Rev Saúde Pública 2011;45(4)

Adauto Martins Soares Filho

Homicide victimization according to racial characteristics in Brazil

ABSTRACT

OBJECTIVE: To describe the temporal patterns of mortality by homicide in Brazil.

METHODS: A series of homicides in Brazil from 2000 to 2009 were studied. The explanatory variables were race/skin color, gender and education. The death statistics were obtained from the Mortality Information System. A trend analysis was performed by means of a polynomial regression for a historic time series ($p < 0.05$, 95% confidence interval).

RESULTS: The black population represented 69% of the homicide victims in 2009. The homicide rate increased in the black population, while it decreased in the white population in the period studied. The homicide rate increased in groups with both higher and lower education among blacks; among whites, the rate decreased for those with the lowest level of schooling and remained stable in the group with higher educational levels. In 2009, blacks had a higher risk of death than whites from homicide, regardless of education level. Between 2004 and 2009, the homicide rate decreased in the white population, while it increased in the black population.

CONCLUSIONS: The relative risk of falling victim to homicide increased in the black population, suggesting an increase in inequality. The effect of the anti-gun measures implemented in Brazil in 2004 was positive in the white population and less pronounced in the black population. Overall, race/skin color predicted the occurrence of homicide.

DESCRIPTORS: Homicide. Space-Time Clustering. Ethnic Group and Health. Socioeconomic Factors. Social Inequity. Time Series Studies.

INTRODUCTION

In 2009, 137,050 people died from external causes, i.e., accidents and violence, in Brazil; these represent the third-leading cause of death in the overall population and the second in men. Almost 36% of these deaths were homicides, which were concentrated in males (92%) and in people aged 15 to 49 years (87%).[a]

Homicide rates in Latin America are the highest in the world, surpassing those of Europe; they are even slightly higher than those of sub-Saharan Africa. Their distribution is heterogeneous in the Americas (29.2/100,000 men). Differences between countries in the same region are notable, including El Salvador (101.2), Costa Rica (12.6), Paraguay (32.4), Chile (6.8), Colombia (113.3), Venezuela (60.2) and Ecuador (36.8). United States (9.4) and Canada (2.1) have lower

[a] Ministério da Saúde. Departamento de Informática do Sistema Único de Saúde]. Informações de saúde: estatísticas vitais [cited 2011 Jan 12]. Available from: http://www2.datasus.gov.br/DATASUS/index.php?area=0205&VObj=http://tabnet.datasus.gov.br/cgi/deftohtm.exe?simp/cnv/ext.

Departamento de Análise da Situação de Saúde. Secretaria de Vigilância em Saúde. Ministério da Saúde. Brasília, DF, Brasil

Correspondence:
Adauto Martins Soares Filho
Secretaria de Vigilância em Saúde
Ministério da Saúde
SAF Sul, Trecho 2, Lote05/06, Bloco F, Torre I
Edificium Premium, térreo, Sala 15
70070-600 Brasília, DF, Brasil
E-mail: adauto.filho@saude.gov.br

Received: 16/9/2009
Approved: 6/2/2011

Article available from: www.scielo.br/rsp

rates, while Brazil and Mexico have rates of 56.7 and 16.1 per 100,000 men, respectively.[5,b]

After growth in the 1980s and 1990s, there was a reduction in homicides in Brazil in recent years. In 1996, the rate was 24.8; in 2007, it was 25.5, with a peak of 29.1/100,000 inhabitants in 2003. A similar reduction was observed in cities with more than 100,000 residents in the Southeast and Central-West states after 2004, except for Espírito Santo state. In São Paulo, the rate has decreased since 2000. Homicide rates in men 20-39 years old have greatly decreased in the capital cities, particularly São Paulo and Rio de Janeiro. In contrast, Salvador and Fortaleza have shown increases. In 2008, the adjusted homicide rates ranged from 11.3 (Piauí), 12.7 (Santa Catarina) and 14 (São Paulo) to 49.8 (Pernambuco), 54.2 (Espírito Santo) and 61.5 (Alagoas).[c,d,e]

Age, sex and alcohol consumption are the variables most clearly associated with victimization[f] for distinct causes of urban violence in the cities of Latin America and Spain. Men and people aged 18 to 25 who consume alcohol are the groups that suffer violence more frequently.[11] São Paulo had the highest prevalence of alcohol consumption among male victims of homicide, particularly those killed by firearms, with a more frequent occurrence on weekends.[l] Illicit drugs are also associated with the risk of homicide, which is the most common cause of death among dependent users of crack (an impure form of cocaine); these are usually men and youths with little education. Although age[21,23] and sex constitute the most important variables in predicting the risk of violent victimization, other variables may be associated, such as race/skin color or ethnic group (in the United States)[g,h] and socioeconomic status (in Brazil[3,17] and Colombia[10]).

Several explanatory models suggest a relationship between inequality, poverty, unemployment and violence.[10,18,i] Areas with the worst social indicators are at greater risk of death from homicide and have a higher number of fatal victims of police violence.[20] Low-income young men in urban areas experience higher rates of homicide in São Paulo and Rio de Janeiro.[16,28] Anthropological studies emphasize the roles of culture, values, social norms and symbols as elements for understanding this problem.[26]

In the United States in 2008, the rates for each violent crime measured were higher among blacks than among whites (simple assault, serious theft, sexual assault and rape). The relative risk of victimization for such violence in the black population in relation to the white population was 1.4.[h] Blacks at greatest risk of being victims of violence are men, youths, singles, those from families with lower income and urban dwellers. Black homicide victims are usually male (85%) and 17 to 29 years of age (51%); they are typically killed with firearms (77%). In 25% of nonfatal violence against blacks, the attackers were under the influence of alcohol or drugs.[i]

Racial inequalities appear to be associated with mortality in Brazil.[4,6,9,j] There are significant differences in the risk of death by homicide between blacks and whites, even when controlling for the level of schooling.[25,k] Life expectancy is lower among black men and women; most blacks are among the poorest, are in the most precarious positions in the labor market and have the lowest levels of formal education. But not all observed inequalities are the fruits of discriminatory processes. In fact, some of them can also be explained by related social issues.[l] Depending on the region of Brazil, residents of neighborhoods with low socioeconomic indicators, the areas most affected by violence, are usually black. Black individuals die at younger ages and lose 12.2 times more potential years of life due to homicide than do whites in Salvador.[2]

