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Race/skin color differentials in potential years of life lost due to external causes

ABSTRACT

OBJECTIVE: Deaths by external causes represent one of the most important challenges for public health and are the second cause of death in Brazil. The aim of this study was to analyze differentials in mortality by external causes according to race/skin color.

METHODS: A descriptive study was carried out in Salvador, Northeastern Brazil, using 9,626 cases of deaths by external causes between 1998 and 2003. Data were obtained from the Forensic Medicine Institute and from *Instituto Brasileiro de Geografia e Estatística* (Brazilian Institute of Geography and Statistics). The indicator "potential years of life lost" was utilized to identify the existence of differences among age groups, sex groups and race/skin color groups.

RESULTS: Deaths by external causes provoked the loss of 339,220 potential years of life, of which 210,000 were due to homicides. Nonwhite individuals died at earlier ages and lost 12.2 times as much potential years of life due to deaths by homicidies than white individuals. Although the nonwhite (black and mixed) population was three times larger than the white population, its number of potential years of life lost was 30 times higher. The population of blacks was 11.4 % smaller than the white population, but its loss of potential years of life was almost three times higher. Even after the adjustment for age, the differences observed in the indicator potential years of life lost/100,000 inhabitants and in the ratios between strata according to race/skin color were maintained.

CONCLUSIONS: The results showed differentials in mortality by external causes according to race/skin color in Salvador. The nonwhite population had greater loss of potential years of life, higher average number of years not lived and, on average, they died at an earlier age due to homicides, traffic accidents an all other external causes.

DESCRIPTORS: External Causes. Mortality. Potential Years of Life Lost. Ethnic Group and Health. Health Inequalities. Social Inequity. Brazil. Race/Skin color.

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INTRODUCTION

Deaths by external causes or violent deaths represent one of the most relevant public health problems in the majority of the world's countries. Among other factors, their occurrence has been attributed to socioeconomic inequalities among regions, countries and population groups.[14] This group of causes of death corresponds to Chapter XX (VO1-Y98) of the 10th Revision of the International Classification of Diseases (ICD-10): homicides, traffic accidents, suicides, accidental falls, drowning, other accidents and other types of violence.

The reduction in the number of deaths by external causes represents a great challenge both in developed and in developing countries. In Russia, for example, the external causes rank second among the main causes of death, mainly suicides, followed by homicides, accidental poisoning by alcohol and traffic accidents.[8] In Alaska, the external causes represent 40% of overall mortality.[7] In the 1990s, in the United States, homicides were responsible for more potential years of life lost than all the accidents, cancers and cardiovascular diseases among young and black men and among black women below 44 years of age.[19]

In Brazil, mortality by external causes is the second among the main causes of death. However, when they are evaluated in potential years of life lost, they rank first.[13] Especially in large urban centers, the external causes affect predominantly black youths aged between 15 and 49 years, when they are in the phase of reproductive life and high economic production.[a] According to Waiselfisz[21] (2007), the homicide rate of the black population in Brazil in 2004 was much higher than that of the white population. The rate of death by homicide of the black population was 1.731 times higher than that of the white population, which represented 73.1% more victimization due to this cause in the black population. Nevertheless, mortality studies that approach the role of race/skin color are scarce in Brazil.

Several authors have used the indicator "potential years of life lost" (PYLL) because of its capacity to discriminate the magnitude, vulnerability and transcendence of causes of death. Among the Brazilian studies, Reichenheim & Werneck[17] (1994) used PYLL when they studied the external causes in the municipality and state of Rio de Janeiro, and Arnold et al[1] (1997) determined the PYLL by homicide among children and adolescents in Recife (state of Pernambuco). However, the race/skin color variable was not assessed in these studies.

As it expresses the effect of deaths occurred prematurely in relation to the life expectancy that is expected of a certain population, PYLL can be considered a valuable tool to assess the relative importance of diseases and events that culminate in premature death and also as a parameter to assess social inequalities in health. [9,10,19,22]

Investigations focusing on the analysis of health inequalities according to race/skin color are also rare. Nevertheless, studies of mortality by external causes in Brazil have shown greater victimization among the black population.[2,5] Although the deaths by external causes occur predominantly in the adolescent population and in individuals who are in the beginning of adult life, which would already justify their relevance as a

public health problem, and despite the broad use of the PYLL indicator in the international literature,[4,10,12] few studies in Brazil have used it to measure differentials in mortality by external causes, and no studies have accomplished this taking race/skin color into account.

