics of the indigenoyus population in 2000 and 2010. In this case, the most detailed study was done by IBGE and focused on regional and urban/rural distribution, literacy, income, and sanitation, among other aspects [7,11].

The current study is part of a set of efforts to compare the results for indigenous peoples in the 2000 and 2010 censuses. In relation to the studies done thus far, in addition to describing similarities and differences in the demographic and socioeconomic characteristics of Brazil's indigenous peoples based on simple absolute and relative frequencies, the current study is innovative in that it uses regression models to adjust for covariates. An example illustrates the importance of this approach: previous analyses, including studies by the IBGE, had already pointed to the fact that in Brazil as a whole and in its major geographic regions, there was an increase in the literacy rates among indigenous persons 15 years or older from 2000 to 2010 [7]. Nevertheless, the interpretation of this information should take into account that there were changes in the age structure of indigenous population between the two

Figure 1

Predicted probability of age distribution of indigenous persons, according to urban/rural situation and region. Population censuses, Brazilian Institute of Geography and Statistics (IBGE), Brazil, 2000 and 2010.



Statistics (IBGE), Brazil, 2000 and 2010.

Figure 2

Predicted probability of schooling categories of indigenous persons, according to urban/rural situation and region. Population censuses, Brazilian Institute of Geography and Statistics (IBGE), Brazil, 2000 and 2010.