Understanding the circumstances surrounding homicide in Brazil and the personal characteristics of victims,

[b] Organización Panamericana de la Salud. Situación de salud en las Américas: indicadores básicos 2009. Washington, DC; 2009 [cited 2011 Jan 12]. Available from: http://new.paho.org/hq/dmdocuments/2009/IB_SPA_2009.pdf

[c] Ministério da Saúde. Rede Interagencial de Informações de Saúde. Indicadores e dados básicos para a saúde. Brasília, DF; 2010 [cited 2011 Jan 19]. Available from: http://tabnet.datasus/cgi/tabcgi.exe?idb2009/c09.def

[d] Soares Filho AM, Macário EM, Alencar G, Conceição GMS, Mascarenhas MDM, Almeida MC, et al. A violência do Brasil: abordando diferentes fontes. In: Ministério da Saúde. Saúde Brasil 2007. Brasília, DF; 2007. p.185-262.

[e] Gawryszewski VP, Monteiro RA, Bandeira de Sá NN, Mascarenhas MDM, Silva MMA, Berna R, et al. Acidentes e violências no Brasil: um panorama atual das mortes, internações e atendimentos em serviços de urgência. In: Ministério da Saúde. Saúde Brasil 2009. Brasília, DF; 2010. p.137-73.

[f] Victimization is defined as the act in which an object is used with force, which produces a physical or psychological harm.[2]

[g] Rand MR. National Crime Victimization Survey: criminal victimization, 2008. *Bull Bureau Justice Stat*. 2009 Sept:1-8. [cited 2010 Jul 27]. Available from: http://bjs.ojp.usdoj.gov/content/pub/pdf/cv08.pdf

[h] Harrel E. Black victms of violent crime: special report. Washington DC: U.S. Department of Justice; 2007. [cited 2010 Jul 27]. Available from: http://bjs.ojp.usdoj.gov/content/pub/pdf/bvvc.pdf

[i] Souza ER, Lima MLC, Veiga JPC. Violência interpessoal: homicídios e agressões. In: Ministério da Saúde. Impacto da violência na saúde dos brasileiros. Brasília, DF: Ministério da Saúde; 2005. (Série B. Textos Básicos de Saúde).

[j] Fundação Nacional de Saúde. Saúde da população negra no Brasil: contribuições para a promoção da equidade. Brasília, DF: FUNASA; 2005.

[k] Ministério da Saúde. Saúde Brasil 2005: uma análise da situação de saúde. Brasília, DF: Secretaria de Vigilância em Saúde; 2005. Análise da morte violenta segundo raça/cor; p.435-590. (Série C. Projetos, Programas e Relatórios) [cited 2011 Jan 12]. Available from: http://portal.saude.gov.br/portal/arquivos/pdf/saude_brasil_2005.pdf

[l] Pinheiro L, Fontoura NO, Querino AC, Bonetti A, Rosa W. Retrato das desigualdades de gênero e raça: análise preliminar dos dados. 3. ed. Brasília, DF: IPEA/UNIFEM; 2008. p.1-15 [cited 2011 Mar 20]. Available from: http://www.ipea.gov.br/sites/000/2/destaque/Pesquisa_Retrato_das_Desigualdades.pdf

including vulnerable groups, is essential to identifying its determinants. This understanding includes the recognition of differences that derive from profound aspects of individuals' identity, such as ethnicity or race/skin color.[m]

This study aimed to describe the temporal trend of mortality due to homicide in Brazil.

METHODS

We analyzed homicide deaths in Brazil, according to race/skin color, gender and education. Data from 2000 to 2009 were obtained from the *Sistema de Informações sobre Mortalidade* (SIM – Mortality Information System) registry. This period was chosen for its completeness index for the variable of race/skin color, which was satisfactory as of 2000 (92%). The completeness index for the data was, on average, 90% for race/color, 99.9% for sex and 99.6% for age. According to the codes of the International Statistical Classification of Diseases and Related Health Problems - 10th edition (ICD-10),[n] we considered homicide to be a form of assault in the present analysis (X85-Y09). Events involving the use of a firearm with undetermined intent (Y22 to Y24) were chosen for analysis by a comparative study of the records of homicides in the SIM and security data.[8]

The population analyzed was from the 2000 census performed by the *Instituto Brasileiro de Geografia e Estatística* (IBGE – Brazilian Institute of Geography and Statistics). Race/color data were obtained from the IBGE 2000 Demographic Census,[o] and we projected the proportions of blacks and whites, as well as age groups and sexes, in Brazil's population estimates for the years 2001 to 2009 from Datasus.[p]

The explanatory variables considered for mortality by aggression were race, sex and education. For race/color, the categories of white and black (black and mixed) were considered, similar to the IBGE census. The indigenous and Asian categories were excluded due to low representation (0.5%).

As a proxy for the social status of homicide victims aged 15 or older, we analyzed the risk of victimization by race/color according to two educational groups: less than eight years of schooling (less education) and eight or more years of schooling (more education). The index of completeness for schooling was, on average, 65%. This variable was used to control for confounding bias between race/color and the social status of the populations studied because low socioeconomic status is associated with both race and aggression. The categorization took into consideration compatibility with SIM and IBGE.

Differences in homicide victimization of blacks and whites in Brazil were analyzed by mortality rate and adjusted for age by a direct method,[12] with a 95% confidence interval. The homicide rate for groups by schooling was adjusted by years of study. The relative risk was used to analyze the differences in risk between blacks and whites.

Temporal trends in mortality by aggression from 2000 to 2009 in white and black populations were described by constructing polynomial regression models ($\hat{y} = a + b_1x + b_2X^2 + ... + b_nx^n$), ($p < 0.05$). We chose a second-degree polynomial model by considering adjusted values for the coefficient of determination (R^2) and the ease of formulation and interpretation of the results. A segmented regression model[15] including the year 2004 was used to analyze the trends before and after this year.

The statistical hypothesis that the homicide rates in blacks and whites would be significantly equal was tested. The hypothesis was considered false when confidence intervals did not overlap, i.e., when they had significantly different rates.

