

# Youth mortality in Brazil: profile and trends in the period 2000-2012

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## Abstract

**Objective:** to describe and analyze youth (15-29 years of age) mortality trends in Brazil between 2000 and 2012. **Methods:** this was a descriptive and time series study conducted with Mortality Information System data; Prais-Winsten linear regression was used to analyze mortality rate trends. **Results:** 958,224 deaths were registered in the period, 79.6% were male; the overall corrected mortality rates were 1.6 and 1.5 per 1,000 inhabitants in 2000 and 2012, respectively; overall mortality rates showed stationary trends in the period (-0.34%; 95%CI -1.05;0.37); increasing trends among men were observed in the Northeast (3.08%; 95%CI 2.56;3.61) and Southern (0.88%; 95%CI 0.09;1.66) regions; in 2012, external causes accounted for 71.4% of deaths, 79.2% among men and 38.5% among women. **Conclusion:** youth mortality rates were high and stable during the study period; external causes were presented as the main causes of death, in both sexes.

**Keywords:** Young Adult; Mortality; External Causes; Ecological Studies; Temporal Distribution.

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## Introduction

In Brazil, the Statute of Youth (Law No. 12,852, dated August 5<sup>th</sup> 2013) was enacted in 2013.<sup>1</sup> The statute defines as young the people between 15 and 29 years of age and determines the rights of this population to be ensured and promoted by the Brazilian State, through the development of inter-sector public policies, programs and actions towards youth. In 2012, Brazil had 52.2 million young inhabitants, corresponding to approximately 27% of its population.<sup>2</sup>

The young population presents distinct mortality patterns. According to Pan American Health Organization's Regional Health Observatory (OPAS) data referring to 2012, assaults were the main cause of youth death between 15 and 29 years of age in the Americas.<sup>3</sup> In Brazil, violence was also the main cause of death among young people in 2013. The highest violent deaths proportion in males was registered in the North region (10.8%), in the Northeast region (10.7%) and in the Midwest region (10.1%) of the country.<sup>4</sup>

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In most member countries of the World Health Organization (WHO), the majority of the external causes deaths occur due to suicides or are related to civil wars.<sup>3</sup> In Brazil, the high mortality rate related to violence is attributed to homicides in urban contexts, in which young men predominate as aggressors and victims, and social inequalities emerge as the main determining factors of these violent acts.<sup>5</sup>

According to Minayo, violence is a social and historical phenomenon that has been transforming into a Public Health problem, once it affects both individual and collective health, besides requiring the development of specific practices and policies for this sector. This problem is particularly important for young people, who represent a huge potential resource for most developing and emerging countries.<sup>7</sup>

However, in Brazil, according to data provided by the 2013 National Household Sample Survey (PNAD), almost

one out of five youngsters did not attend a regular school and neither worked in the reference week. Furthermore, in families with at least one youngster, the average per capita monthly income of the family was 36.3% lower than the income in family households without youngsters.<sup>8</sup> A great amount of the Brazilian youth were considered poor, forming a priority group to health promoting actions.

Research on mortality rates in this population is important because of the characteristics of the young Brazilian population and the recent (2013) approval of the Statute of Youth – which includes, among its principles and guidelines, the need of information management and production of knowledge regarding youth.

This study aim is to describe and analyze youth (15-29 years of age) mortality trends in Brazil between 2000 and 2012.

## Methods

This was a descriptive and time series study conducted with Mortality Information System data (*SIM*), from the Ministry of Health's Secretariat of Health Surveillance (*SYS/MS*), referring to the 2000-2012 period.

The study included the youngsters' deaths between 15 and 29 years of age, of both sexes, that occurred in Brazil between January 1<sup>st</sup> 2000 and December 31<sup>st</sup> 2012.

Initially, the absolute number of deaths was obtained through direct means, from *SIM* data. Crude mortality rates were calculated per 1,000 inhabitants, having as its denominator the total number of the young resident population, taken from the 2010 Demographic Census and in the inter-census population estimates produced by the Brazilian Institute of Geography and Statistics (*IBGE*) and provided by the IT Department of the Brazilian National Health System (*Datasus*) ([www.datasus.gov.br](http://www.datasus.gov.br)).