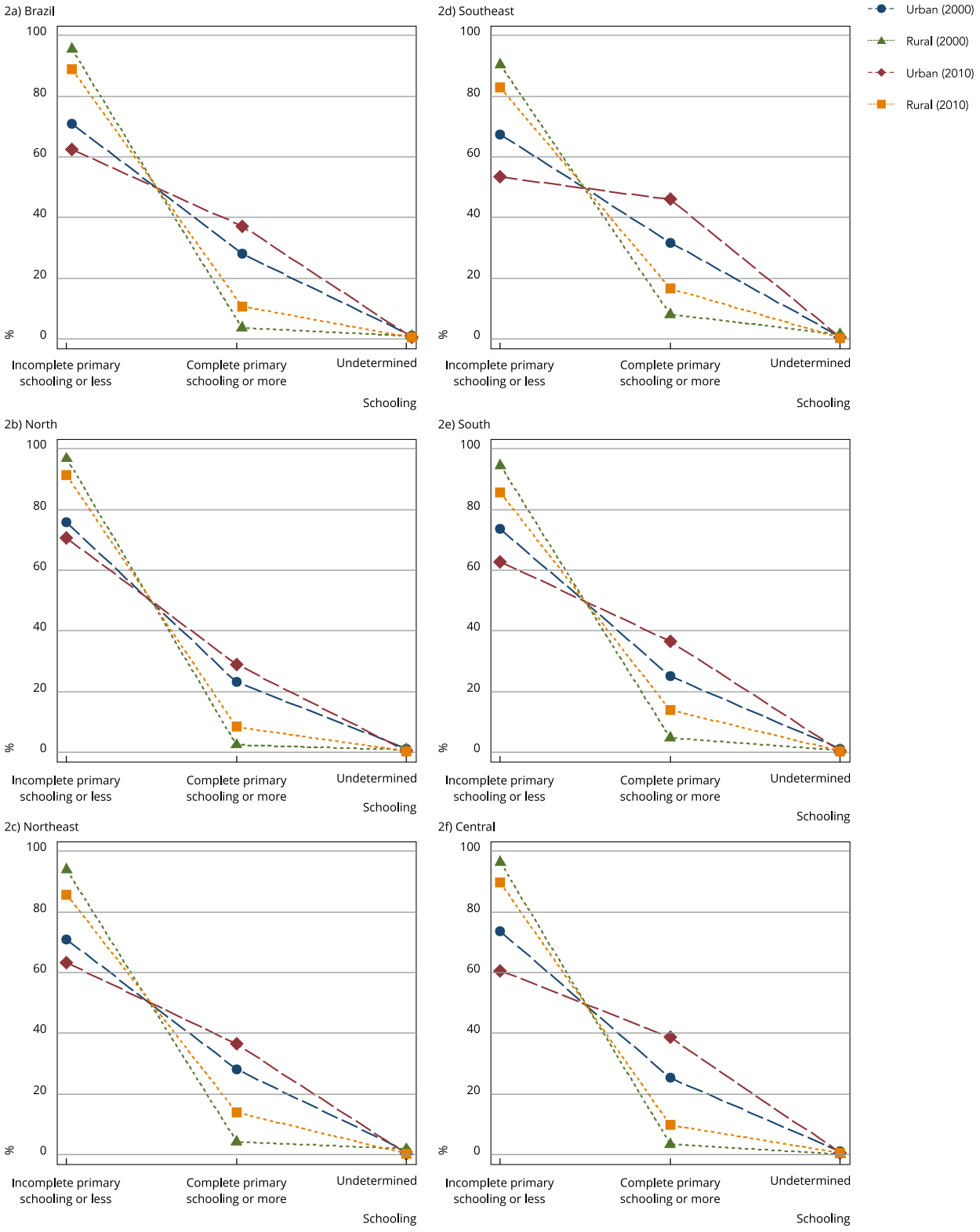


Figure 3

Predicted probability of income categories of indigenous persons, according to urban/rural situation and region. Population censuses, Brazilian Institute of Geography and Statistics (IBGE), Brazil, 2000 and 2010.