We used the computer program Epidemiological Analysis of Tabulated Data (EpiData), version 3.1; the Pan American Health Organization (PAHO)/Xunta de Galicia;[q] and STATA 11 software.

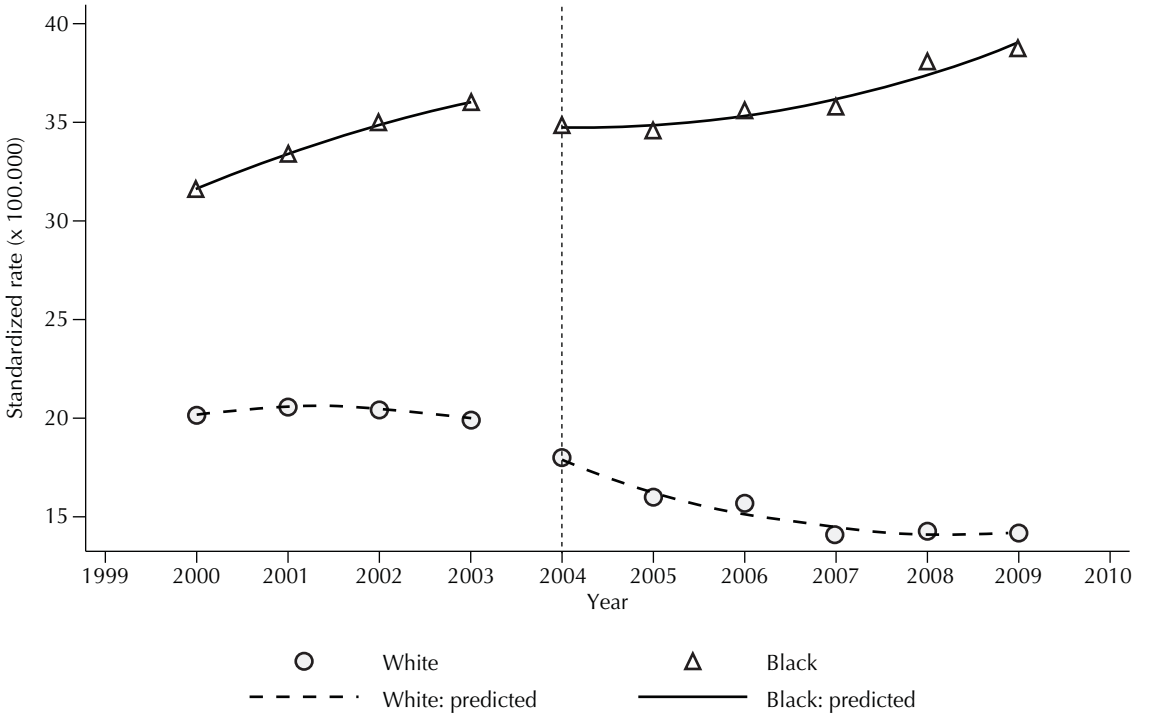
RESULTS

The occurrence of homicide victims in the black and white populations was markedly different during the period studied.

The number of blacks victimized by homicides increased by 28.6%, while the incidence of homicides in whites decreased by 24.5%. In 2009, blacks represented 69% of the cases, although they corresponded to 45% of the total population (Table).

The homicide rate displayed an increasing trend in the black population (22.4%, polynomial $R^2 = 0.7834$) and

[m] For a review of the concept ethnicity / race see the article by Torres-Parodi & Bolis.[29]
[n] Organização Mundial da Saúde. Classificação Estatística Internacional de Doenças e Problemas Relacionados à Saúde. Décima revisão. São Paulo: Editora da Universidade de São Paulo; 1993.
[o] Instituto Brasileiro de Geografia e Estatística. Censo demográfico 2000: características gerais da população: resultados de amostra. Brasília, DF [cited 2010 jul 27]. Available from: http://www.ibge.com.br/home/estatistica/populacao/censo2000/default_populacao.shtm
[p] Ministério da Saúde. Departamento de Informática do SUS. Informações de saúde, demográficas e socioeconômicas [cited 2011 Mar 25]. Available from: http://www2.datasus.gov.br/DATASUS/index.php?area=0206&VObj=http://tabnet.datasus.gov.br/cgi/deftohtm.exe?ibge/cnv/pop
[q] Dirección General de Salud Pública de la Xunta de Galicia; Organización Panamericana de la Salud. EPIDAT 3.1: análisis epidemiológico de dados tabulados [cited 2010 Jul 25]. Available from: http://dxsp.sergas.es/ApliEdatos/Epidat/Ayuda/Ayuda-general/Ayuda%20General.pdf



Source: Sistema de Informações sobre Mortalidade/Secretaria de Vigilância em Saúde/Ministério da Saúde e Instituto Brasileiro de Geografia e Estatística

Before 2004
Race/color Model
Black y = -0.1695x2 + 2.3054x + 29,534
White y = -0.2117x2 + 0.99x + 19,441

After 2004
Race/color Model
Black y = 0.1751x2 – 0.362x + 34,905
White y = 0.1981x2 – 2.1213x + 19,816

Period 2000-2009
Race/color Model
Black y = 0.0084x2 + 0.509x + 32,264
White y = -0.0064x2 – 0.8075x + 22,055

Figure 1. Adjusted homicide mortality rates according to race/color and straight regression polynomial fit. Brazil, 2000-2009.

a decreasing trend in the white population (-29.8%; polynomial $R^2 = 0.9072$). The trend rate has increased before and after 2004 (first $R^2 = 0.9993$; second $R^2 = 0.9437$) for the black population and was almost stable in the first segment and decreased in the second ($R^2 = 0.9534$) for the white population. These opposing trends indicate that the relative risk was rising throughout the period (1.6 to 2.7). Homicide rates among blacks were significantly higher than among whites (Figure 1, Table).

The trends of the adjusted rates of homicides in black and white men showed patterns similar to that described for the total population, and 90% of the homicidal death victims were male.

