Racial Disparities in Life Expectancy in Brazil: Challenges From a Multiracial Society

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Objectives. We calculated life expectancy at birth for Whites, Blacks, and mixed races in Brazil, and decomposed the differences by causes of death.

Methods. We used Ministry of Health death records and 2010 Census population data (190 755 799 residents and 1 136 947 deaths). We applied the Arriaga methodology to calculate decomposition of life expectancy by cause of death. We performed sensitivity analyses for underreporting of deaths, missing data, and numerator–denominator bias.

Results. Using standard life table methods, female life expectancy was highest for mixed races (78.80 years), followed by Whites (77.54 years), then Blacks (76.32 years). Male life expectancy was highest for Whites (71.10 years) followed closely by mixed races (71.08 years), and lower for Blacks (70.11 years). Homicides contributed the most to the relative life expectancy increase for Whites, and cancer decreased the gap. After adjustment for underreporting, missing data, and numerator–denominator bias, life expectancy was higher for Whites than for Blacks and mixed races.

Conclusions. Despite wide socioeconomic differences between Whites and mixed races, standard life table methods showed that mixed races had higher life expectancy than Whites for women, and similar for men. With the increase of multiracial populations, measuring racial disparities in life expectancy will be a fast-growing challenge. (*Am J Public Health.* 2014;104:2156–2162. doi:10.2105/AJPH.2013.301565)

The idea of a "Brazilian racial democracy" first gained traction during the early 20th century and quickly spread thereafter.[1] Racial democracy came to signify intense race mixing, in which the blurring of race-group boundaries would foreshadow the creation of a postracial individual, free from discrimination. It is ironic that the ideology of living in a "race-free" society has held back scientific inquiry into the existence of racial/ethnic disparities in Brazil for several decades.[2]

This history of not openly talking about race in Brazil is well exemplified by the 2010 Census, which was the first ever to include a question about race in the national survey applied to every resident.[3] (Before 2010 all data about race were based on samples.) The results showed a country divided between Whites and non-Whites, with 47.73% Whites, 7.61% Blacks, 43.13% mixed races (*pardos*), 1.09% Asians, and 0.43% indigenous. The census also revealed the depth of socioeconomic racial inequalities in Brazil.[4] Whites earn an average monthly income that is 84.50% higher than Blacks' (R$ 1535.47 vs R$ 832.25) and 81.96% higher than mixed races' (R$ 843.87).

Results from a 2008 nationally representative, probability-based, multistage survey of Brazilian households had previously indicated that Whites also have higher education levels and report better self-rated health than Blacks and mixed races.[5] Whites were significantly more likely to have 8 years or more of formal education (51.68% vs 41.64% and 36.75%, respectively), and less likely to have no education (11.82% vs 16.40% and 18.41%, respectively).

These socioeconomic disparities by race in Brazil compare unfavorably with those in the United States, a country that shares a history of slavery, but unlike Brazil went through an additionally extended period of overt racial segregation (Jim Crow laws) that persisted well into the second half of the 20th century. Nonetheless, recent results show that US Blacks have a lower income disparity in relation to Whites (36.13% lower) in comparison with Brazil (45.8% lower among Blacks compared with Whites).[6]

This association between Black (or mixed) racial status and having both lower income and education, along with high crime rates in the communities in which they live, has had an important effect in perpetuating racial prejudice in Brazil.[7] Studies have found that when asked to identify the race of other people, respondents display a tendency to "Whiten" the other person's race, a bias known as "interviewer Whitening."[8] This is considered to be a way to avoid offending the other person.[9]

Analyzing race and mortality in Brazil has been long problematic for 2 reasons: first, as already mentioned, no complete data existed for population distribution by race; second, the quality of mortality data was considered to be unsatisfactory. As recently as 2000, it was estimated that only 85.4% of deaths were reported to authorities, and by 2010 the proportion had increased to 92.3%, a level of coverage similar to most developed countries.[10]

The objective of the present study was to use the recently released 2010 Census data to compare life expectancy at birth in Brazil for Whites, Blacks, and mixed races. We then aimed to decompose the life expectancy gaps by specific causes of death.