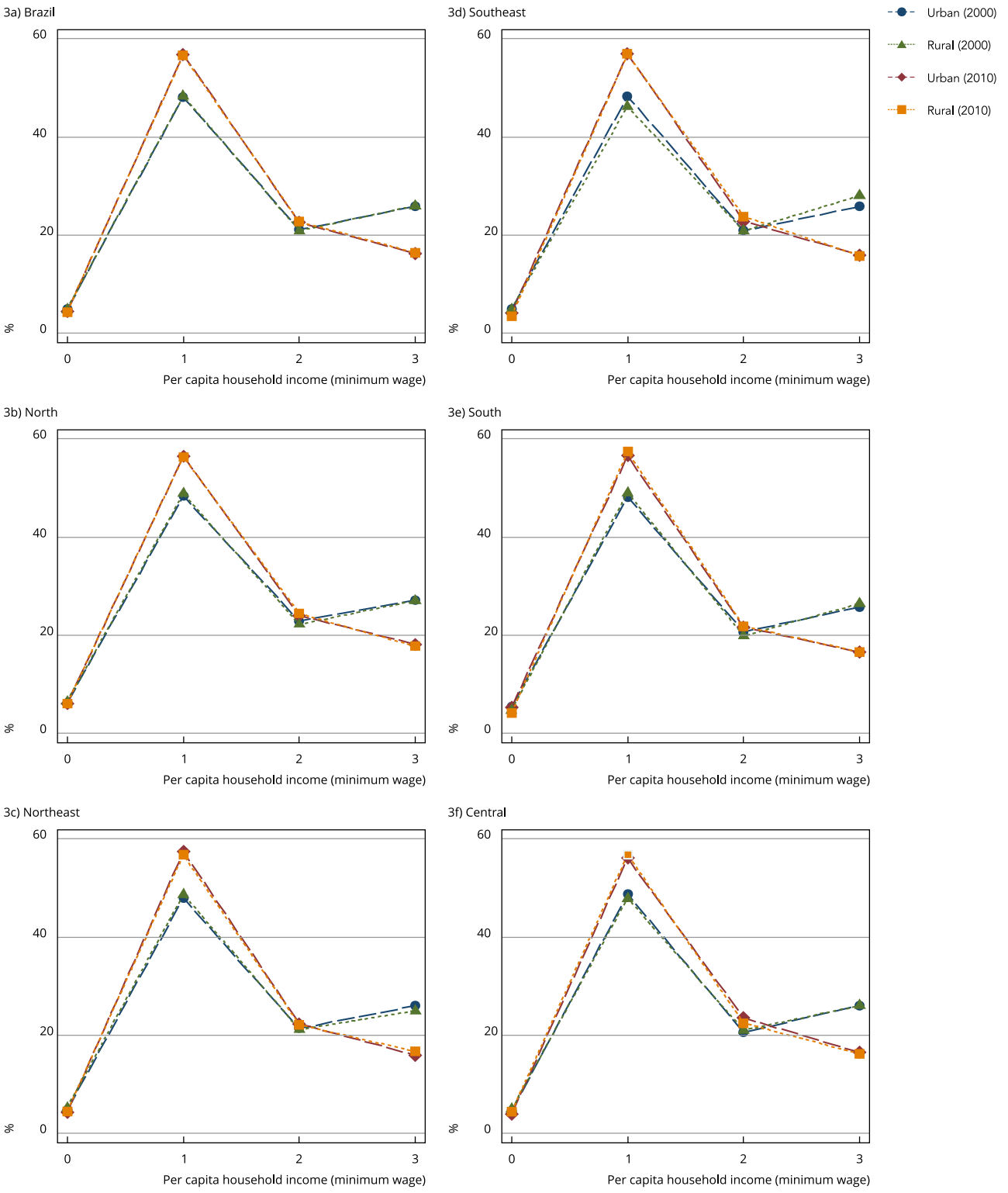
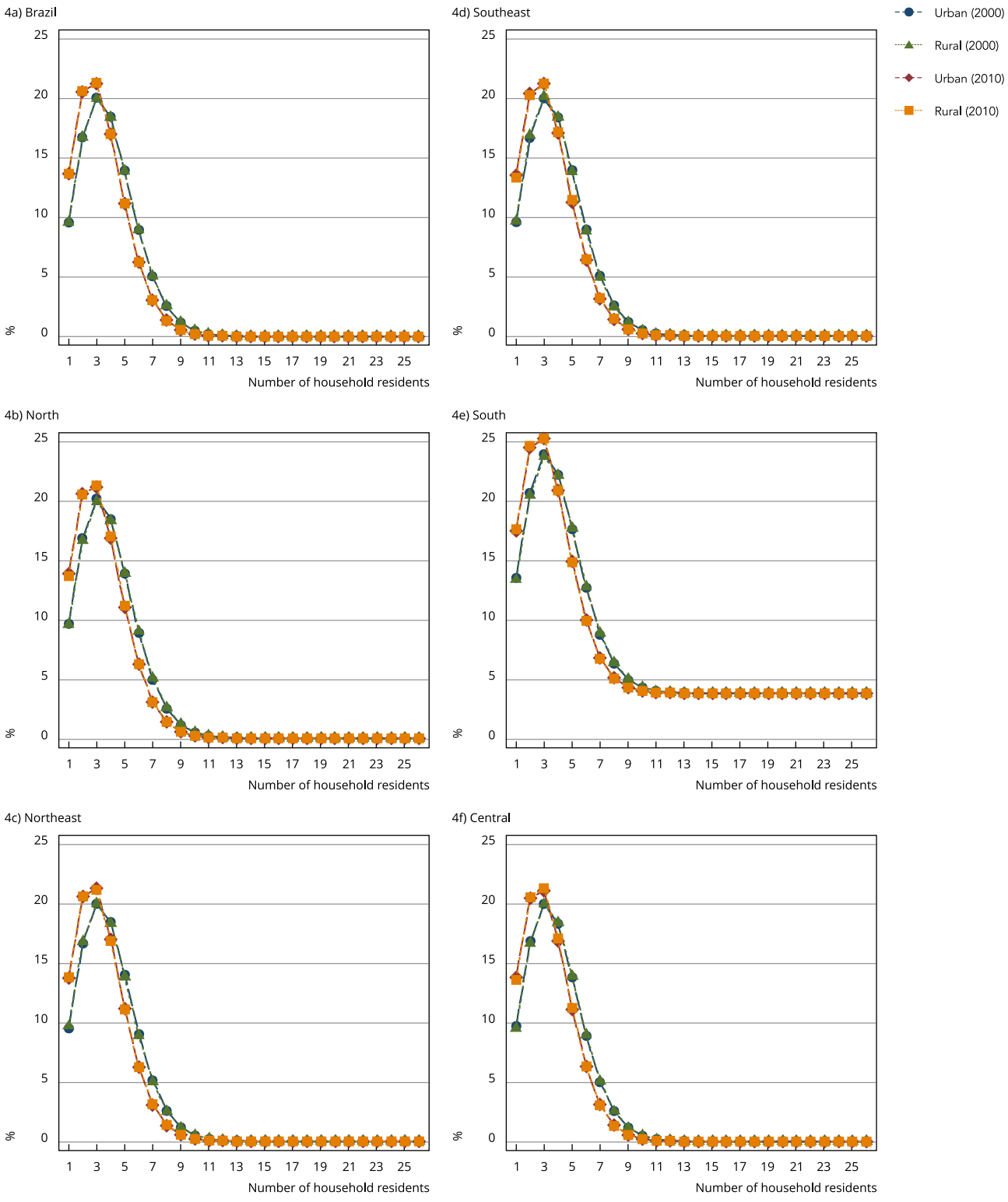