The corrected mortality rates were calculated to Brazil and its macro regions, upon application of the correction factors made by Szwarcwald et al.<sup>9</sup> The correction factors were derived from a study held in 2008 that estimated the coverage of vital information systems in Brazilian municipalities from the active search of deaths in a sample of 129 municipalities located in the Northeast region and at the Legal Amazon. The *SIM* coverage was estimated at 93% for Brazil. However, an inadequate coverage was found in some regions, especially in small municipalities of the Northeast region and the Legal Amazon. Among the 129 investigated municipalities, the average of the correction factor of deaths was 1.26 and the median was 1.13, with a range between 1.00 and 3.44.

From the deaths registered in *SIM*, the proportional mortality of the groups of causes were calculated, based on the codes from the International Statistical Classification of Diseases and Related Health Problems 10th Revision (ICD-10): certain infectious and parasitic diseases (A00-B99); neoplasms (C00-D48); diseases of the diseases of the circulatory system (I00-I99); external causes of morbidity and mortality (V01-Y98); ill-defined causes; and other chapters.<sup>10</sup> Still, for women, the group for causes related to pregnancy, childbirth and post-partum period (O00-O99) was considered.

Subsequently, the calculation was done for the proportional mortality of sub groups with regard to the total number of deaths due to external causes: assault and legal intervention and operations of war (X85-Y09 and Y35-Y36); transport accidents (V01-V99); other external causes of accidental injury (W00-X59); intentional self-harm (X60-X84); events of undetermined intent (Y10-Y34); and other external causes (Y40-Y98).

The total number of deaths, the mortality rate and the proportional mortality were described according to sex (male and female) and macroregions (North, Northeast, Midwest, Southeast and South).

The overall crude mortality trends, according to sex and Brazilian macroregions, were analyzed using the Prais-Winsten linear regression. This procedure allows the correction of auto correlation of first order in the time-series analysis, and to classify overall mortality rates, too. The mortality rate trends were interpreted as increasing, decreasing or stationary. The annual variation rate of the measure was quantified and the respective 95% confidence interval (95%CI) was estimated as well.<sup>11</sup>

STATA version 12.0 (StataCorp) was used to analyze the data.

This study was held exclusively with secondary data obtained from national basis of the Brazilian National Health System (*SUS*), of open access, available at the website of *SUS* IT Department – *Datasus*. These databases preserve the individual's identity in order to show that this study respected the principles of ethic in researches involving human beings, according to the Resolution of the National Health Council (*CNS*) No. 466, dated December 12<sup>th</sup>, 2012.

## Results

In the period between 2000 and 2012, 958,222 deaths of youngsters between 15 and 29 years of age

were registered at *SIM*: 762,841 male deaths (79.6%) and 195,272 female deaths (20.4%). Among men, the death frequency was higher amongst those between 20 and 24 years of age (39.0%), with brown skin color (52.1%) and with less than eight years of schooling (69.9%). Among women, the death frequency was higher in those between 25 and 29 years of age (39.4%), with white skin color (47.2%) and with less than eight years of schooling (57.8%). For both sexes, deaths were more frequent on Saturdays and Sundays, with a relatively homogenous distribution throughout the months of the year (Table 1).

In Brazil, regarding the age group observed in the 2002-2012 period, the overall crude mortality rates varied between 1.5 and 1.4 per 1,000 inhabitants. The ratio of the overall mortality rates between males and females was 4.2 in 2012, whilst it had been over 3.0 in the other years. The overall mortality rate for this population showed a stationary trend in the analyzed period (-0.34%; 95%CI -1.05;0.37) (Table 2).