METHODS

To calculate life expectancy for Whites, Blacks and mixed races in Brazil, we used population data from the 2010 Census and death records from the Ministry of Health for 2010, totaling 190 755 799 residents and 1 136 947 deaths. We included live births records to use as the denominator for the calculation of infant mortality rates. Racial categories used for the death certificate and the Census survey were the same (White, Black, mixed, Asian, indigenous).

We calculated life expectancy by applying standard life table methods for the age groups: less than 1 year, 1 to 4 years, 5 to 9 years, 10 to 14 years, 15 to 19 years, and so on for each 5-year group.[11] The last age group for which death records are available in Brazil is age 80 years and older. We assumed constant mortality rates beyond age 80 years and person-years lived up to 95 years when closing the life table. Missing data for population race (0.003%), age of death (0.35%), and for race of the deceased (6.33%) were distributed proportionally by race unless mentioned otherwise.

For computing differences in life expectancy by cause of death, we used the Arriaga methodology, which allows for the decomposition of the overall difference in life expectancy by race, according to the underlying causes of death.[12] The overall gap in life expectancy at birth between Whites and Blacks is equivalent to the sum of its cause-specific components. We analyzed each cause of death by its contribution to the Black–White gap. Hence, if the value for the decomposition is positive for a specific cause of death, it means that the cause increases the White life expectancy in relation to Black life expectancy. We then did the same for the White and mixed races life expectancy gap. The causes of death included were the 10 leading causes of death for all races in 2010. We identified causes of deaths according to the *International Classification of Diseases, 10th Revision*, using the definition of the National Vital Statistics Report.[13,14]

We conducted sensitivity analyses for life expectancy to explore alternative scenarios accounting for missing data on race. First we excluded all deaths with missing race (n = 41 258 for men and 31 529 for women), to provide a crude estimate (i.e., one for which we do not make any assumptions about the distribution of missing data). Second, drawing from previous studies that showed that death records with missing values are more frequent among poor people,[15] we distributed these deaths proportionally to the racial distribution of people earning less than the minimum wage. In this case, 37.75% of deaths with missing race were included as White, 10.60% as Black, 51.28% as mixed, and 1.37% as other. This decreased the relative number of deaths of Whites, compared with the 2 previous approaches.

The third test included the deaths assumed to be missing because of underreporting (estimated to be around 7.7% of deaths nationwide, according to the national statistics bureau).[10] As missing values are higher for the poorest (and more Black and mixed-race) regions of the country, we distributed the number of deaths assumed to be underreported for each region by its respective racial distribution. For example, in the northern region, the national statistics bureau estimated for 2010 that an excess of 18 886 deaths went unreported. We distributed these extra deaths according to the racial distribution of this region (23.45% White, 6.64% Black, 66.89% mixed, 1.09% Asian, 1.93% indigenous).

We then considered the numerator–denominator bias, which can occur when the race of the deceased (the numerator in the calculation of mortality rates) is reported by the attending physician and not by the actual person as in the Census (which constitutes the denominator). Thus, the same information (i.e., race of the person X), could show up differently in the numerator (race of the deceased) and the denominator (racial distribution of the population), leading to a potential bias in the calculation of mortality rates by race. For example, if the person filling in the death certificate (the attending physician) is conservative about assigning "Black" race to the decedent, this will result in a systematic underestimation of Black mortality rates. We used a correction factor from the Ethno-Racial Population Characteristics Study by the Brazilian Institute of Geography and Statistics, which found that external observers reported an excess in the number of Whites by 15.5% and a decrease of 8.0% and 25.8% in the number of mixed races and Blacks, respectively, when compared with self-classification.[16] We first tried to account for this bias by applying the correction factor to the standard calculation of life expectancy. We also tested a fully adjusted life expectancy by distributing missing race values according to low income and accounting for racial distribution of regions with underreporting.