Figure 4

Predicted probability of count of the individuals residing in the occupied indigenous households, according to urban/rural situation and region. Population censuses, Brazilian Institute of Geography and Statistics (IBGE), Brazil, 2000 and 2010.



censuses. Statistical modeling is thus useful for data interpretation, considering other characteristics that affect the comparison, including age structure.

The analyses presented here corroborate a set of trends among indigenous population in Brazil from 2000 to 2010. In keeping with previous studies [7,8], besides the changes in the size of the indigenous population indicating important variations between the two censuses, there were significant changes in the regional distributions, as seen in the urban and rural areas. Specifically in rural areas, there was an increase in the indigenous population from 2000 to 2010, from 347,145 to 494,306 individuals, but the overall profile of the proportional distribution between the major geographic regions remained practically unchanged. In both censuses, the rural North was home to some 50% of the indigenous population, followed by the Northeast and Central with 20% each, totaling some 90% of the country's total rural indigenous population. The changes in urban areas were more heterogeneous, since the decrease in the urban indigenous population (from 379,560 in 2000 to 318,769 in 2010) was accompanied by important transformations in the regional distributions. While some major geographic regions experienced absolute and relative increases (e.g., the North and Northeast), others, like the Southeast and South, displayed lower absolute and relative numbers in 2010. When considering differences in the proportions of the indigenous population according to major geographic region and urban/rural location, the most important changes between the two censuses, on the order of 5 p.p. or more, occurred in only three strata: the urban Southeast (36.7% in 2000 vs. 25.5% in 2010), urban Northeast (27.6% vs. 33.8%), and urban North (12.1% vs. 19%).

Without ruling out the influence of other factors (e.g., greater or lesser propensity to self-identify with a given color or race category or the country's growing urbanization and the possible changes in the demarcation of urban and rural areas by Brazilian municipalities between 2000 and 2010), variations in the size of the indigenous population in the rural area, with a mean annual growth rate of 3.7 from 2000 to 2010 [11], can potentially be explained by the demographic dynamics themselves, particularly the relationship between birth and death rates, as well as migration, the latter perhaps on a smaller scale [17]. Especially in a scenario of reduction in the indigenous population in urban areas, it is less plausible to explain the changes without considering the possibility of more incisive influences related to data collection procedures and changes in ethnic and racial identification. For example, as mentioned previously, indigenous self-identification in the 2000 Census was based solely on the answer to the question on color race, while the 2010 Census included questions on specific indigenous group (ethnic people or ethnicity) and languages spoken at home [7]. Respondents living in urban areas that opted for the indigenous category in 2000 may have failed to do so in 2010, especially when asked questions about their specific indigenous group and the language spoken at home, as discussed previously. This effect may have been even stronger in some regions of Brazil, especially in the urban Southeast.