Among Brazilian macroregions, the youth mortality trends between 15 and 29 years of age presented variation. The Southeast region presented a decreasing trend among men (-3.48%; 95%CI -4.29;-2.66) and women (-1.64%; IC95% -2.76;-0.51). The Northeast and South regions presented an increasing trend among men, with annual increasing rates of 3.08% (95%CI 2.56;3.61) and 0.88% (95%CI 0.09;1.66), respectively. There was also a growth in the mortality rates in the total young population (both sexes) in the North (1.96; 95%CI 1.12;2.80) and Northeast (2.30; 95%CI 1.72; 2.89) regions (Table 2).

In 2000, the youth deaths due to external causes corresponded to 65.5% of the total amount of deaths: 74.5% of deaths of males and 32.2% of females. In 2012, this proportion was of 71.4% of deaths of both sexes: 79.2% of males and 38.5% of females (Figure 1).

Table 3 shows the proportional distribution of deaths according to groups of causes, regions and sex. An increase was observed in the proportion of youth deaths due to external causes in almost all Brazilian macroregions, from 2000 to 2012; except for the Southeast region, which presented a proportional decrease from 70.0 to 65.9. Certain infectious and parasitic diseases and ill-defined causes presented a decrease in their proportional participation in youth mortality in study period. A similar situation was observed in both sexes; however, there was an increase in the proportion of

**Table 1 – Number of youth deaths between 15 and 29 years of age and proportional mortality (%), according to the characteristics of the victims and the occurrence. Brazil, 2000 to 2012**

Youth deaths: characteristics and occurrence	Crude number			Proportional mortality (%)		
	Male	Female	Total	Male	Female	Total
<b>Age (in years)</b>						
15-19	197,972	53,419	25,391	26.6	27.4	26.2
20-24	290,359	64,976	355,335	39.0	33.3	37.1
25-29	256,501	76,889	351,426	34.4	39.4	36.7
<b>Skin color</b>						
White	274,743	84,499	359,251	38.6	47.2	42.1
Black	62,121	15,125	77,246	8.7	8.5	9.0
Yellow	1,692	568	2,260	0.2	0.3	0.3
Brown	370,182	77,683	411,820	52.1	43.4	48.2
Indigenous	2,321	1,051	3,372	0.3	0.6	0.4
<b>Schooling (in years of study)</b>						
<8	354,681	72,498	432,453	69.9	57.8	69.8
≥8	153,074	52,918	186,759	30.1	42.2	30.2
<b>Day of the week of the occurrence</b>						
Monday	103,247	26,146	131,310	13.5	13.5	13.7
Thursday	88,680	26,084	114,764	11.6	13.5	12.0
Wednesday	88,024	25,826	113,850	11.5	13.4	11.9
Tuesday	90,947	25,630	116,577	11.9	13.3	12.2
Friday	98,084	26,520	124,604	12.9	13.7	13.0
Saturday	132,629	29,682	162,311	17.4	15.4	16.9
Sunday	161,230	33,467	194,697	21.1	17.3	20.3
<b>Month of the occurrence</b>						
January	66,486	16,875	83,361	8.7	8.6	8.7
February	62,424	15,250	77,674	8.2	7.8	8.1
March	65,723	16,703	82,426	8.6	8.6	8.6
April	63,081	16,323	79,404	8.3	8.4	8.3
May	63,343	16,634	79,977	8.3	8.5	8.3
June	61,135	16,112	77,247	8.0	8.3	8.1
July	61,305	16,559	77,864	8.0	8.5	8.1
August	61,616	16,226	77,842	8.1	8.3	8.1
September	61,754	16,014	77,768	8.1	8.2	8.1
October	65,126	16,409	81,535	8.5	8.4	8.5
November	62,442	15,364	77,806	8.2	7.9	8.1
December	68,406	16,803	85,209	9.0	8.6	8.9

deaths due to ill-defined causes among men of the Southeast region.

Deaths related to pregnancy, childbirth and the post-partum corresponded to 5.9% of the total amount of deaths among women in 2012. A reduction in these deaths proportion was observed in all macroregions of the country in the 2000-2012 period, except for the Southeast (from 4.9 to 5.1%) and the Midwest (from 4.9 to 6.2%), which showed an increase (Table 3).