In black males, the homicide rate showed an upward trend (22%, polynomial $R^2 = 0.7596$). In white men, a decreasing trend (-30.6%, polynomial $R^2 = 0.9179$) as observed throughout the observed period. The trend rate increased in both segments of the period (1º. $R^2 = 0.9978$; 2º. $R^2 = 0.9394$) for black men. In white men, the trend was almost stable in the first segment ($R^2 = 0.9979$) and decreased in the second ($R^2 = 0.9533$). The opposite trend (blacks and whites) showed high rates of relative risk during this period (1.5 to 2.7). Homicide rates in black men were significantly higher than in white men (Figure 2, Table).

The adjusted homicide rates for females were lower than those observed for males. In white men, the rate was on average ten times higher than in white women, while black men were 13 times more likely than black women to be the victims of homicide. The homicide rate among black women was significantly higher than among white women for all the years studied. The relative risk increased from 1.2 to 2.0 between 2000 and 2009 (Table).

The adjusted rate of homicide among black women varied with a significant increase (26.9%; polynomial $R^2 = 0.9$). In white women, a decreasing trend was observed (-22.3%; polynomial $R^2 = 0.926$). The trend rate increased (1º. $R^2 = 0.6952$; 2º. $R^2 = 0.8654$) for

black women in both segments, while for white women, the rates were virtually unchanged in the first segment ($R^2 = 0.8945$) and decreased in the second ($R^2 = 0.953$) (Figure 3).

The homicide rate remained stable among whites and increased among blacks (102.8%), raising the relative risk among the better educated (1.3 to 2.4). The rate decreased among whites with less education and increased among blacks with less education, elevating the relative risk (Figure 4).

The relative risk of death by homicide between the two educational groups decreased for both blacks and whites, but for different reasons. Among whites, the largest rate reduction was observed in the group with less education, while among blacks, it was due to a significantly increased rate in the group with higher education. The rate among whites remained stable or decreased significantly in both educational groups and increased significantly in the black population (Table).

The change in homicide rates over the period studied changed the profile of victimization. In 2000, victims with less education had the highest homicide rates, regardless of race or color. Within each educational group, the black population had higher homicide rates than the white population until 2005; at that point, they began to be significantly higher among blacks, regardless of education (Figure 4, Table).

DISCUSSION

The findings of this study suggest that the anti-gun legislation in Brazil has resonated differently among populations according to race or color. The risk of death by homicide in the white population declined during the period studied. In the black population, the risk tended to increase, with increased victimization, even after the gun control measures and regardless of sex; however, after the enactment of the measures, there was an apparent acceleration in risk for black women. In

Table. Homicide rate (per 100,000 inhabitants) and relative risk according to race/color, sex and years of schooling. Brazil, 2000 to 2009.

Year	White					Black (black+mixed)					Relative risk rate adjusted black/white
	Number of homicides	rates		95% CI		Number of homicides	rates		95% CI		
		Raw	adjusted	min	max		raw	adjusted	min	max	
Total											
2000	18,712	20.2	20.2	19.9	20.5	24,763	32.0	31.7	31.3	32.1	1.6
2001	19,348	20.6	20.6	20.3	20.9	26,479	33.7	33.4	33.0	33.8	1.6
2002	19,536	20.5	20.5	20.2	20.8	28,142	35.3	35.0	34.6	35.4	1.7
2003	19,306	20.0	20.0	19.7	20.3	29,238	36.3	36.0	35.6	36.4	1.8
2004	17,590	18.0	18.0	17.7	18.3	28,586	35.1	34.9	34.5	35.3	1.9
2005	16,142	16.1	16.0	15.8	16.3	29,097	34.8	34.6	34.2	35.0	2.2
2006	16,090	15.8	15.7	15.5	16.0	30,395	35.8	35.6	35.2	36.0	2.3
2007	14,644	14.2	14.1	13.9	14.4	30,960	36.0	35.8	35.4	36.2	2.5
2008	14,885	14.4	14.3	14.1	14.5	33,004	38.3	38.1	37.7	38.5	2.7
2009	14,134	13.7	14.2	14.0	14.4	31,855	37.2	38.8	38.4	39.2	2.7
variation (%)	-24.5	-32.2	-29.8	-	-	28.6	16.4	22.4	-	-	74.4
Male											
2000	16,903	38.0	38.2	37.6	38.7	23,044	58.7	58.0	57.3	58.8	1.5
2001	17,585	39.0	39.0	38.4	39.6	24,637	61.8	61.2	60.4	62.0	1.6
2002	17,723	38.8	38.9	38.3	39.5	26,300	65.1	64.4	63.6	65.2	1.7
2003	17,505	37.8	37.9	37.3	38.5	27,308	66.9	66.2	65.5	67.0	1.7
2004	15,856	33.8	33.8	33.3	34.4	26,685	64.7	64.0	63.2	64.8	1.9
2005	14,490	30.1	30.1	29.6	30.5	27,086	64.0	63.4	62.6	64.1	2.1
2006	14,441	29.6	29.5	29.0	30.0	28,224	65.6	65.1	64.3	65.9	2.2
2007	13,125	26.5	26.5	26.0	26.9	28,864	66.2	65.6	64.8	66.4	2.5
2008	13,314	26.8	26.8	26.3	27.2	30,728	70.4	69.8	69.0	70.6	2.6
2009	12,648	25.6	26.5	26.0	26.9	29,597	68.3	70.8	70.0	71.6	2.7
variation (%)	-25.2	-32.7	-30.6	-	-	28.4	16.4	22.0	-	-	75.9

