

Mortality and years of life lost by interpersonal violence and self-harm: in Brazil and Brazilian states: analysis of the estimates of the Global Burden of Disease Study, 1990 and 2015

Mortalidade e anos de vida perdidos por violências interpessoais e autoprovocadas no Brasil e Estados: análise das estimativas do Estudo Carga Global de Doença, 1990 e 2015

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ABSTRACT: Objective: To analyze mortality and years of life lost due to death or disability (disability-adjusted life years – DALYs) for interpersonal violence and self-harm, comparing 1990 and 2015, in Brazil and Federated Units, using estimates produced by the Global Burden of Disease 2015 (GBD 2015). **Methods:** Secondary data analysis of estimates from the GBD 2015, producing standardized death rates and years of life lost due to death or disability. The main source of death data was the Mortality Information System, submitted to correction of underreporting of deaths and redistribution of garbage codes. **Results:** From 1990 to 2015, homicide mortality rates were stable, with a percentage variation of -0.9%, from 28.3 / 100 thousand inhabitants (95% UI 26.9-32.1) in 1990 to 27.8 / 100,000 (95% UI 24.3-29.8) in 2015. Homicide rates were higher in Alagoas and Pernambuco, and there was a reduction in São Paulo (-40.9%). Suicide rates decreased by 19%, from 8.1 / 100,000 (95% UI 7.5-8.6) in 1990 to 6.6 / 100,000 (95% UI 6.1-7.9) in 2015. Higher rates were found in Rio Grande do Sul. In the ranking of external causes for years of life lost due to death or disability (DALYs), firearm aggression predominated, followed by transportation accidents; self-inflicted injuries were in sixth place. **Conclusions:** The study shows the importance of external causes among young people and men as a cause of premature death and disabilities, which is a priority problem in the country. The Global Burden of Disease study may support public policies for violence prevention.

Keywords: Homicide. Suicide. External causes. Violence. Mortality. Disability-adjusted life years. Aggression. Violence against women.

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RESUMO: *Objetivo:* Analisar a mortalidade e os anos de vida perdidos por morte ou incapacidade (*Disability-Adjusted Life Years* – DALYs) por violências interpessoais e autoprovocadas, comparando 1990 e 2015, no Brasil e nas Unidades Federadas, utilizando estimativas produzidas pelo estudo Carga Global de Doença 2015 (GBD 2015). *Métodos:* Análise de dados secundários das estimativas do GBD 2015, com produção de taxas padronizadas de mortes e DALYs. A principal fonte de dados de óbitos foi o Sistema de Informações sobre Mortalidade, submetido à correção do sub-registro de óbitos e redistribuição de códigos *garbage*. *Resultados:* De 1990 a 2015, observou-se estabilidade das taxas de mortalidade por homicídios, com variação percentual de -0,9%, passando de 28,3/100 mil habitantes (II 95% 26,9-32,1), em 1990, para 27,8/100 mil (II 95% 24,3-29,8), em 2015. As taxas de homicídio foram mais altas em Alagoas e Pernambuco, e ocorreu redução em São Paulo (-40,9%). As taxas de suicídio variaram em -19%, saindo de 8,1/100 mil (II 95% 7,5-8,6), em 1990, para 6,6/100 mil (II 95% 6,1-7,9), em 2015. Taxas mais elevadas ocorreram no Rio Grande do Sul. No *ranking* de causas externas por *Disability-Adjusted Life Years* (DALYs), predominaram as agressões por arma de fogo, seguidas de acidentes de transporte e em sexto lugar lesões autoprovocadas. *Conclusões:* O estudo aponta a importância das causas externas entre jovens e homens na morte prematura e em incapacidades, constituindo um problema prioritário no país. O estudo Carga Global de Doença poderá apoiar políticas públicas de prevenção de violência.

Palavras-chave: Homicídio. Suicídio. Causas externas. Violência. Mortalidade. Anos de vida perdidos por incapacidade. Agressão. Violência contra a mulher.

INTRODUCTION

Global Burden of Disease (GBD) study estimated 973 million people injured and 4.8 million deaths from accidents and violence around the world in 2013. The main causes of death were road traffic accidents (29.1%), suicides (17.6%), falls (11.6%), and homicide (8.5%). Among the people injured, 5.8% (56.2 million) had to be hospitalized and 38.5% (21.7 million) sustained fractures¹.

GBD data indicate reduction in homicide rates worldwide, with regional differences. In Asia and Europe, the rates decreased, but in the Americas, East Africa, and other regions they remained high. Noteworthy is the increase of years of life lost due to death or disability (disability-adjusted life years – DALYs) in Latin America and sub-Saharan Africa, owing to homicides². Suicide is the second leading cause of death from violence globally, the third in Brazil, and a major contributor to DALYs^{1,3}.