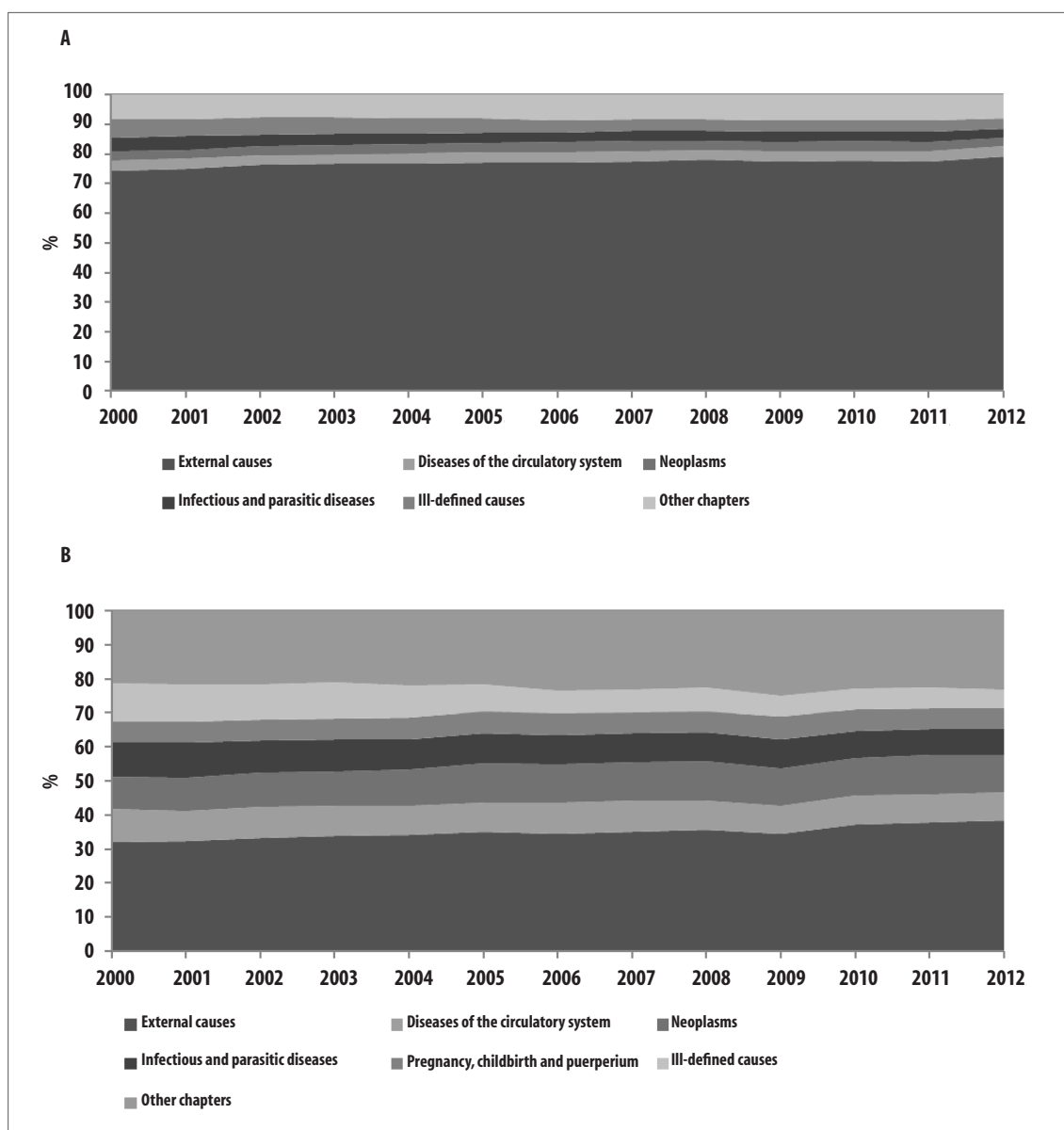
Out of the total amount of youth deaths due to external causes in the 2000-2012 period, 54.6% were due to assault and 25.3% due to transport accidents. Among young men, these proportions were 57.0% and 23.7%, respectively. Among young women, an inverse order was revealed: transport accidents were the main cause of death due to external causes (38.8%), followed by assault (33.9%) and intentional self-harm (10.8%) (Figure 2).