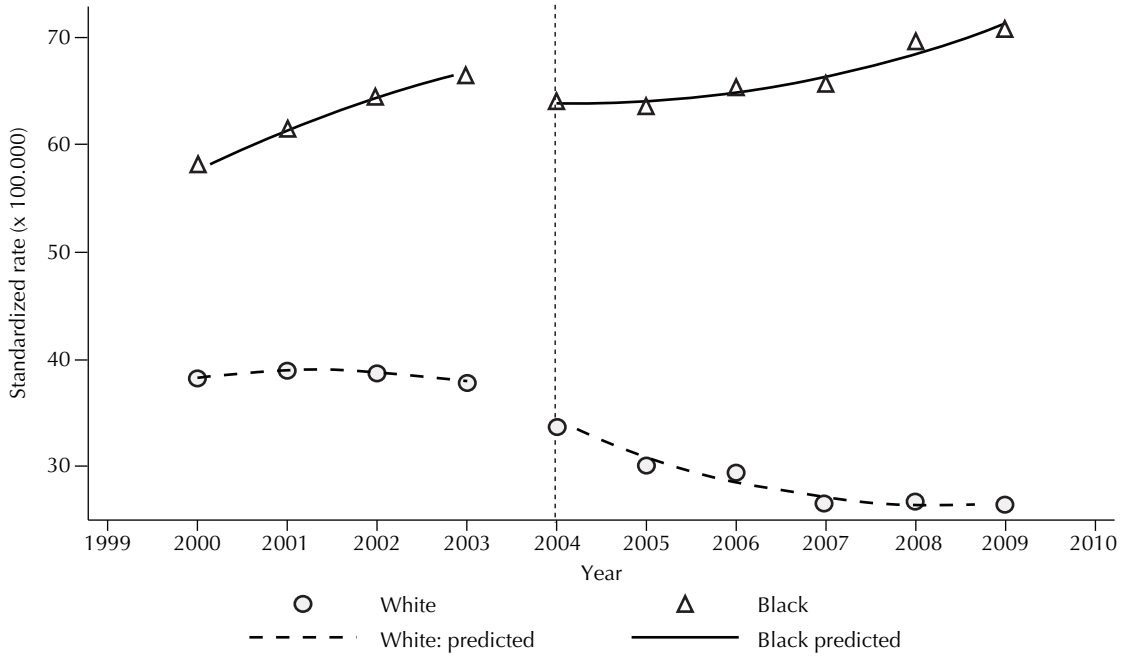
To be continued

Table 1 continuation

Year	White					Black (black+mixed)					Relative risk rate adjusted black/white
	Number of homicides	rates		95%CI		Number of homicides	rates		95%CI		
		Raw	adjusted	min	max		raw	adjusted	min	max	
Female											
2000	1,808	3.8	3.7	3.6	3.9	1,713	4.5	4.5	4.3	4.7	1.2
2001	1,760	3.6	3.6	3.4	3.8	1,840	4.7	4.7	4.5	4.9	1.3
2002	1,811	3.6	3.6	3.5	3.8	1,832	4.6	4.6	4.4	4.9	1.3
2003	1,800	3.6	3.6	3.4	3.7	1,928	4.8	4.8	4.6	5.0	1.3
2004	1,733	3.4	3.4	3.2	3.6	1,895	4.7	4.7	4.5	5.0	1.4
2005	1,650	3.2	3.1	3.0	3.3	2,010	4.9	4.9	4.7	5.1	1.6
2006	1,638	3.1	3.1	2.9	3.2	2,163	5.2	5.2	5.0	5.4	1.7
2007	1,516	2.8	2.8	2.7	2.9	2,090	4.9	5.0	4.8	5.2	1.8
2008	1,566	2.9	2.9	2.7	3.0	2,266	5.3	5.4	5.2	5.6	1.9
2009	1,485	2.8	2.9	2.8	3.0	2,256	5.3	5.7	5.5	5.9	2.0
variation (%)	-17.9	-25.4	-22.3	-	-	31.7	17.9	26.9	-	-	63.3
15 or more years of age with 0 to 7 years of schooling											
2000	8,762	26.0	25.6	25.1	26.1	12,244	34.0	34.5	33.9	35.1	1.3
2001	8,959	26.2	25.9	25.3	26.4	13,200	36.1	36.7	36.1	37.3	1.4
2002	9,217	26.6	26.2	25.6	26.7	14,560	39.3	40.2	39.6	40.9	1.5
2003	8,778	25.0	24.5	24.0	25.0	15,142	40.3	41.4	40.7	42.0	1.7
2004	7,993	22.5	22.0	21.5	22.5	14,873	39.1	40.3	39.6	40.9	1.8
2005	7,064	19.4	18.9	18.4	19.3	14,765	37.8	38.9	38.3	39.5	2.1
2006	6,755	18.3	17.8	17.3	18.2	14,754	37.3	38.2	37.6	38.9	2.2
2007	6,269	16.0	15.5	15.2	15.9	15,335	36.6	37.8	37.2	38.4	2.4
2008	6,555	16.6	16.0	15.6	16.4	17,465	41.3	42.8	42.2	43.5	2.7
2009	6,611	16.5	15.9	15.5	16.3	18,371	42.8	44.5	43.8	45.1	2.8
variation (%)	-24.5	-36.6	-37.9	-	-	50.0	26.0	28.8	-	-	107.3
15 or more years of age with 8 or more years of schooling											
2000	2,882	9.2	9.7	9.4	10.1	2,196	14.3	12.7	12.1	13.2	1.3
2001	2,815	8.8	9.3	9.0	9.7	2,321	14.9	13.2	12.7	13.8	1.4
2002	3,039	9.4	10.0	9.6	10.3	2,649	16.8	14.9	14.3	15.5	1.5
2003	3,374	10.3	10.9	10.6	11.3	3,147	19.7	17.3	16.7	17.9	1.6
2004	3,284	9.9	10.5	10.2	10.9	3,403	21.0	18.5	17.8	19.1	1.8
2005	3,116	9.1	9.8	9.4	10.1	3,470	20.8	18.2	17.6	18.8	1.9
2006	3,583	10.4	11.0	10.7	11.4	3,969	23.5	20.6	20.0	21.3	1.9
2007	3,319	9.1	9.7	9.3	10.0	4,403	24.6	21.4	20.8	22.1	2.2
2008	3,350	9.1	9.7	9.3	10.0	5,086	28.2	24.6	23.9	25.3	2.5
2009	3,729	9.9	10.6	10.3	11.0	5,363	29.3	25.7	25.0	26.4	2.4
variation (%)	29.4	8.2	9.0	-	-	144.2	105.2	102.8	-	-	86.1

Source: Sistema de Informações sobre Mortalidade/Secretaria de Vigilância em Saúde/Ministério da Saúde e Instituto Brasileiro de Geografia e Estatística

* Relative risk has the white population as its reference



Source: Sistema de Informações sobre Mortalidade/Secretaria de Vigilância em Saúde/Ministério da Saúde e Instituto Brasileiro de Geografia e Estatística

Before 2004
Race/color Model
Black y = -0.3177x2 + 4.37x + 53,917
White y = -0.462x2 + 2.2186x + 36,412

After 2004
Race/color Model
Black y = 0.3261x2 - 0.7474x + 64,124
White y = 0.3733x2 - 4.0358x + 37,317

Period 2000-2009
Race/color Model
Black y = 0.0056x2 + 1.0133x + 59,066
White y = -0.0145x2 - 1.5502x + 41,793

Figure 2. Adjusted homicide mortality rates for men according to race/color and straight regression polynomial fit. Brazil, 2000-2009.