RESULTS

Figure 1 presents the results of life expectancy calculations for Whites, Blacks, and mixed races by using standard life table methods. The racial ordering of female life expectancy was highest for mixed races (78.80 years), followed by Whites (77.54 years), then Blacks (76.32 years). Male life expectancy for Whites and mixed races was similar (71.10 and 71.08 years, respectively) and lower for Blacks (70.11 years).

Table 1 shows the contribution of each specific cause of death to the White–Black (and White–mixed) gap in life expectancy. Positive

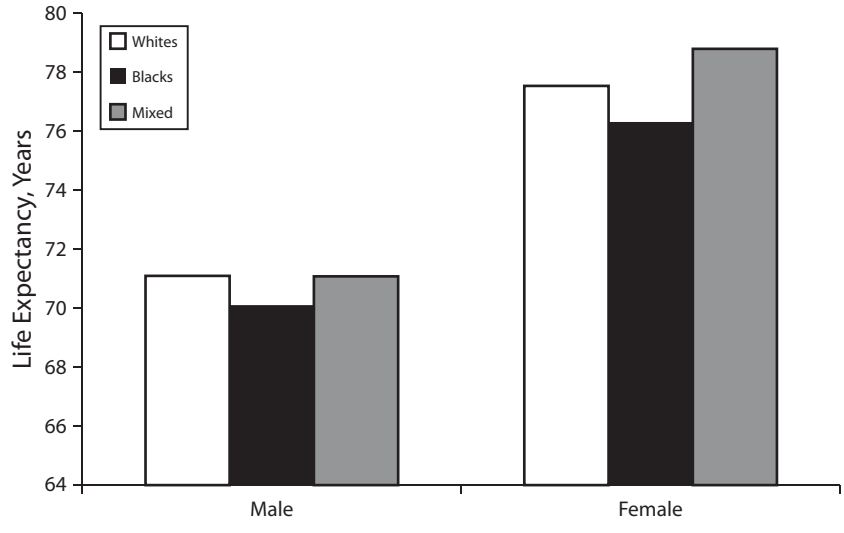

FIGURE 1—Life expectancy by gender for Whites, Blacks, and mixed races, using standard life table methods: Brazil, 2010.

TABLE 1—Decomposition of Differences in Life Expectancy at Birth Between Whites and Blacks, and Whites and Mixed Races, by Cause of Death: Brazil, 2010

Cause of Death	Female		Male	
	Black	Mixed Race	Black	Mixed Race
Cancer	−0.28	−0.48	−0.66	−0.98
Ischemic heart disease	−0.01	−0.11	−0.23	−0.30
Cerebrovascular diseases	0.30	0.05	0.23	0.01
Accidents	−0.10	−0.01	−0.29	0.28
Flu or pneumonia	−0.05	−0.11	−0.08	−0.18
Diabetes	0.18	0.05	0.10	0.00
Homicide	0.01	0.06	0.50	1.10
Hypertensive diseases	0.26	0.09	0.27	0.10
Chronic lower respiratory disease	−0.08	−0.07	−0.20	−0.20
Ill-defined or unknown	0.24	0.15	0.35	0.26

values indicate that the specific cause of death increased the White life expectancy in relation to the Black (or mixed-race) life expectancy, whereas negative values indicate that it decreased the difference. Homicides contributed the most to relative life expectancy disparities for men in Brazil, accounting for a 1.1-year gap in life expectancy between Whites versus mixed races and for a 0.5-year gap between Whites and Blacks. (For women, the contribution of homicide was much lower.) By contrast, cancer mortality contributed in the opposite direction—i.e., decreasing the life expectancy difference between Whites and Blacks by 0.66 years for men and 0.28 years for women, and between Whites and mixed races by 0.98 years for men and 0.48 years for women.

Figures 2 and 3 present the results of the sensitivity analyses. We found a consistent crossover in life expectancy at higher age groups. That is, Whites exhibited higher mortality rates compared with Blacks and mixed races beyond a threshold age, which has also been found previously in US data.[17] This crossover phenomenon has been attributed to the selective survival of the hardiest Black individuals who survive adversity into old age. By changing the approach of dealing with missing values and underreporting, results for life expectancy moved in the direction of a higher relative White life expectancy. Where underreporting was accounted for, Whites had a life expectancy that was 2.56 and 2.64 years higher (respectively) in relation to Blacks and mixed races for men and 3.24 and 2.03 years higher for women.