**Table 2 – Youth mortality rates<sup>a</sup> between 15 and 29 years of age, annual increase rates (%) and trends, according to sex and Brazilian macro-regions. Brazil, 2000 to 2012.**

	Overall mortality rates (per 1,000 inhabitants from 15 to 29 years of age)												Annual variation rate (%)	95%CI <sup>b</sup>	Trend			
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011				2012		
<b>North</b>																		
Male	1.8	1.9	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.1	2.86
Female	0.7	0.7	0.6	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	-0.36
Uncorrected total	1.3	1.3	1.4	1.4	1.4	1.3	1.4	1.3	1.5	1.5	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.96
Corrected total	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.8	1.9	2.0	1.9	1.9	1.9	1.9	1.9	1.9	—
<b>Northeast</b>																		
Male	2.0	2.0	2.1	2.1	2.2	2.2	2.3	2.3	2.4	2.5	2.7	2.7	2.7	2.8	2.8	2.8	3.08	
Female	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	-0.10	
Uncorrected total	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.6	1.7	1.7	1.7	1.7	1.7	1.7	2.30	
Corrected total	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.8	1.9	1.9	1.9	1.9	1.9	1.9	—	
<b>Southeast</b>																		
Male	2.9	2.8	2.8	2.7	2.5	2.3	2.2	2.2	2.1	2.1	2.0	2.0	2.0	1.9	1.9	1.9	3.48	
Female	0.7	0.6	0.6	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	-1.64	
Uncorrected total	1.8	1.7	1.7	1.7	1.5	1.4	1.4	1.4	1.3	1.4	1.3	1.3	1.3	1.2	1.2	1.2	-2.90	
Corrected total	1.8	1.7	1.8	1.7	1.6	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	1.3	1.3	1.3	—	
<b>South</b>																		
Male	1.9	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.2	2.2	2.2	2.2	2.2	2.1	2.1	2.1	0.88	
Female	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	-0.62	
Uncorrected total	1.2	1.3	1.3	1.3	1.4	1.3	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.3	1.3	1.3	0.62	
Corrected total	1.3	1.3	1.4	1.4	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.4	1.4	1.4	1.4	1.4	—	
<b>Midwest</b>																		
Male	2.4	2.2	2.4	2.3	2.4	2.3	2.2	2.2	2.3	2.5	2.5	2.5	2.5	2.6	2.6	2.6	0.76	
Female	0.7	0.7	0.7	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.7	0.6	0.6	0.6	0.6	0.6	-0.53	
Uncorrected total	1.5	1.4	1.5	1.5	1.5	1.4	1.3	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	0.61	
Corrected total	1.6	1.5	1.6	1.6	1.6	1.5	1.4	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	—	
<b>Brazil</b>																		
Male	2.3	2.3	2.4	2.4	2.3	2.2	2.2	2.2	2.3	2.3	2.3	2.4	2.3	2.3	2.3	2.3	-0.19	
Female	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.5	0.5	0.5	-0.91	
Uncorrected total	1.5	1.5	1.5	1.5	1.4	1.4	1.4	1.4	1.4	1.5	1.5	1.5	1.5	1.4	1.4	1.4	-0.34	
Corrected total	1.6	1.6	1.6	1.6	1.6	1.5	1.5	1.5	1.5	1.6	1.6	1.6	1.6	1.6	1.6	1.6	—	

a) Rates according to sex were not corrected. Corrected rates were derived from the application of correction factors. Trends were estimated from uncorrected rates.