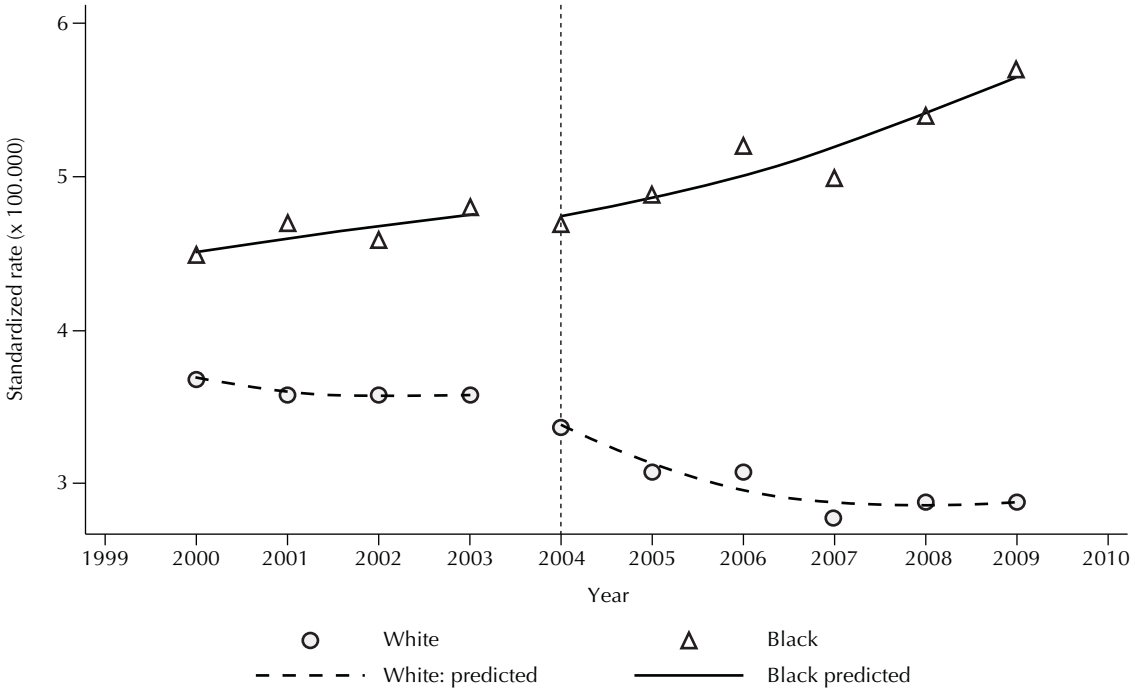
white women, the trend in risk decelerated after control measures were implemented.

In recent years, Brazil has reduced deaths by firearms, particularly those caused by aggression. The gun control policy implemented appears to have been effective in reducing violence in Brazil, with a possible association with the recent drop in homicides, especially those by firearms, concomitant with the implementation of the Disarmament Statute and national campaigns for the voluntary recall of weapons in 2004. Except for the northern region in the Amazon, all regions showed a decline of homicide by firearms. Homicides declined particularly in the Southeast, which contains the two largest Brazilian cities, São Paulo and Rio de Janeiro. Most of the states showed a decrease in their rates of homicide by firearms, and a similar pattern was observed in the capital cities.[27] There was a similar effect in Colombia, which had a decreasing trend in the homicide rate.[30]

A similar association was observed in Diadema, Southeastern Brazil. The arms control measures led to a decline in homicides that was slightly less than the decline associated with measures restricting the time of sale of alcoholic beverages.[13] Arms control was particularly effective in the state of Sao Paulo, which began reducing rates before the implementation of "anti-gun" measures. Other measures may also partly explain the decline in the homicide rate, such as the increase in the incarceration of individuals who committed crimes (disabling effect). Incarceration also has a secondary effect; the threat of imprisonment inhibits a free individual from committing crimes (deterrent effect/deterrence).[20] This argument is reinforced by the evidence that greater impunity is related to higher homicide rates.[19]

The Disarmament Statute may have reduced the homicide rate among whites. In the black population, homicide victimization increased, suggesting that the measures implemented were not particularly effective for this population.

In the initial period studied, the risk of homicide was higher among those with lower education. A relatively more disadvantaged social situation and race/color can be concurrent with factors for higher homicide victimization, a characterization similar to



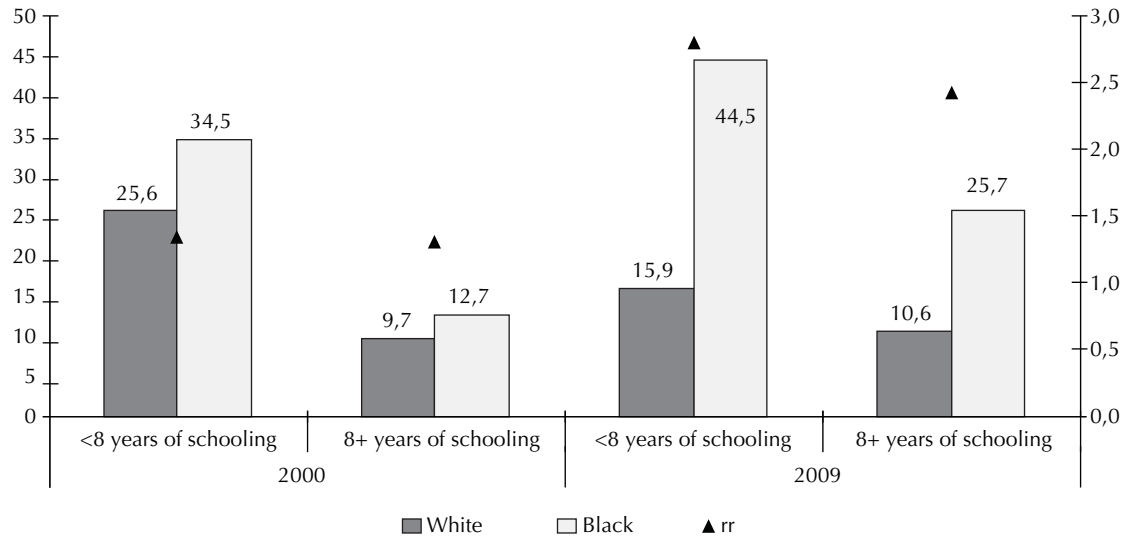
Source: Sistema de Informações sobre Mortalidade/Secretaria de Vigilância em Saúde/Ministério da Saúde e Instituto Brasileiro de Geografia e Estatística