In Brazil, external causes correspond to the third leading cause of death. However, in the age groups 1–49 years, they are the main cause and mostly affect young men⁴. Between 2000 and 2010, more than 1.4 million people died from these causes; 38% (545,500 people) from homicides, and 6.5% (92,300 people) from suicide⁴. There are significant regional differences in homicide mortality rates, and the highest rates are observed in the states of the north and northeast regions of the country⁴.

Violence put great pressure on health, legal, and social services systems and, increasingly, is identified as a factor that erodes the economy of the countries⁵, being a challenge

for the physical and emotional effects it causes in people⁶. Homicides and suicides involve young people at full production capacity and result in high individual and collective costs^{4,6}.

The GBD has innovated by calculating in a comparable way, in all countries of the world, the impact of these events on mortality, in the occurrence of disabilities, in the incidence and prevalence of disease and injury⁷⁻¹¹. The GBD 2015 has updated estimates and time series from 1990, owing to the inclusion of new data and review of methods. Data were included for Brazil and, for the first time, for the 27 federated units (FUs), enabling comparison between Brazil, FUs, and other countries¹².

This study aimed at analyzing the mortality and years of life lost due to death or disability (DALYs) from interpersonal violence and self-harm, comparing 1990 and 2015, in Brazil and FUs, using estimates produced by the 2015 GBD study.

METHODS

This is a study based on secondary data used in the estimates of 2015 GBD, which applied the methodology proposed by the Institute for Health Metrics and Evaluation (IHME) at the University of Washington, United States of America¹³.

The GBD discloses on its website the data sources used in each country, which, in general, consists of vital registration, verbal autopsy, censuses, surveys, hospital data, police and forensic services records¹³. For violent causes, reports of homicide incidents, road traffic accidents, and suicides recorded by the police are also used. Studies published by national agencies and research institutions, such as the United Nations Surveys on Crime Trends¹⁴ and the Global Status Report on Road Safety¹⁵ were also considered. In countries such as Brazil, which have vital registrations, police data are not used, unless the number of injuries reported in these records exceeds the vital registration. The GBD discloses the sources of information used in each country, state, or other sub-national geographical unit, adopted every year^{11,16}.

The main data source on mortality in Brazil was the death registration database of the Mortality Information System (in Portuguese, *Sistema de Informações sobre Mortalidade – SIM*) of the Ministry of Health, which was subject to adjustments by other national and international sources.

In the calculation of GBD estimates of external causes, a mapping of data sources on disease and injury was carried out first. Second, garbage codes were adjusted, redistributing them to defined causes. Details of the grouping by causes, using the ICD-9 and ICD-10, have been described previously¹⁶. The GBD 2015 used the International Statistical Classification of Diseases (ICD), ninth and tenth revision: in ICD-9, E000-E999 and codes 800-999; in ICD-10, subgroups V01 to Y98 of Chapter XX and subgroups S00 to T98 of Chapter XIX. Third, statistical models were used and modeling were conducted to estimate data by age, sex, country, year, and cause – the Cause of Death Ensemble Modeling – CODEm. CODEm is an analytical tool that tests the variety of possible statistical models of causes of death and creates a combined set of models that offers the best predictive performance. The DisMod

- MR 2.1, a meta-regression calculation tool for simultaneous estimates of incidence, prevalence, remission, disability, and mortality is used^{12,17}.

In this study, the following metrics were used: mortality rates and years of life lost due to death or disability, the DALYs. This is a compound indicator that includes the premature death (years of life lost – YLL) and the damage caused by disease, sequelae, or disability, considering different levels of severity of one or more diseases simultaneously years lived with disability – YLD). In this indicator, the weight of lethal and non-lethal diseases is equivalent¹⁸. The rates were standardized by age, and suicide indicators were calculated for individuals aged over 9 years.

The Global Burden of Disease Study (GBD Brazil 2015) was approved by the Ethics Committee of the *Universidade Federal de Minas Gerais* (CAAE Project –62803316.7.0000.5149).

RESULTS

In Brazil, deaths by external causes accounted for 134,931 deaths in 1990 and 168,018 in 2015, and the rates were reduced by 22.8% during the period, from 105.1 (95% UI 105.1-81.2) to 81.2/100,000 (95% UI 77.4-85.4), within the limit of significance. The main groups of causes were homicide, followed by road accidents, other accidental causes, and suicides (Table 1).