Figure 4 shows the result when we accounted for the effect of "interviewer Whitening," in which positive values indicate higher life expectancy for Whites. We first introduced this approach to standard life table calculations (i.e., where deaths with missing race were distributed proportionally). In this case, Whites had a higher life expectancy than mixed races (1.16 years for women and 3.09 years for men) and Blacks (6.72 years for women and 7.59 years for men). We then introduced a "fully adjusted life expectancy," where missing races were distributed proportionally in relation to low income and underreporting was addressed by racial composition of Brazilian regions. In this case, the life expectancy gap between Whites and mixed races was 2.87 years for women and 5.08 years for men, and for Blacks it was 8.45 years for women and 9.28 years for men.

DISCUSSION

Results from standard life table methods showed that life expectancy among Whites was similar to that of mixed races for men (71.10 for Whites vs 71.08 for mixed races), and lower for White women (77.54 years) than for mixed-race women (78.80 years). Black life expectancy was lower for both men (70.11) and women (76.32).

We first explored the decomposition of the life expectancy gap according to causes of death. An excess of deaths from homicides for mixed races and Blacks was a major contributor to the increase of the relative life expectancy for White men. On the other hand, cancer was an important factor for the decrease of the life expectancy gap between Whites and Blacks or mixed races. The similarity for homicide, though not for chronic diseases such as cancer, could be attributed to a numerator–denominator bias. There is a possibility that physicians could be more likely to assign Black or mixed race to victims of homicide and to engage in "interviewer Whitening" in the case of deaths from chronic diseases.

Despite Brazil having a wider socioeconomic difference between Whites and Blacks than the United States, standard life table calculations showed a much narrow life expectancy gap. Whereas Blacks in the United States had a life expectancy that was 5.5 years lower for men and 3.7 years lower for women (in relation to Whites), in Brazil the gap was 0.99 and 1.22 years, respectively.[13] We then proposed alternative scenarios that could correct for the numerator–denominator bias, missing data, and racial misclassification, but none can be considered the definite standard. These analyses increased the life expectancy gap considerably in favor of Whites. In our fully adjusted model, White women had a life expectancy that was 2.87 years higher than mixed races (*pardos*) and 8.45 years higher than Blacks (78.72, 75.84, and 70.26 years, respectively). For men, that difference was 5.08 and 9.28 years (72.48, 67.41, and 63.21 years, respectively).

We propose here that the absence of well-defined racial markers could hide the real presence of racial inequalities in health. Studies that analyze inequalities in a country with blurred racial boundaries need to take into account the numerator–denominator bias,[18] a consequence of using data provided by different sources. On the one hand, racial identification for the living is performed by self-classification, but on the other hand, death certificates are the responsibility of the attending physician (or in some countries, the funeral director). Although this is not considered an issue for the United States (an analysis by Harris and Sim found a 99.9% concordance between self-classification and interviewer classification for Whites, and 99.8% for Blacks),[19] studies in Brazil have consistently identified the presence of an "interviewer Whitening."[8,20]