b) 95%CI: 95% confidence interval



**Figure 1 – Proportional distribution (%) of youth deaths between 15 and 29 years of age, according to groups of causes and male (A) and female (B) sexes. Brazil, 2000 to 2012.**

## Discussion

This study revealed that overall youth mortality rates in Brazil increased and presented stationary trends in the 2000-2012 period, for both sexes. However, there were regional differences. A mortality increase among young men was observed in the Northeast and South regions, as well as in the overall young population in the North and Northeast regions. In the Southeast region, however, there was a decrease in the youth

mortality trends for both sexes. The ratio of mortality trends for young men and women was always over 3.0. Violence and accidents were the main causes of death, especially regarding males. Over half of deaths due to external causes were caused by assaults. Deaths caused by pregnancy, childbirth and the post-partum corresponded to, approximately, one in 20 deaths of young women.

The high mortality rates support prior findings. In 2011, the adjusted rates for the age group 10-19, for men

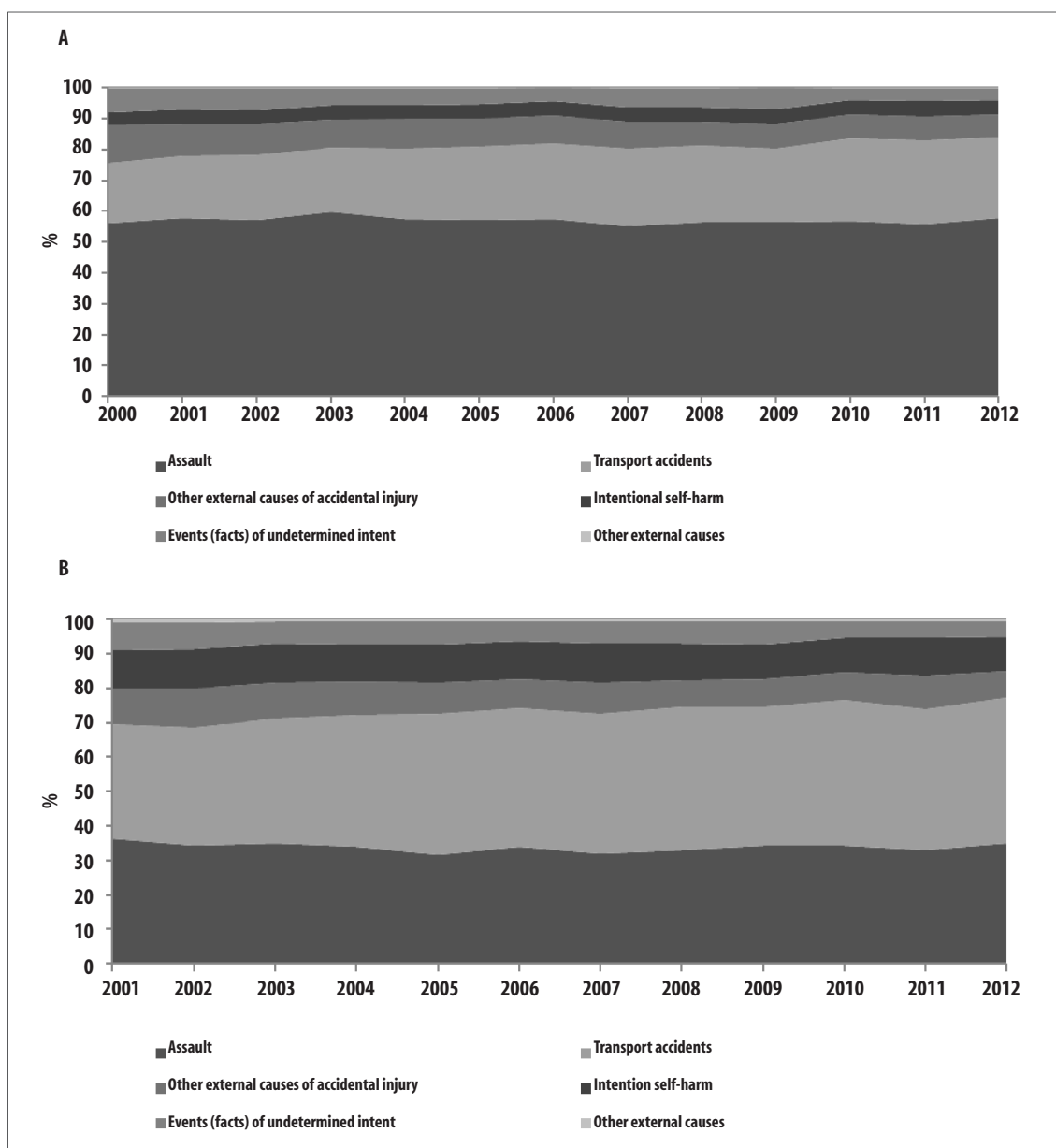
**Table 3 – Proportional distribution (%) of youth deaths between 15 and 29 years of age, according to groups of causes, sex and macro regions of the country. Brazil, 2000 and 2012**