Between 1990 and 2015, homicide mortality rates were stable, with percentage change of -0.9%, varying from 28.3/100,000 inhabitants (95% UI 26.9-32.1) in 1990 to 27.8/100,000 (95% UI 24.3-29.8) in 2015. However, firearm homicides increased from 15.5 (95% UI 14.4-18.7) to 19.3/100,000 (95% UI 15.7-20.8) (27.5%), without significant difference. The rate of homicides by sharp object increased from 5.3 (95% UI 4.9-6.6) to 4.9/100,000 (95% UI 4.5-5.5), and homicides by other means varied from 7.6 (95% UI 5-8.4) to 3.6/100,000 (95% UI 3-4.3).

The homicide rates were higher in Alagoas, Pernambuco, and Espírito Santo (54.1; 43.4, and 40.4/100,000 inhabitants, respectively). Although the rates are within the uncertainty interval, they increased in several states, such as Bahia (117.9%), Rio Grande do Norte (55.6%), Ceará (53%), Minas Gerais (49.7%), Paraná (47.3%), Amapá (45%), Pará (36.1%), Paraíba (35.7%), and Alagoas (21.3%). There was a statistically significant reduction in homicides only in the state of Sao Paulo (-40.9%). The following states had important, but not statistically significant reductions: Rio de Janeiro (37.4%) and Rondônia (30.5%) (Table 2). Suicide rates varied -19%, from 8.1/100,000 (95% UI 7.5-8.6) in 1990 to 6.6/100,000 (95% UI 6.1-7.9) in 2015, without statistically significant difference. Higher rates occurred in Rio Grande do Sul, which registered a rate of 10.5/100,000 in 2015. Rio de Janeiro was the only state with a statistically significant reduction (-58%), 5.4/100,000 (95% UI 4.8-8.1) in 1990, and rate of 4.4/100,000 (95% UI 3.0-6.9) in 2015. Other states with reduction within the uncertainty interval were Goiás (34.2%), Rondônia (33.3%), Federal District (27.8%), Pernambuco (27.2%), Paraná (27.1%), Santa Catarina (24.3%), and Rio Grande do Sul (21.6%). The most significant increases in rates were in states such as Bahia (70.6%) and Ceará (27.9%) (Table 2).

The DALYs rates from accidents and violence in 1990 and 2015, among men, show that assault by firearms (first position) and pedestrian road injuries (second position) remained with the same classification; road injuries involving motorcyclists moved from ninth position to third position; and road injuries involving motor vehicle occupants moved from third position to fourth position. Falls remained at the fifth position. Self-harm rose from seventh to sixth position, followed by assault by sharp object (seventh position). Drowning moved from sixth to the eighth position and assaults by other means migrated from fourth to ninth

Table 1. Frequency and standardized mortality rate (per 100,000) by accidents and violence with UI (95%), Brazil, in 1990 and 2015.

Causes of death	Number of deaths		Rate (per 100,000)	
	1990	2015	1990	2015
Total causes of deaths	911,317 (896,944; 925,847)	1,357,434 (1,312,612; 1,400,906)	1,102.2 (1,085.9; 1,118.6)	786.2 (761.2; 810.3)
External causes	134,931 (131,104; 138,852)	168,018 (159,904; 177,046)	105.1 (101.7; 108.1)	81.2 (77.4; 85.4)
Road injuries	48,618 (46,835; 50,494)	54,601 (51,381; 60,111)	37.3 (36; 38.6)	25.9 (24.4; 28.4)
Injuries by other causes	34,975 (32,391; 36,301)	38,144 (35,781; 40,384)	31.2 (28.3; 32.5)	20.9 (19.6; 22.2)
Suicide and homicide	51,048 (48,599; 55,573)	75,273 (69,169; 80,229)	36.4 (34.8; 39.8)	34.3 (31.7; 36.6)
Suicide	9,882 (9,232; 10,550)	14,036 (12,973; 16,861)	8.1 (7.5; 8.6)	6.6 (6.1; 7.9)
Homicide	41,166 (38,893; 46,017)	61,237 (53,401; 65,653)	28.3 (26.9; 32.1)	27.8 (24.3; 29.8)
Homicide by firearm	23,022 (21,245; 27,908)	42,744 (34,739; 46,161)	15.5 (14.4; 18.7)	19.3 (15.7; 20.8)
Homicide by sharp object	7,352 (6,824; 9,240)	10,874 (9,850; 12,002)	5.3 (4.9; 6.6)	4.9 (4.5; 5.5)
Homicide by other means	10,792 (6,787; 12,012)	7,619 (6,331; 9,199)	7.6 (5; 8.4)	3.6 (3; 4,3)

Source: <http://www.healthdata.org/results/data-visualizations>.
UI 95%: 95% uncertainty interval.

Table 2. Standardized mortality rate (per 100,000), uncertainty interval (UI) 95% by homicide and suicide, according to Federated Units. Brazil, variation (Var %) in 1990 and 2015.