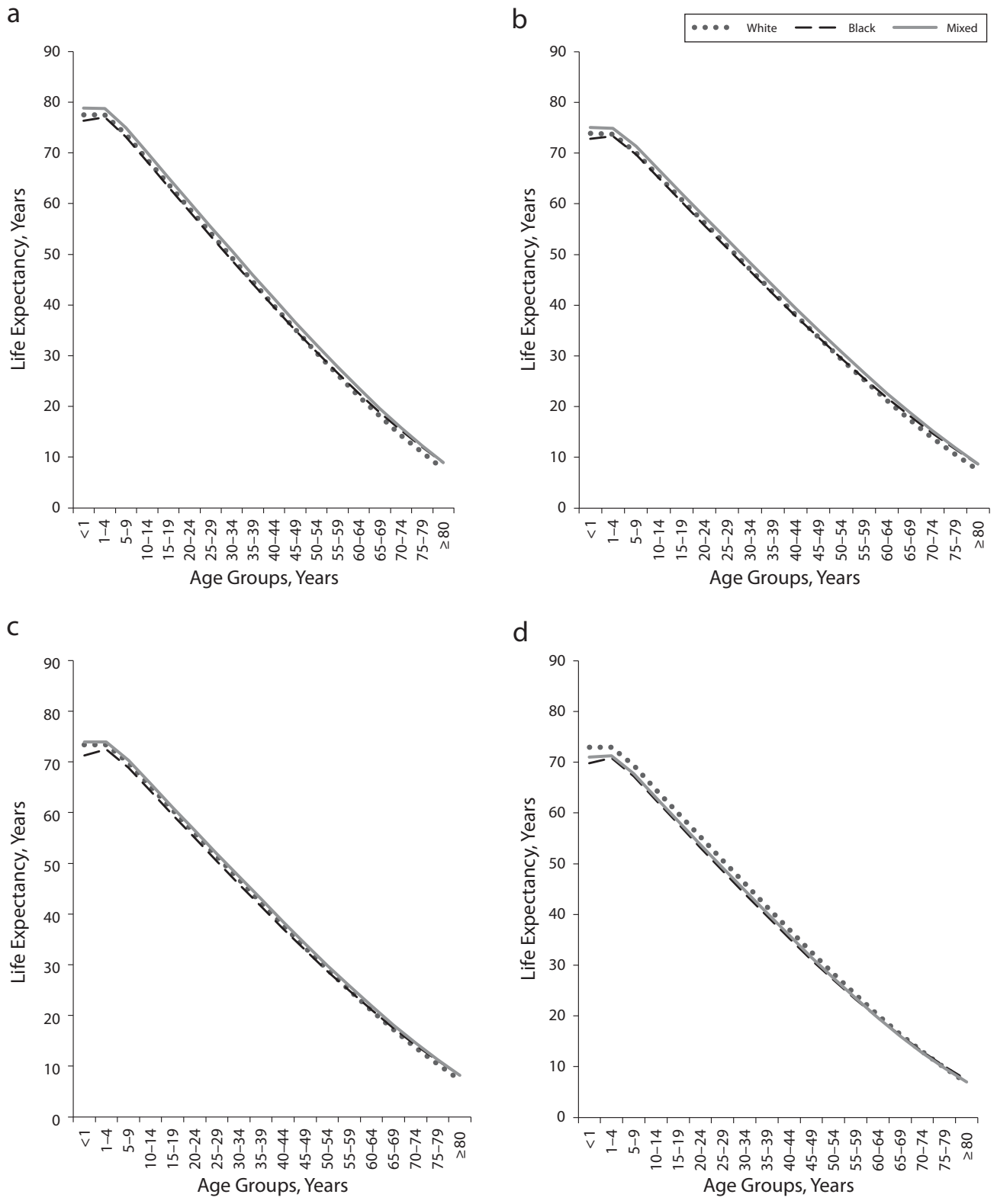

FIGURE 2—Sensitivity analysis of women for addressing missing values (a) distributed proportionally by race, (b) excluded, (c) distributed proportionally by low income, and (d) distributed proportionally by race while accounting for underreporting: Brazil, 2010.