The objective of the present study was to analyze the differentials in mortality by external causes according to race/skin color.

METHODS

PYLL values were compared between groups of individuals classified according to race/skin color (black, mixed, white) residing in Salvador, state of Bahia, who died due to external causes in the period from 1998 to 2003. Blacks and mixed-ethnicity individuals were assessed together, being called nonwhite population, and separately. This categorization would allow us to identify the existence, or not, of a gradient that indicates worse results as the skin color darkens. Individuals of yellow skin color or indigenous ethnicity were excluded due to the low number of occurrences in these groups.

Sociodemographic data were obtained from *Instituto Brasileiro de Geografia e Estatística* (IBGE – Brazilian Institute of Geography and Statistics) and data about 9,626 deaths were collected from the database of *Instituto Médico Legal* (IML – Forensic Medicine Institute) of the Government of the State of Bahia. Data about the deaths included reference to police reports, postmortem reports and other complementary documents when the cause of death was not specified on the death certificate.

The analyzed variables were: sex, age group, race/skin color, according to types of deaths by external causes: homicide (X85-Y09); deaths caused by traffic accident (V01-V99) and total number of deaths by external causes, classified according to ICD-10.[15] Deaths coded Y10 to Y36 (those whose intent was undetermined, legal interventions and operations of war) were not analyzed separately (they were included in the set of deaths by all external causes).

The race/skin color that was considered was the one that was registered on the death certificate by the IML. As for the population, census data based on the self-declaration were used. Although the IML performs the necropsy of all deaths by external causes occurred in the municipality, we selected only the deaths of individuals who resided in Salvador. The necropsies of residents whose death occurred outside Salvador are informed to *Diretoria de Informação e Comunicação em Saúde do Estado da Bahia* (DICS – Health Information and

Communication Management of the state of Bahia) which, in turn, includes this information in *Sistema de Informação de Mortalidade* (Mortality Information System) of *Ministério da Saúde* (MS - Ministry of Health). Comparing the total number of deaths by external causes of individuals residing in Salvador provided by the IML with the information supplied by MS/Datasus, a percentage below 8% was observed for the former (IML).

In the data analysis, the following indicators were employed: absolute and average number of PYLL, percentage distribution of PYLL, age in which, on average, the deaths occurred, and the number of PYLL per 100,000 inhabitants, specified according to type of external cause of death, sex, age group and race/skin color (gross and age-adjusted estimates; we adopted the direct method and the population of Salvador in the year 2000 as the standard). The PYLL per 100,000 inhabitants corresponded to the accumulated coefficients for 1998 to 2003, and the population of the middle of the period was the mean of the populations of the years 2000 and 2001, used as denominator. To each type of external cause, the ratio between PYLL/100,000 inhabitants was calculated, adjusted for the age group, considering the white race/skin color population as the reference group. To this indicator, the confidence interval was estimated at 95%, according to Dever's method[6] (1988).

The absolute value of PYLL in each age group was calculated by multiplying the number of remaining years of life by the number of deaths occurred in the same age group. The total value of PYLL was obtained by the summation of the PYLL in each age group by applying the formula: $PYLL = \sum a_i \times d_i$, where: a_i represents the difference between the limit age and the middle point of each age group, based on the presupposition that the deaths that occurred in each group have a uniform distribution; d_i refers to the number of deaths due to a specific cause in this same age group.[18] In the present study, 0 (zero) and 70 years of age were stipulated, respectively, as the upper and lower limits for the calculation of the PYLL.

For the calculation of the average number of PYLL, which expresses the amount of years that, on average, each death by a certain cause subtracted from a person (non-lived years), the number of PYLL related to each type of external cause was divided by the number of deaths occurred due to this same type of cause. The age at which, on average, the death occurred was obtained by subtracting the average number of non-lived years due to a certain external cause from the maximum stipulated age (70 years).[11,16] For reasons of greater operational practicalness and because the data do not differ from those obtained directly, it was decided to calculate the age at which, on average, the deaths occurred according to the formula used by Peixoto & Souza (1999).[16]

The research project was approved by the Research Ethics Committee of the Public Health Institute of *Universidade Federal da Bahia* (029-04 CEP-ISC/UFBA).