Federated Units	Homicide – rate and 95% UI		Suicides – rate and 95% UI	
	1990	2015	1990	2015
Alagoas	44.6 (34.6; 51.7)	54.1 (34.4; 67.5)	4.7 (3.9; 7.7)	4.6 (3.6; 8.5)
Pernambuco	51.8 (37.1; 59.2)	43.4 (31.5; 53.3)	8.1 (7.1; 9.2)	5.9 (4.7; 9.0)
Espírito Santo	38.3 (29.5; 43.5)	40.4 (26.8; 49.5)	5.7 (4.9; 8.8)	4.8 (3.7; 8.7)
Pará	28.0 (23.4; 33.8)	38.1 (25.8; 49.5)	5.3 (4.5; 7.3)	4.8 (3.7; 8.2)
Bahia	16.8 (13.8; 30.0)	36.6 (27.3; 44.4)	3.4 (2.7; 6.8)	5.8 (4.6; 8.1)
Paraíba	26.6 (22.8; 31.0)	36.1 (27.6; 45.4)	5.5 (4.8; 6.5)	6.2 (4.9; 8.2)
Ceará	23.0 (19.5; 28.0)	35.2 (27.1; 42.9)	6.8 (5.3; 7.9)	8.7 (6.9; 10.6)
Maranhão	40.9 (32.9; 50.7)	34.4 (23.8; 46.5)	7.5 (6.1; 9.4)	6.0 (4.4; 8.3)
Rio de Janeiro	54.5 (36.3; 60.5)	34.1 (25; 40.6)	10.5 (9.2; 11.9)	4.4 (3.6; 8.7)
Amapá	23.2 (19.3; 28.5)	33.8 (24.3; 45.7)	6.0 (4.9; 7.6)	6.7 (4.8; 9.3)
Sergipe	26.9 (23.2; 32.3)	33.4 (26.4; 40.5)	8.7 (6.7; 10.0)	7.3 (6.0; 9.0)
Rondônia	47.5 (34.7; 54.8)	33 (25.5; 40.1)	9.9 (8.5; 11.3)	6.6 (5.4; 8.6)
Amazonas	27.9 (23.2; 32.6)	32.5 (24.7; 41.3)	6.4 (5.5; 7.7)	6.5 (5.1; 8.7)
Goiás	30.7 (27.1; 34.7)	32.5 (26.1; 39)	11.4 (7.7; 12.8)	7.5 (6.3; 9.1)
Mato Grosso	30.0 (25.2; 35.7)	31.7 (23.8; 39.1)	6.9 (5.9; 8.9)	6.7 (5.4; 8.6)
Acre	27.9 (24.2; 33.6)	29.3 (23.5; 36.3)	7.1 (6.1; 8.5)	6.7 (5.2; 8.7)
Roraima	33.9 (30.1; 39.0)	28.2 (23; 34)	11.6 (8.3; 13.1)	9.4 (7.2; 11.2)
Rio Grande do Norte	18.0 (15.4; 26.1)	28 (22.8; 33.7)	7.5 (5.2; 8.6)	7.7 (6.3; 9.3)
Paraná	18.8 (16.5; 26.2)	27.7 (21.3; 33.9)	9.6 (7.3; 10.7)	7.0 (5.7; 8.6)
Mato Grosso do Sul	29.1 (25.3; 33.4)	26.9 (21.2; 33.1)	10.2 (7.6; 11.6)	8.6 (6.9; 10.4)
Tocantins	23.7 (18.8; 31.1)	25.6 (19.2; 33)	7.7 (6.0; 9.6)	8.5 (6.5; 10.9)
Minas Gerais	14.9 (12.6; 27.5)	22.3 (18.5; 27.4)	8.4 (7.4; 9.4)	7.4 (6.1; 8.9)
Federal District	22.6 (20.3; 25.9)	21.6 (16.1; 26.2)	5.4 (4.8; 8.1)	3.9 (3.0; 6.9)
Rio Grande do Sul	19.7 (17.1; 26.4)	20.5 (15.9; 25.7)	13.4 (7.6; 15.4)	10.5 (6.9; 13)
Piauí	16.4 (13.2; 28.7)	19.2 (14.9; 28.7)	7.4 (5.4; 8.6)	8.8 (6.6; 10.8)
São Paulo	29.1 (25.4; 33.2)	17.2 (13.9; 21.3)	6.9 (6.2; 9.0)	5.5 (4.5; 7.1)
Santa Catarina	12.1 (10.0; 24.0)	12.4 (9.7; 19.8)	11.1 (7.1; 12.6)	8.4 (6.3; 10.4)

Table 3. Ranking of DALYs rate/100,000, external causes, men 1990–2015.