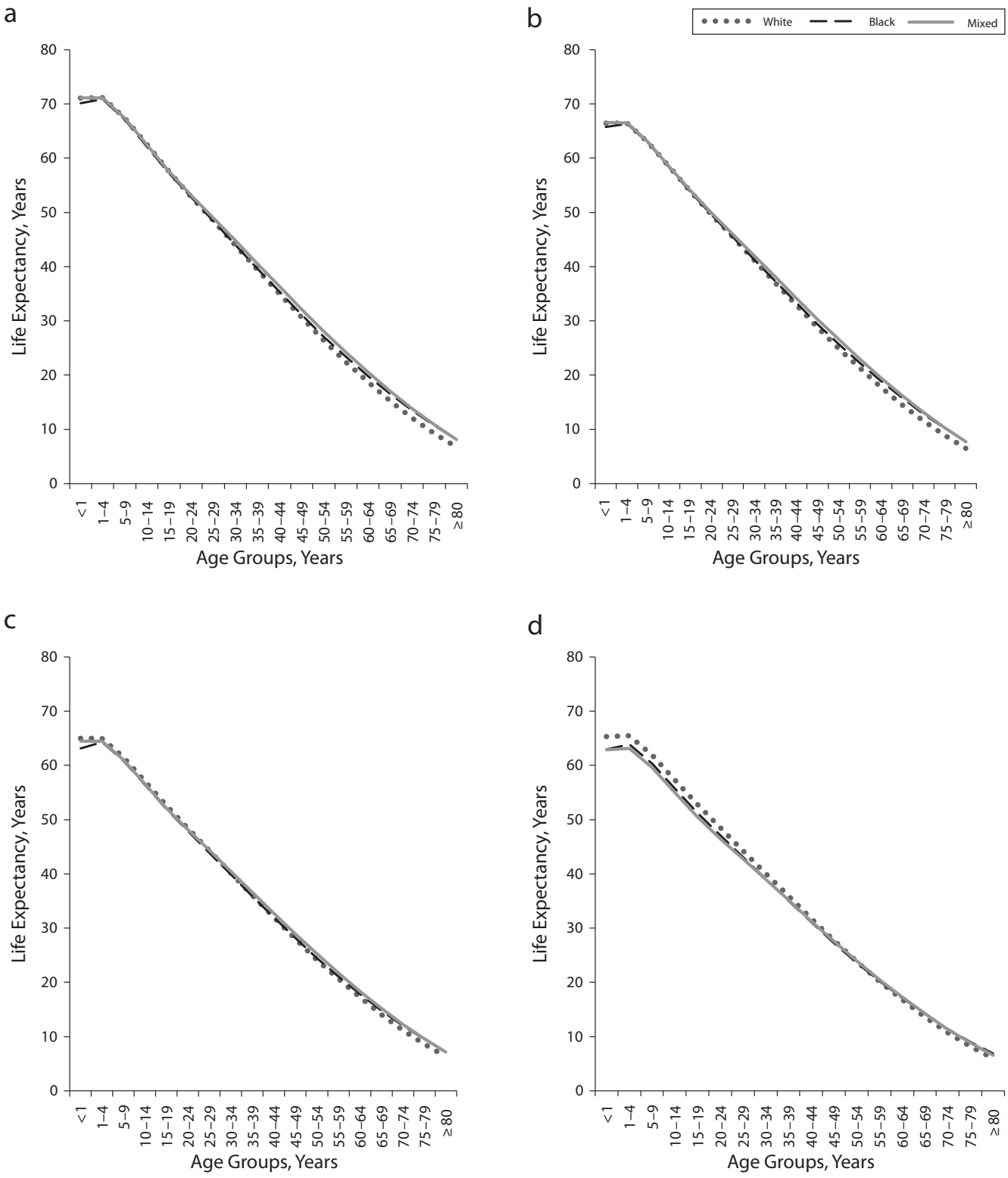

FIGURE 3—Sensitivity analysis of men for addressing missing values (a) distributed proportionally by race, (b) excluded, (c) distributed proportionally by low income, and (d) distributed proportionally by race while accounting for underreporting: Brazil, 2010.