The interrelations between demographic factors and sociopolitical dimensions influencing the color or race profile are a broader issue in Brazil and in other countries, and are not limited to indigenous minorities [18,19]. Miranda [20] argues that recent variations in the proportions of black and brown individuals in Brazil, with an upward trend from 2000 to 2010, may be due to the implementation of affirmative action policies with a racial focus in recent years (see also Telles [19] and Francis & Tannuri-Pianto [21,22]). In the case of the indigenous population, on the basis of census data, color or race classification cuts across dimensions linked to ethnicity and language, in addition to a whole plethora of socioeconomic aspects, resulting in complex classification processes, the characteristics of which require further understanding [3,8,10,15,23].

Featured in the current study's findings are the converging trends observed in Brazil's indigenous population, despite the positive and negative variations in the size of the population according to rural/urban location and major geographic region. For example, the urban Southeast and Northeast experienced different changes, with a decrease from 36.7% to 25.5% and an increase from 27.6% to 33.8%, respectively, as proportions of the country's total. At the same time, the overall pattern of changes in schooling, household income, and number of residents per household was similar in the same two geographic regions. Thus, despite regional specificities, the findings of the regression analysis did not reveal particularities (by major geographic region and urban/rural location) with patterns of changes that differed markedly from the overall observations. This included a trend

towards population aging (less in rural areas and slightly more pronounced in the urban Southeast, South, and Central); an increase in schooling (particularly in complete primary schooling or more); a decrease in households with no income, as well as in those with more than 2 times the minimum wage; and a decrease in the number of household residents. Importantly, such changes, i.e., population aging, more schooling and income, and a decrease in the average number of household residents, have largely been true for the Brazilian population as a whole, although to different degrees and at different paces [24].

Given the above, and surprisingly, the different patterns of gains or losses in the indigenous population did not mean that the specific geographic regions (and according to urban versus rural location) tended to display even more specific profiles of social and demographic changes. Whatever the explanations for the variations in the number of indigenous persons between the two censuses, including the previously mentioned possibility of less self-identification with the indigenous category in the urban South and Southeast in 2010 due to questions on specific indigenous ethnic group and language spoken at home, they did not result in markedly different variations in the social and demographic profiles when comparing the various geographic regions, whether with decreases or increases in the population. If the explanation for the decrease in Brazil's urban indigenous population from 2000 and 2010 already posed an important analytical challenge, we contend that the question of convergence in the socioeconomic profiles (both in terms of losses and gains in the indigenous population) should also be prioritized in studies on indigenous demographics based on census data.

The results for per capita household income comparing 2000 and 2010 are proving difficult to explain, since all the brackets showed similar proportions in the major geographic regions, in both urban and rural areas. In addition, the gains in the income bracket up to 1 minimum wage were offset by a proportional decrease in the group earning more than 2 times the minimum wage. One cannot rule out the possibility that measuring household income implies additional complexity in the case of indigenous peoples, especially when located in rural areas and where the mother tongue is not Portuguese. For example, a previous analysis of the census data [15] indicated that indigenous mothers in the North showed high percentages of responses that were provided by proxies, rather than by themselves, on the number of children in their childbearing history. Taken together, these results signal a complexity of sociocultural factors that may impact the production of census data in general (and not only those pertaining to income), making it difficult to interpret the observed patterns and profiles.

Meanwhile, the decrease in the number of residents in indigenous households, although consistent and homogeneous across the major geographic regions and urban and rural areas, nevertheless showed relative inertia in the age structure between 2000 and 2010. This was particularly unexpected since, strictly speaking, the decrease in total household residents should have been linked to the population's aging. Given that only the urban Southeast stood out with a perceptible but slight change in its age distribution, one would expect that the average household count would decrease more intensely there than in the other geographic regions. Marinho [25] pointed out an important decrease in the number of indigenous households in urban areas (from some 134,000 in 2000 to 112,000 in 2010), as well as an increase in rural areas (from 66,000 in 2000 to 96,000 in 2010). That is, the pulverization of indigenous population across more households in the rural area would only partially explain the decrease in residents in indigenous households, since the same was not observed in urban areas. One potential hypothesis is whether, for example, the decreases observed from 2000 to 2010 (particularly in the urban Southeast and South) were more pronounced in the case of indigenous individuals living in households in which the other residents, including the household head, were not indigenous. Such a change would be consistent with the current study's findings, in the sense of differential patterns of changes in the population's size, whether increases or decreases, along with changes in the socioeconomic profiles that did not differ markedly according to major geographic region or urban versus rural location.