1990	Classification			2015
Rate; UI*	1990	2015	Causes	Rate; UI*
1,506.6 (1,383.4; 1,844.9)	1	1	Assaults with firearm	1,958.3 (1,545.5; 2,123.9)
1,338.1 (1,236.2; 1,521.1)	2	2	Road injuries – pedestrian	686.1 (604.5; 794.5)
938.9 (754.7; 1045.8)	9	3	Road injuries – motorcyclist	588.6 (392.9; 738.6)
689.7 (415.4; 772.7)	3	4	Road injuries – motor vehicle	533.2 (462.4; 702.7)
620.1 (535.9; 714.2)	5	5	Falls	515 (431.9; 613.2)
619 (586; 653.3)	7	6	Self-harm	458.7 (418.8; 571.8)
544.1 (503; 576.6)	8	7	Assaults by sharp objects	431.9 (377.9; 485.3)
462.7 (426; 599.4)	6	8	Drowning	300.4 (278.7; 333.6)
379.4 (320.6; 474.4)	4	9	Assaults by other means	291.7 (232.9; 354.5)
260.4 (228.3; 298.8)	10	10	Other accidents	187.9 (160.6; 220.8)
163.8 (108.6; 185.5)	11	11	Respiratory accident risk	91.9 (60.2; 112.9)
154.6 (117.8; 170.6)	20	12	Other road injuries	87.3 (70.7; 99.9)
142, 8 (124.9; 175.7)	13	13	Other mechanical forces	83.8 (69.2; 102.1)
134.1 (100.8; 171.7)	17	14	Road injuries – cyclist	83.7 (74.8; 99.3)
110.8 (81.6; 144.6)	14	15	Extreme temperature	68.8 (49.9; 92.9)
89 (50.9; 99.5)	15	16	Medical complications	63.7 (50.5; 83.8)
67 (61; 78.5)	12	17	Fire and heat	58.8 (51.8; 70.3)
36.4 (27; 41.4)	16	18	Injuries by firearms	36.9 (25.4; 47.2)
34.6 (22.3; 39.8)	24	19	Other transport injuries	32.1 (16.1; 42.1)
33.1 (29.3; 38.7)	18	20	Unintentional suffocation	14 (11.6; 20.2)
29.4 (25.1; 32)	19	21	Poisoning	13.9 (11.5; 20.1)
23,6 (14, 8; 25.7)	21	22	Venomous animals	12 (10.6; 17.0)
14.4 (3.4; 31.7)	22	23	Foreign body	8.9 (7.9; 10.9)
11 (8.5; 23.4)	25	24	Non-venomous animals	7.3 (6.3; 11.5)
9.9 (8.9; 12)	23	25	Natural disasters	1.1 (0.6; 2.4)

Source: <http://www.healthdata.org/results/data-visualizations>.

*UI 95%: uncertainty interval.

position. Road injuries involving motorcyclists rose from 17th to 14th position, and unintentional firearms injuries moved from 16th to 18th position (Table 3).

Among women, data not shown, falls rose from second to first position of DALYs rates due to external causes, between 1990 and 2015, followed by pedestrians road injuries (second position) and motor vehicle occupants road injuries (third position). Homicides by firearms rose from sixth (1990) to fourth position (2015). Suicide remained at fifth position.

DALYs rates by interpersonal violence and self-harm, in 2015, were higher among men than among women in all FUs, with predominance of assaults by firearms in most states except for Amapá and Roraima, where injuries by sharp objects were predominant. Self-harm was the leading cause of death among women in Roraima, Rio Grande do Sul, Piauí, Mato Grosso do Sul, Santa Catarina, Minas Gerais, São Paulo, and Rio Grande do Norte. The highest rates of DALYs by violence were registered in Alagoas, Pernambuco, and Espírito Santo, and the lowest rates were registered in Santa Catarina, São Paulo, and Piauí. Among women, the highest rates were in Roraima, Espírito Santo, and Pernambuco (Figure 1).