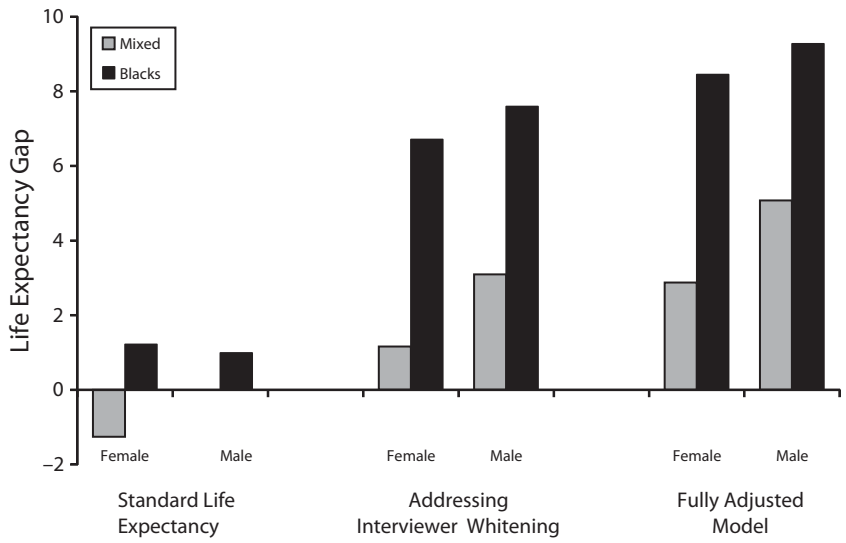

FIGURE 4—Life expectancy gap between Whites and Blacks, and Whites and mixed races: Brazil, 2010.

An important factor for the existence of "interviewer Whitening" is that the word used for Blacks in Brazil, *pretos*, can sometimes be used by itself as a racial slur. This makes some people wary of declaring other individuals, or even themselves, as *pretos*. It is interesting that more educated Blacks in Brazil are more likely to declare themselves as being Black as a matter of racial pride—a phenomenon known as "darkening with education."[21] There is evidence that the opposite occurs in the United States, where a "racial passing" effect has been reported.[22]

One solution to the numerator–denominator bias would be to require physicians to directly ask the family of the deceased about racial classification, instead of inferring it by proxy. But this may be difficult to enforce. Another possibility for documenting and monitoring racial inequalities is to perform the linkage of death certificates to census data, using the census self-classification as the gold standard—as has been done in New Zealand by Blakely et al. The authors found a significant underestimation of mortality data for Maori and Pacific peoples in New Zealand after performing the linkage, which they attributed to the numerator–denominator bias.[23] A study by Martens et al. also found a higher mortality rate for indigenous Canadians than was previously assumed.[24] Future studies of racial inequalities in Brazil using this methodology would be welcomed.

Limitations

To our knowledge, this is the first report to use complete data for racial distribution in Brazil, by analyzing the results from the 2010 Census. An important limitation was the presence of missing values for race and underreporting. We tried to address the fact that missing values were not completely random by distributing it proportionally to the racial composition of poor individuals. We also tried to consider that underreporting was not random by race by distributing the number of deaths assumed to be underreported according to the racial composition of each region of the country. Nevertheless, assuming a random distribution conditional on only these covariates could still hide the real distribution of missing values and underreporting.

Another limitation of our study was the use of the underlying causes of death for the decomposition analysis, which may hide the presence of multifactorial relationships among causes of death (e.g., the association between HIV/AIDS and pneumonia).

Conclusions

Race mixing has been on the rise in most countries. Recent census data show that those who identify themselves as multiracial are among the fastest growing groups in the United States, United Kingdom, and Canada.[25] Our results indicate that racial inequalities in life expectancy pose a challenge for measurement in the context of high prevalence of race mixing and fluid racial boundaries, as is the case in Brazil. The present study proposed some corrections to the crude values for life expectancy by race, none of which can be considered the definitive. Future studies that use linkage techniques, in which individual race is assessed by self-classification and not reliant on the death record, could help to monitor the extent of racial inequalities in Brazil on a consistent basis. ■

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Contributors

A. D. P. Chiavegatto Filho and I. Kawachi conceptualized and designed the original study. A. D. P. Chiavegatto Filho and H. Beltrán-Sánchez analyzed the data. A. D. P. Chiavegatto Filho drafted the first version of the article and I. Kawachi and H. Beltrán-Sánchez contributed substantially to the revision. All authors interpreted the results and approved the final version.

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Human Participant Protection

The study used publicly available online data from the Brazilian government, thus institutional review board approval was not needed.

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