Youth deaths, by cause groups	Brazil		North		Northeast		Southeast		South		Midwest	
	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012	2000	2012
<b>External causes</b>												
Male	74.5	79.2	64.9	79.2	69.0	82.6	78.2	74.1	73.7	81.4	75.8	82.7
Female	32.2	38.5	24.3	36.1	27.6	37.6	34.3	35.3	34.9	45.8	40.4	47.1
Total	65.5	71.4	54.2	70.6	59.3	75.0	70.0	65.9	64.5	74.3	68.0	75.9
<b>Diseases of the circulatory system</b>												
Male	3.4	3.2	3.7	2.9	4.0	3.0	3.1	4.0	3.3	2.4	3.8	2.8
Female	9.5	8.1	8.1	8.0	10.3	8.9	9.5	8.8	8.5	5.6	9.6	5.8
Total	4.7	4.2	4.8	4.0	5.5	4.0	4.3	5.0	4.6	3.0	5.1	3.4
<b>Neoplasms</b>												
Male	3.1	3.1	3.0	2.6	2.9	2.4	2.8	3.8	4.5	4.0	3.6	3.1
Female	9.4	11.2	9.2	10.1	8.3	10.7	9.5	12.3	11.2	11.2	10.0	9.6
Total	4.4	4.7	4.6	4.1	4.2	3.8	4.1	5.6	6.1	5.4	5.0	4.3
<b>Infectious and parasitic diseases</b>												
Male	4.5	2.9	6.0	3.5	4.0	2.5	4.2	3.5	6.3	2.4	4.3	2.3
Female	10.2	7.6	11.0	9.4	7.6	7.0	11.2	7.8	12.5	8.2	8.3	5.2
Total	5.7	3.8	7.3	4.7	4.9	3.3	5.5	4.4	7.8	3.6	5.2	2.9
<b>Pregnancy, childbirth and post-partum</b>												
Male	–	–	–	–	–	–	–	–	–	–	–	–
Female	6.2	5.9	9.6	7.9	7.2	6.8	4.9	5.1	6.6	4.6	4.9	6.2
Total	6.2	5.9	9.6	7.9	7.2	6.8	4.9	5.1	6.6	4.6	4.9	6.2
<b>Ill-defined causes</b>												
Male	6.3	3.6	12.9	4.7	10.7	2.8	4.5	5.1	3.1	2.3	3.5	2.2
Female	11.2	5.7	17.7	7.6	17.8	6.3	8.7	6.0	4.9	3.0	5.3	3.5
Total	7.3	4.0	14.2	5.3	12.3	3.4	5.3	5.3	3.5	2.5	3.9	2.5
<b>Other chapters</b>												
Male	8.2	7.9	9.5	7.1	9.4	6.7	7.2	9.6	9.1	7.6	9.0	6.9
Female	21.4	22.6	20.1	20.9	21.2	22.7	21.8	24.6	21.3	21.7	21.5	22.7
Total	12.3	11.9	14.8	11.4	13.8	10.6	10.9	13.9	13.6	11.3	12.8	11.1

and women, were of 1.2 and 0.4 per 1,000 inhabitants, respectively. In the age group 20-29, the rates were even higher: 3.1 and 0.9 per 1,000 inhabitants, respectively to men and women.<sup>12</sup>