The proportional distribution of DALYs by age, according to interpersonal violence and self-harm, in 2015, indicates higher frequency of cases in the younger age groups, by order of importance, in age groups 20–24 years, 15–19 years, 25–29 years, and 30–34 years. Except

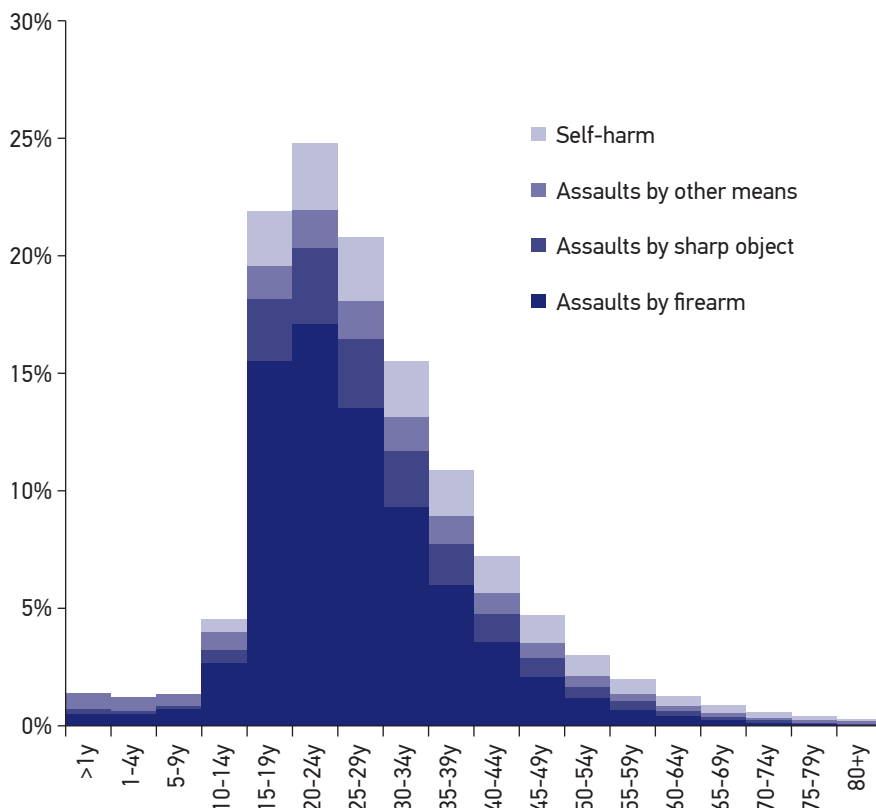


Figure 1. Proportional distribution of DALYs by violence, by age group, Brazil, in 2015.

for age group 0–4 years, in which assaults by other means are prevalent. In other age groups, assaults by the firearm and sharp objects are predominant (Figure 2).

DISCUSSION

The study shows the magnitude of external causes in the country, which was the third cause of death in 2015. Between 1990 and 2015, these causes were reduced by a quarter. Among the external causes, homicides predominate, followed by road injuries, other accidental causes, and suicides. Homicides remained stable during the period; however, with large variations between states. São Paulo was the only state with a statistically significant reduction during the period. In several other states, although the rates are within the uncertainty interval, they had an increase, such as in Bahia, Rio Grande do Norte, Ceará, and Minas