Before 2004
Race/color Model
Black y = -0.018x2 + 0.1812x + 4,3479
White y = 0.019x2 - 0.1416x + 3,8473

After 2004
Race/color Model
Black y = 0.0192x2 + 0.0354x + 4,7352
White y = 0.0345x2 - 0.3499x + 3,7207

Period 2000-2009
Race/color Model
Black y = 0.0112x2 - 0.0113x + 4,5871
White y = 0.0002x2 - 0.1178x + 3,9055

Figure 3. Adjusted homicide mortality rates for women according to race/color and straight regression polynomial fit. Brazil, 2000-2009.



Source: Sistema de Informações sobre Mortalidade/Secretaria de Vigilância em Saúde/Ministério da Saúde e Instituto Brasileiro de Geografia e Estatística

Figure 4. Homicide mortality rates in the >15-year-old population according to race/color and years of schooling. Brazil, 2000 and 2009.

that reported elsewhere.[25] Socioeconomic inequality has been described as an important factor in predicting victimization by homicide.[3,10,14,16-18,22,28]

The homicide rate increased in the black population for the two strata of education, suggesting that race/color may partially explain the occurrence of homicide. However, education alone does not exhaust all the analytical dimensions of social conditions. Secondary data on deaths caused by assault do not allow to structure a synthesis of indicators that could amplify and specify the socioeconomic status of groups, such as income, employment status and occupation. Just as the conditions of social disadvantage experienced by black people can be related to racism and discrimination, these conditions can also be associated with disadvantages in mortality, in the case of homicide.[2]

These trends have led to a consistent disparity between blacks and whites in the risk of death by homicide, with a consequent tendency for increased relative risk. The increase in inequality in death from this cause between blacks and whites is striking, especially in light of the reduction in risk among whites and the increased victimization among blacks.

A major limitation of the study was the use of variable criteria for the classification of the race/color of the individuals studied. The SIM uses the classification established by coroners, while IBGE adopts the criterion of self-classification, which may produce differences in categorization. Although to a lesser extent, other observers may determine the race or color by apparent socioeconomic status.[7,r] The problem would be minimized if a family member indicated the race/color of the individual in the case of death.

Another limitation was in the collection of data on educational levels; on average, 35% of this field was not completed. Although this percentage was similar for blacks and whites, these incomplete data may result in bias, with potential modifications to the relations that have been described for this variable. However, it brings to light potential evidence of links between homicide, socioeconomic conditions and alleged discrimination or racism that need to be explored further.

Race or color may be related to socioeconomic status. If this relationship is related to the occurrence of homicide, we must consider it to be a bias in the analysis. To minimize this bias, we have included education, a variable pertaining to social situation.

It is necessary to study the effects of government actions[24] that accompany the implementation of disarmament statutes on maintaining the homicide reductions identified in the white population, after nearly five years of implementation of the anti-gun law. The measures do not have the same impact on population subgroups, particularly in the black population, where the measures have not been effective in addressing the specifics of the life situation of this population. Torres-Parodi & Bolis (2007)[29] have warned about the limits of universal policies to meet the specific needs of different groups.

In conclusion, there appeared to be a decrease in homicides due to the implementation of anti-gun measures in Brazil; this relationship positively affected the white population, while it was ineffective for the black population. Thus, race has a predictive value in the characterization of homicide victims, and the growth of the racial inequality in homicide rates shows the limits of Brazilian public policies in controlling violence. Consequently, universal policies are not adequate for the particular characteristics of a diverse population.

ACKNOWLEDGEMENTS

To Dr Juan José Cortez Escalante of Secretaria de Vigilância em Saúde/Ministério da Saúde for methodological guidance on proportions trend; and to Dr Estela Maria Garcia de Pinto da Cunha of Núcleo de Estudos de População at Unicamp for suggestions to the manuscript.

REFERENCES

1. Andreuccetti G, Carvalho HB, Ponce JC, Carvalho DG, Kahn T, Muñoz DR, et al. Alcohol consumption in homicide victims in the city of São Paulo. *Addiction*. 2009;104(12):1998-2006. DOI:10.1111/j.1360.0443.2009.02716.x

2. Araújo EM, Costa MCN, Hogan VK, Mota ELA, Araújo TM, Oliveira NF. Diferencias de raça/cor da pele em anos potencias de vida perdidos por causas externas. *Rev Saude Publica*. 2009; 43(3):405-12. DOI: 10.1590/S0034-89102009005000021

3. Barata RB, Ribeiro MCSA. Relação entre homicídios e indicadores econômicos em São Paulo, Brasil, 1996. *Rev Panam Salud Publica*. 2000;7(2):118-24. DOI:10.1590/S1020-49892000000200008

4. Batista LE, Escuder MML, Pereira JCR. A cor da morte: causas de óbito segundo características de raça no Estado de São Paulo, 1999 a 2001. *Rev Saude Publica*. 2004;38(5):630-6. DOI:10.1590/S0034-89102004000500003

5. Bricenõ-León R, Villaveces A, Concha-Eastman A. Understanding the uneven distribution of the incidence of homicide in Latin America. *Int J Epidemiol*. 2008;37(4):751-7. DOI:10.1093/ije/dyn153

[r] Petrucelli JL. A declaração de cor/raça no Censo 2000: um estudo comparativo. Rio de Janeiro: IBGE, Departamento de População e Indicadores Sociais; 2002.