RESULTS

Of the overall number of 9,626 deaths by external causes included in the study, 4.8% did not present information on race/skin color and 1.7% did not record the type of cause that led to the death.

These deaths represented the loss of 339,220 potential years of life, or 14,507/100,000 inhabitants residing in Salvador in the period. Among all the analyzed race/skin color segments, the greatest losses of potential years of life occurred among male individuals and among those who had mixed and black race/skin color. Analyzed separately, the mixed individuals of both sexes presented the highest values of PYLL/100,000 inhabitants, followed by those of black race/skin color of the male sex.

The average number of PYLL determined by deaths caused by homicide was higher than that caused by traffic accidents. The age in which, on average, the individuals died due to homicide (27.6 years) was lower than that of the people who died due to traffic accident (35.3 years) and due to all external causes (30.3 years). Homicides also determined the occurrence of more premature deaths than the other types of external causes.

Premature deaths were more frequent among nonwhite individuals than among white ones, for all types of external causes. Analyzing the deaths by all external causes together and separately by homicide, men died more prematurely than women. As for traffic accidents, the women died at an earlier age, especially black women (Table 1).

It was observed that 62.0% of the potential years of life lost were due to homicides, 18.0% to traffic accidents and 20.0% to the other external causes. The age groups from 15 to 49 years presented the highest proportions of PYLL.

The number of PYLL resulting from deaths by all external causes was 8.8 (CI 95% 8.04:9.56) times higher for the nonwhite population. For homicides and deaths caused by traffic accidents, this loss was, respectively, 12.2 (11.82:12.58) and 6.4 (6.12:6.68) times higher (Table 2). The differences found in the value of the indicator PYLL/100,000 inhabitants among the different groups according to skin color were maintained even after the adjustment for age, in which mixed and black men, in this order, presented higher proportions or died at an earlier age due to all types of external causes of death.

Table 1. Potential years of life lost due to external causes according to race/skin color, sex and type of external cause. City of Salvador, Northeastern Brazil, 1998-2003.

Race/ Skin color	Type Sex	All external causes			Homicides			Traffic accidents		
		PYLL	PYLL/10⁵	Average age at death (years)	PYLL	PYLL/10⁵	Average age at death (years)	PYLL	PYLL/10⁵	Average age at death (years)
Black	Male	25,922.5	10,808.0	28.6	18,417.5	7,679.4	27.0	3,247.5	1,354.1	33.1
	Female	1,972.5	805.0	32.8	515.0	210.2	33.2	577.5	235.7	31.5
	Total	27,895.0	5,753.3	29.0	18,932.5	3,904.8	27.2	3,825.0	788.9	37.1
Mixed	Male	266,830.0	42,953	30.3	176,125.0	28,298.6	27.8	43,512.5	6,991.3	35.3
	Female	33,900.0	5,591.8	29.2	10,047.5	1,462.5	28.7	11,202.5	1,630.6	34.8
	Total	300,730.0	23,350.1	30.7	186,199.5	14,218.2	27.5	54,715.0	4,178.6	35.2
Black/ mixed	Male	292,752.5	32,951.0	29.5	194,542	22,566.3	27.4	46,760.0	5,423.3	34.2
	Female	35,872.5	4,072.3	31.0	10,562.5	1,133.3	30.9	11,780.0	1,263.9	33.1
	Total	328,625.0	18,315.5	29.8	205,132.0	11,431.2	27.3	58,540.0	3,262.6	36.1
White	Male	8,152.5	3,351.2	35.9	4,002.5	1,640.3	31.9	2,047.5	839.1	40.3
	Female	2,442.5	880.9	31.6	928.0	317.7	34.3	660.0	225.9	33.3
	Total	10,595.0	2005.3	35.5	4,922.0	919.7	32.4	2,707.5	505.0	38.9
Total	Male	300,905.0	27,201	30.3	198,545	17,948	27.5	48,807.5	4,412.1	35.4
	Female	38,315.0	3,130.0	29.8	11,490.5	938.7	29.3	12,440.0	1,016.2	34.6
	Total	339,220.0	14,556.6	30.3	210,035.5	9,013.1	27.6	61,247.5	2,628.3	35.3

PYLL: Potential years of life lost
All External Causes: V01-Y98
Homicide: X85-Y09
Traffic accidents: V01-V09

DISCUSSION

The results of the present study show that there are differentials in mortality by external causes according to race/skin color in Salvador. Nonwhites had greater loss of potential years of life, greater average number of non-lived years and died, on average, at earlier ages due to homicides, traffic accidents and other external causes.