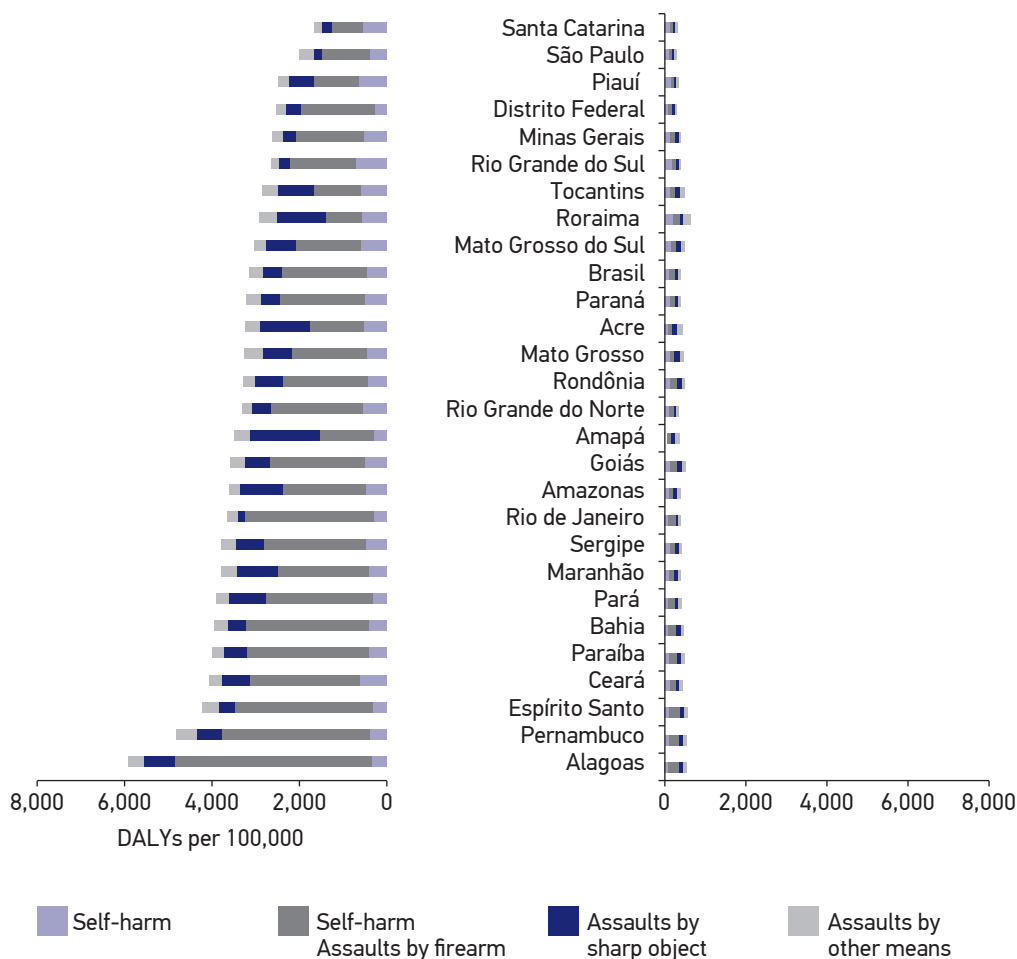


Figure 2. DALYs rate by violence, sex, Brazil and Federated Units, 2015.

Gerais. Suicide rates decreased by approximately a quarter, within the uncertainty range. In the ranking of external causes for years of life lost due to death or disability (DALYs), assaults by firearms are predominant, followed by road injuries. Suicides were in the sixth position. The proportional distribution of DALYs by interpersonal violence and self-harm, in 2015, indicate higher frequency among men and in young age groups, especially between 20 and 24 years of age, followed by young people aged 15–19 years. The highest rates of DALYs by violence in men occurred in Alagoas, Pernambuco, and Espírito Santo.

Brazil is simultaneously part of the groups of countries with higher risk of death by homicide and with lower suicide rates, according the World Health Organization reports^{19,20}. Despite worldwide phenomenon, homicides have a heterogeneous distribution by geographical areas and social groups. Rates show overall reduction, with large variations depending on the economic status of the countries²⁰. In high-income countries, the decrease in homicide rate was 39%; in middle-income countries, the decline was 13%; and in low-income countries, the decrease in the rate was equal to 10%. In a report from the United Nations (UN) in 2012, it was estimated that in Latin America and the Caribbean the majority of deaths from external causes occurred by homicides, and three quarters of them were caused by firearms. In South America, Brazil has the third highest homicide mortality, after Venezuela and Colombia¹⁴. The risk of homicide is ten times higher than that of high-income countries such as France and the United States of America (rates below 3 / 100,000), and Latin American countries with low and middle income, such as Argentina and Mexico (3 to 7 per 100,000)^{12,21}.

The pattern of occurrence of homicide and suicide shows different aspects in the country, with significant differences by gender, age, and FUs. Violence, in general, is more common among young men, predominantly homicides by firearms in the northeast and north regions. Although within the significance limits, states such as Minas Gerais and Paraná registered rates which differed from that observed in their regions, considering the declining rates in Sao Paulo and stable rates in the other states of the south and southeast regions. A previous study identified increased risk of homicide in cities of Paraná State, which are located close to the border between other countries, possibly owing to greater availability of firearms and illegal drugs²².

Homicide victims are usually young adult men (aged 20–34 years) and adolescents (aged 15–19 years) and residing mainly in the northeast and north regions, murdered with firearms. This pattern of mortality are in accordance with other studies on violence, which evidence the main victims as being men, young, black, and poor^{21,23,24}. In Brazil, men are 9.2 times more likely to die from homicide than women, which can be partially explained by cultural issues that encourage male violence. The profile of murdered women is also of young victims and, similar to men, death is caused by firearms. In an urban northeast center, the main profile of women murdered is young, black, and single, with low education and income, and they are victims of physical and/or sexual violence²⁵. According a UN report, Brazil ranks fifth globally in femicide, or cruel murders resulting from the discriminatory culture of sexual violence and sexism²⁶. The violence suffered by adolescents is also associated to school delays and criminal records²⁷, trafficking and drug use, alcohol abuse, pregnancy among adolescent girls²⁸, and abuses and violence committed by family members²⁹.

Also among the elderly people, studies reporting abuse perpetrated by their sons, daughters, and other family members are frequent³⁰.

Studies on violence, particularly homicides, show that violent behaviors are exacerbated in conditions of structural inequality, in degraded urban areas and outskirts of cities, and are more common among people with low education and income, who use alcohol and drugs, who are involved in trafficking and illegal possession of weapons, and who experience fragile family ties. There is also the victimization by domestic violence, unemployment, precarious education and public safety, as well as police violence. Conflicts in areas of agricultural borders and land disputes are also mentioned^{21,31-35}.