6. Cardoso AM, Santos RV, Coimbra Jr CEA. Mortalidade infantil segundo raça/cor no Brasil: o que dizem os sistemas nacionais de informação? *Cad Saude Publica*. 2005;21(5):1602-8. DOI:10.1590/S0102-311X2005000500035

7. Carvalho JAM, Wood CH, Andrade FCD. Notas acerca das categorias de cor dos censos e sobre a classificação subjetiva de cor no Brasil: 1980/90. *Rev Bras Estud Popul*. 2003;20(1):29-42.

8. Castro MSM, Assunção RM, Durante MO. Comparação de dados sobre homicídios entre dois sistemas de informação, Minas Gerais. *Rev Saude Publica*. 2003;37(2):168-76. DOI:10.1590/S0034-89102003000200002

9. Chor D, Lima CRA. Aspectos epidemiológicos das desigualdades raciais em saúde no Brasil. *Cad Saude Publica*. 2005;21(5):1586-94. DOI:10.1590/S0102-311X2005000500033

10. Concha-Eastman A, Espitia VE, Espinosa R, Guerrero R. La epidemiologia de los homicídios em Cali, 1993-1998: seis años de um modelo poblacional. *Rev Panam Salud Publica*. 2002;12(4):230-9. DOI:10.1590/S1020-49892002001000003

11. Cruz JM. La victimización por violencia urbana: niveles e factores associados en ciudades de América Latina y España. *Rev Panan Salud Publica*. 1999;5(4-5):259-67. DOI:10.1590/S1020-49891999000400009

12. Curtin LR, Klein RJ. Direct standardization (age-ajusted death rates). *Healthy People 2000 Stat Notes*. 1995;(6):1-10.

13. Duailibi S, Ponicki W, Grube J, Pinsky I, Laranjeira R, Raw M. The effect of restricting opening hours on alcohol-related violence. *Am J Public Health*. 2007;97(12):2276-80. DOI:10.2105/AJPH.2006.092684

14. Gawryszewski VP, Costa LS. Homicídios e desigualdades sociais no Município de São Paulo. *Rev Saude Publica*. 2005;39(2):191-7. DOI:10.1590/S0034-89102005000200008

15. Gillings D, Makuc D, Siegel E. Analysis of interrupted time series mortality trends: an example to evaluate regionalized perinatal care. *Am J Public Health*.1981;71(1):38-46.

16. Lotufo PA, Bensenor IM. Income inequality and male homicide rates: São Paulo, Brazil, 1996-2007. *Eur J Public Health*. 2009;19(6):602-4. DOI:10.1093/eurpub/ckp078

17. Macedo AC, Paim JS, Silva LMV, Costa MCN. Violência e desigualdade social: mortalidade por homicídios e condições de vida em Salvador, Brasil. *Rev Saude Publica*. 2001;35(6):515-22. DOI:10.1590/S0034-89102001000600004

18. Moreno Montoya J, Sánchez Pedraza R. Muertes por causas violentas y ciclo económico em Bogotá, Colombia: un estudio de series de tiempo, 1997-2006. *Rev Panam Salud Publica*. 2009;26(1):23-30. DOI:10.1590/S1020-49892009000700004

19. Nadanovsky P, Celeste RK, Wilson M, Daly M. Homicide and impunity: an ecological analysis at state level in Brazil. *Rev Saude Publica*. 2009;43(5):733-42. DOI:10.1590/S0034-89102009000500001

20. Nadanovsky P. O aumento no encarceramento e a redução nos homicídios em São Paulo, Brasil, entre 1996 e 2005. *Cad Saude Publica*. 2009;25 (8):1859-64. DOI:10.1590/S0102-311X2009000800022

21. Oliveira LG, Nappo SA. Caracterização da cultura de crack na cidade de São Paulo: padrão de uso controlado. *Rev Saude Publica*. 2008;42(4):664-71. DOI:10.1590/S0034-89102008005000039

22. Peres MFT, Cardia N, Mesquita Neto P, Santos PC, Adorno S. Homicídios, desenvolvimento socioeconômico e violência policial no município de São Paulo, Brasil. *Rev Panam Salud Publica*. 2008;23(4):268-76. DOI:10.1590/S1020-49892008000400007

23. Ribeiro M, Dunn J, Laranjeira R, Sesso R. High mortality among young crack cocaine users in Brazil: a 5-year follow-up study. *Adicction*. 2004;99(9):1133-5. DOI:10.1111/j.1360-0443.2004.00804.x

24. Silva MMA, Malta DC, Morais Neto OL, Rodrigues EMS, Gawryszewski VP, Matos S, et al. Agenda de prioridades da vigilância e prevenção de acidentes de violências aprovada no I Seminário Nacional de Doenças e Agravos Não Transmissíveis e Promoção da Saúde. *Epidemiol Serv Saude*. 2007;16(1):57-64. DOI:10.1590/S0102-311X2009000800022

25. Soares Filho AM, Souza MFM, Gazal-Carvalho C, Malta DC, Alencar AP, Silva MMA, et al. Análise da mortalidade por homicídios no Brasil. *Epidemiol Serv Saude*. 2007;16(1):7-18. DOI:10.5123/S1679-49742007000100002

26. Soares LE. Meu casaco de general: 500 dias no *front* da segurança pública no Rio de Janeiro. São Paulo: Companhia das Letras; 2000.

27. Souza MFM, Macinko J, Alencar AP, Malta DC, Morais Neto OL. Reductions in firearm- related mortality and hospitalizations in Brazil after gun control. *Health Aff (Millwood)*. 2007;26(2):575-84. DOI:10.1377/hlthaff.26.2.575

28. Szwarcwald CL, Bastos FI, Viacava F, Andrade, CLT. Income inequality and homicide rates in Rio de Janeiro, Brasil. *Am J Public Health*. 1999;89(6):845-50.

29. Torres-Parodi C, Bolis M. Evolución del concepto etnia/raza y su impacto en la formulación de políticas para la equidad. *Rev Panam Salud Publica*. 2007;22(6):405-16. DOI:10.1590/S1020-49892007001100009

30. Villaveces A, Cummings P, Espitia VE, Koepsell TD, McKnight B, Kellermann AL. Effect of a ban on carrying firearms on homicide rates in 2 Colombian cities. *JAMA*. 2000;283(9):1205-9. DOI:10.1001/jama.283.9.1205

The author declare no conflicts of interest.