One of the main limitations of the study is the utilization of different criteria to classify race/skin color: regarding the death certificates, it was classified by legal experts; regarding the population – used as denominator to calculate the indicators –, IBGE adopts the self-classification criterion. In addition, it is possible that, in a lower proportion, like the census takers,[20] the medical examiners tend to classify people's race/skin color considering their social and economic level, either because of their world views, value judgments or even due to social pressures.

Another problem may have derived from the fact that some death certificates were incorrectly filled in under the circumstances of the accident or violence that produced the fatal lesion. However, this issue may have been minimized when these data were complemented by other sources. Although it is possible that some deaths due to external causes were not registered due to the concealment of corpses, the nonwhites possibly were also the most affected by the lack of register, independently of this situation.

On the other hand, despite the mentioned limitations, the findings of the present study indicate a visible gradient in the loss of potential years of life due to external causes among whites and nonwhites, represented by a linear growth towards the latter in all forms of presentation of the PYLL indicator.

In spite of the fact that the race/skin color variable also represents an approximation in terms of socioeconomic level, we have not included another variable of social stratification to avoid possible biases in the analysis. The contribution of socioeconomic factors to the differentials that were found is important, since approximately 75% of the population of Salvador is composed of nonwhites, who also present lower income and schooling levels. Nevertheless, as this situation of the nonwhites being poorer is possibly related to racism and discrimination, it can be stated that these factors add to the determination of disadvantages also in the mortality by external causes of this population.

Table 2. Ratio between coefficients of standardized[a] potential years of life lost and respective confidence intervals by external causes, according to sex, type and race/skin color. City of Salvador, Northeastern Brazil, 1998-2003.

Type	Male				Female				Total			
	Race/skin color	PYLL/10^5	Ratio PYLL/10^5	95% CI	Race/skin color	PYLL/10^5	Ratio PYLL/10^5	95% CI	Race/skin color	PYLL/10^5	Ratio PYLL/10^5	95% CI
Homicide	Mixed	28347.7	17.3	16.76; 17.84	Mixed	1420.16	4.5	4.20; 4.80	Mixed	14001.2	15.5	15.01; 15.99
	Black	7027.56	4.3	4.15; 4.45	Black	190.34	0.6	0.54; 0.66	Black	3560.98	3.9	3.77; 4.03
	Black/mixed	19941.8	12.2	11111.82; 12.58	Black/mixed	1140.79	3.6	3.36; 3.84	Black/mixed	11027.4	12.2	11.82; 12.58
	White	1633.92	1		White	313.142	1		White	905.437	1	
Traffic accidents	Mixed	7005.47	8.5	8.12; 8.88	Mixed	1582.85	6.9	6.36; 7.44	Mixed	4098.97	8.3	7.93; 8.67
	Black	1277.78	1.5	0.95; 4.13	Black	220.921	1	0.89; 1.11	Black	743.774	1.5	0.95; 4.13
	Black/mixed	5328.48	6.5	6.21; 6.79	Black/mixed	1285.71	5.6	5.16; 6.04	Black/mixed	3163.81	6.4	6.12; 6.68
	White	819.572	1		White	230.588	1		White	491.879	1	
Other external causes	Mixed	7504.86	8.8	8.36; 9.24	Mixed	1879.67	5.7	5.28; 6.12	Mixed	4516.81	8.0	7.60; 8.40
	Black	1689.87	2.0	1.88; 22.12	Black	355.303	1.1	0.99; 1.21	Black	1018.34	1.8	1.69; 1.91
	Black/mixed	5845.19	6.9	6.55; 7.25	Black/mixed	1188.53	3.6	3.33; 3.87	Black/mixed	3407.33	6.0	5.70; 6.30
	White	851.339	1		White	327.681	1		White	565.496	1	
All external causes	Mixed	42858	13	11.88; 14.12	Mixed	5428.15	6.2	5.37; 7.03	Mixed	22896	11.7	10.69; 12.71
	Black	9995.22	3.0	2.63; 3.37	Black	766.56	0.9	0.73; 1.07	Black	5323.1	2.7	2.37; 3.03
	Black/mixed	32172.8	9.7	8.86; 10.54	Black/mixed	2.289.6	2.63	2.58; 2.98	Black/mixed	17279	8.8	8.04; 9.56
	White	3304.83	1		White	871.411	1		White	1962.81	1	