The results presented herein are in accordance with other studies that identified high rates of homicides in the north and northeast regions; and smaller or decreasing rates in southeast region³⁶, owing to the decline in rates in Sao Paulo and Rio de Janeiro³⁷. Factors that would synergistically influence rates decrease are the following: reduction in the percentage of young people; reduction of unemployment; investments in social policies such as poverty reduction programs; civilian disarmament with an increase of seized weapons; and imprisonment³⁸⁻⁴². However, security actions become less important as an explanatory factor, after controlling for unemployment and proportion of young people, emphasizing the strength of socioeconomic and demographic factors⁴³. It is worth noting that disarmament measures may have positively reflected in reducing homicides⁴²; however, the impact would have been greater among white population than among black population in Brazil²³.

The presence of armed conflict zones, rivalry, and dispute in trafficking accentuate the risk of deaths from assault, promoting the “ecology of danger” (prevalence of male violence, availability of weapons, coercion, and domination over territories). High homicide rates have been explained by the high concentration of weapons and poor young men⁴⁴. Impunity is also an important factor for the risk of homicide in Brazil⁴⁵ and Mexico⁴⁶.

Suicide is among the top ten causes of death worldwide, with more than 800,000 deaths each year. It is estimated 20 attempts for each adult who commits suicide and approximately a third of them have a history of repeated attempts^{20,47}. Data from the GBD 2015 indicate the largest global suicide rates in Asia (13.3/100,000) and Europe (17.6/100,000). The Americas have suicide rate of 9.8/100,000, compared with countries such as Russia (36.8/100,000), India (15.8/100,000), and South Africa (14.8/100,000). Brazil is included in the group with lower suicide rates¹².

Sex, age, culture, and ethnicity have significant implications in the epidemiology of suicide in the world. Consummated suicides among men are more frequent than among women. In this study, the DALYs rates for suicides were higher among men, if compared with women, and among young people aged 15–34 years. The rates of death by suicide are higher among people aged over 70 years²⁰, show highest increase among younger people, and indicate more significant risk among indigenous populations^{48,49}. Depression is the most relevant factor associated with suicide among elderly people⁵⁰. Survey on violence in Brazil highlights more suicide attempts among women⁵¹.

Many factors were related to suicide, such as mental disorders (depression, alcoholism, schizophrenia) and sociodemographic characteristics (male, unemployed person, urban

residents, retirees, migrants, and singles)⁵². Other conditions are also related to social aspects as follows: personal loss, violence, social isolation, interpersonal conflicts, legal, or labor issues^{52,53}, and specifically in childhood and adolescence, physical and sexual abuse, and difficulties with sexual orientation^{54,55}.

States of southern Brazil are included in the group with higher incidence of suicide; and Rio Grande do Sul stands out for higher mortality and DALYs rates, which are supported by other studies^{56,57}. Deaths are more common in rural areas of the state, and among the predisposing factors are socioeconomic, educational, particularly historical and cultural aspects, as well as those related to working conditions, among others.

Estimates of the GBD 2015 study advanced methodologically in various aspects such as the standardization of data and correction of underreporting and garbage codes, which enabled the comparison between periods, countries, and between the states of Brazil.

There are limitations related to the data sources accessed. Although the SIM has broadened the collection of records and improved their quality in recent years, in the past, and even in some states, there are deaths that were not registered, incomplete records, and high proportion of garbage codes. Studies^{58,59} have highlighted the need for SIM correction and recommended using adjustment methodologies, such as the active search for deaths. Other limitation is the difference between SIM and GBD data with respect to the data on legal interventions. GBD did not register deaths from legal intervention in Brazil in 2015, and this needs improvement in future editions.

CONCLUSION

The study highlights the differences between the states, the importance of external causes as causes of premature death and disability among young people, and evidences the need to implement policies and measures to reverse this situation. Violence in Brazil is a complex phenomenon that has historical roots and is sustained by the great social inequalities. Any attempt to cope with violence needs to be based on a policy for promotion of life, which requires an interdisciplinary approach with inclusive social policies, implemented in partnership with health area, which may apply its practices of surveillance and care. In Brazil, the actions to manage the violence in recent years have been implemented through coordinated public policies. However, much more must be done to reduce deaths and injuries from violence. Therefore, this needs to be a priority cause of managers, professionals, and society.

The results of the GBD study are a valuable resource for countries seeking to prioritize the management of the main risk factors of deaths and injuries and increase effective actions for the health of the population.

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