In conclusion, the results as a whole indicate relevant trends in Brazil's indigenous population over a ten-year period. The same results have also proven particularly complex and have challenged attempts at understanding them. These aspects can raise methodological questions, for example, involving the census data collection instruments and fieldwork: (1) Considering the indigenous population's decrease in the Southeast and in parallel its relative aging, are we dealing with the same indigenous population in 2000 and in 2010? (2) Although Brazil is characterized by regional and

urban/rural inequalities, how does one explain the largely similar changes in income distribution and number of household residents over the 10 years? These questions doubtless point to the need for more in-depth analyses of the population trends observed here, based among others on data to be produced in the next editions of Brazil's census. Any analysis of demographic trends requires data collected at multiple points in time, and not only in two census years. This emphasizes the fact that since indigenous peoples are among the ethnic and racial population segments in Brazil with the greatest social and environmental vulnerability, it is necessary for the analyses presented here to continue, and in greater depth. This will be indispensable for monitoring the trends and implementing public policies for the indigenous population.

Contributors

J. L. Bastos prepared the database, statistical analysis, and writing of the manuscript. R. V. Santos conceived the article, conducted the data analysis, wrote passages of the manuscript, and performed the critical revision. O. G. Cruz conducted the statistical analysis and critical revision of the manuscript. L. A. F. B. Longo prepared the databank and conducted the statistical analyses and critical revision of the manuscript. L. O. Silva conducted the data analysis and critical revision of the text.

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Resumo

Os perfis sociodemográficos de segmentos da população brasileira têm sido objeto de múltiplas comparações intercensitárias. Neste trabalho, foram contrastadas as distribuições etária, de número de moradores nos domicílios, ensino formal e renda para os indígenas dos censos demográficos de 2000 e 2010. Observou-se redução expressiva na contagem de moradores dos domicílios ocupados, bem como discreto envelhecimento dos indígenas, exceto para o Norte urbano. Por sua vez, houve aumento proporcional da renda até um salário mínimo, acompanhado de redução da faixa de mais de dois salários mínimos nas cinco macrorregiões, em suas áreas urbanas e rurais. A escolaridade, apesar de também ter aumentado, apresentou incrementos díspares conforme macrorregião e situação urbana/rural; Sudeste urbano obteve ganhos mais expressivos, já o Norte e Centro-oeste rurais exibiram incrementos menos evidentes. O estudo reforça a necessidade de que as análises apresentadas sejam aprofundadas, evidenciando particularidades e subsidiando a avaliação e implantação de políticas públicas direcionadas a esse contingente populacional.

População Indígena; Censos; Inquéritos Demográficos

Resumen

Los perfiles sociodemográficos de segmentos de la población brasileña han sido objeto de múltiples comparaciones entre censos. En este trabajo, se contrastaron las distribuciones por edad, número de habitantes por domicilio, enseñanza formal y renta en relación con los indígenas de los censos de 2000 y 2010. Se observó una reducción expresiva en el cómputo de residentes de los domicilios ocupados, así como un discreto envejecimiento de los indígenas, con excepción del norte urbano. A su vez, hubo un aumento proporcional de renta hasta un salario mínimo, seguido de una reducción de la franja de más de dos salarios mínimos en las cinco macrorregiones, en sus áreas urbanas y rurales. La escolaridad, a pesar de haber aumentado también, presentó incrementos dispares según macrorregión y situación urbana/rural; el sudeste urbano mostró beneficios más expresivos, mientras que el norte y centro-oeste rurales mostraron incrementos menos evidentes. El estudio refuerza la necesidad de que los análisis presentados sean profundizados, evidenciando particularidades y apoyando la evaluación e implementación de políticas públicas, dirigidas a este contingente poblacional.

Población Indígena; Censos; Encuestas Demográficas

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