[a] Standardized per 100,0000 inhabitants

As the largest portion of the population of Salvador is composed of nonwhite individuals, the number of potential years that are lost due to this group of causes for this population would also be higher. However, it is observed that although the nonwhite population of this municipality is only three times larger than the white population, the number of years of life lost by the former was more than 30 times higher. Besides, compared to the whites, the population of blacks – 11.4% smaller - lost more than twice (2.6 times) the number of potential years of life.

These differentials were maintained when the PYLL was calculated to every 100,000 individuals of the respective race/skin color, which supports the hypothesis of the existence of some degree of social inequality in the determination of deaths by external causes, mainly because the nonwhites constitute the portion of the population that has the most unfavorable socioeconomic level. The differentials according to race/skin color that were observed in this study, represented by the PYLL due to deaths by external causes, were also found in studies conducted in other fields of knowledge, like work and education, in which a gradient of worse social situation was observed for black and mixed individuals, respectively.

Consistently with the specific literature, the present study found that men presented a greater loss of potential years of life due to external causes, as well as individuals belonging to the age group between 15 and 49 years – particularly 20 - 49 years -, which suggests a greater exposure of this population group. However, it was noted that white women died at an earlier age than black and mixed women, respectively, when the cause of death was homicide. There were no differences when the cause of death was traffic accidents. These results placed white women in a position of vulnerability that is similar to the nonwhite women with regard to the loss of potential years of life due to deaths by external causes. Nevertheless, this finding may reflect a better register of white women's deaths.

Although the nature of the study of PYLL and the measures deriving from it is descriptive rather than being connected with risk measurement, this indicator is a valuable tool to identify differentials in the health area, especially regarding deaths by external causes. The reason is that the majority of deaths by this cause occurred from the age of 15 onwards, contributing to minimize one of the limits of this indicator (underestimation of children's deaths), which, in turn, would affect the PYLL profile.[17]

These findings ratify the few Brazilian studies on social inequalities that approach race/skin color in which worse health results are presented to the nonwhite population,[2,5]

not to mention several other international studies.[4,10,22]

The approach to health differentials deriving from social inequalities according to race/skin color requires, at least, a brief discussion of the theories of racial relations in Brazil. They explain, to some extent, the historical and social construction that led to an evident division of the Brazilian society into population sub-groups, characterized, for example, by the lack of equity in the fulfillment of social rights. Generally speaking, this process has been occurring through the maintenance of the position of advantage and domination – translated as the condition of citizenship and better quality of life – for one portion of the population and by the maintenance of the position of disadvantage and subordination for the other.[a]

However, although it supports the idea of "social democracy" and despite the fact that it has the largest population of African descendants in the Diaspora, Brazil was the last country to abolish slavery and only from the last decade onwards has it begun to recognize the existence of racism.

The creation of Departments for Affirmative Actions, in the federal, state and municipal governments, for African descendants and the implementation of the system of quotas to foster the inclusion of black students in the universities are some of the recent benchmarks for the national recognition of the existence of social differences among segments according to the race/skin color of the population. According to Carvalho[3] (2003), in Brazil only 2% of the university students are black, only 1% of the black population are teachers, while 50% of this population are illiterate.

This investigation reveals differentials in mortality according to race/skin color. However, discussing these differences represents facing a "taboo" in a society that views itself as a "racial democracy" but, on the other hand, has social indicators that show the existence of distinctions in treatment among its segments according to race/skin color.

While in the social sciences there are many studies on racial relations in Brazil, in the public health area there seems to be a tension that has hindered the incorporation of this theme. Therefore, despite the descriptive nature and all the limitations of the present study, its results point to the existence of differentials in mortality by external causes that cannot be ignored in the planning and programming of actions to overcome social inequalities in the health area. It is necessary that these differentials are further investigated by means of the development of more robust study designs that have greater power of analysis, in order to produce information that can strongly support the above-mentioned actions.

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