Although the overall mortality rates had shown stationary trends in Brazil, important variations among the macroregions of the country were noticed. The increasing trend observed in young men of the Northeast and South regions could be explained by the improvement of *SIM*'s coverage and quality in these regions, in the studied period,<sup>13</sup> which possibly overlaps the rise of urban violence. The fact that this rise was only observed in the male sex reinforces the hypothesis of urban violence,<sup>14</sup> to which men are usually more involved with.

With regard to the decreasing trend of the overall youth mortality rate in the Southeast region, for both sexes, it can be a result of the interventions performed in the region, such as the ones conducted in the Public Security area, like the implantation of Pacifying Police Units (UPP) in the municipality of Rio de Janeiro, and the measures aimed at traffic safety, like the operations of the “*Lei Seca*” (Dry Law). Among men, it is also possible that this proportional decrease is an effect of the increase in the proportion of deaths due to ill-defined causes notified in the Southeast. Nevertheless, the need of new studies to investigate the diverging trends between macroregions, as well as the possible impact of distinct interventions over youth morbidity and mortality are



**Figure 2 – Proportional distribution (%) of youth deaths between 15 and 29 years of age due to external causes, according to subgroups of causes and male (A) and female (B) sexes. Brazil, 2000 to 2012**

evident. According to Waiselfisz,<sup>15</sup> some factors could be responsible for the increase or decrease of mortality rates caused by homicides, according to the geographic region: (i) the emergence of economic poles unattended by proper public security policies, favoring the rise of crimes; (ii) the National Plan of Public Security and the National Fund of Public Security, assuring the transfer of resources to the management of public security in the capital cities and metropolitan regions; and (iii)

the decrease of the under-notification of deaths in many regions of the country.

This study highlighted many remarkable differences on youth mortality, according to sex. In Brazil, the ratio in overall mortality rates between sexes peaked at 4.2 in 2012. Gender discrepancies regarding mortality patterns, health needs and services use and its relation to masculinity patterns have been the target of discussions.<sup>16</sup> According to Souza et al,<sup>17</sup> men are more exposed to



accidents and violent situations due to masculinity reassuring behaviors, which makes them more vulnerable to early-death risking events.

Consistently with this study, male over-mortality was observed in all American countries. A study over homicides, held in the period between 1999 and 2009, found higher sex ratio for mortality rates in Venezuela, Puerto Rico, Colombia, Brazil, Equator and Nicaragua: from 17.1 to 10.1.<sup>18</sup> A similar result was observed in adults (20-59 years of age) in Brazil, where, to each woman, almost eight men died due to external causes in 2010.<sup>14</sup>

In this study, mortality rates according to skin color were not calculated. However, 57.2% of the deaths were among the young black or brown-skinned population. The over-mortality of this population segment is known. However, few studies on ethnicity/skin color were conducted to state how discrimination and prejudice reinforce social and economic inequalities and structural disadvantages.<sup>19</sup> According to Araujo et al,<sup>19</sup> the ethnicity/skin color variable must be approached as a social characteristic related to the burden of historical and cultural constructions and, therefore, as a determining factor of iniquities to be emphasized in future studies over the topic.

External causes were the main cause of death among Brazilian youngsters in this analysis. More recent data from 2013 revealed 73.2 thousand deaths registered due to these causes, with relevant differences between sexes: 80.5% of these deaths were of young men.<sup>4</sup> In the Americas, during the 1999-2009 period, around 497 thousand annual deaths due to external causes were registered, corresponding to around 10% of the total amount of deaths in all ages. Among these deaths, 37% occurred due to violence or intentional causes, and the age groups of 15-24 and 25-39 years of age contributed the most to this number of deaths.<sup>18</sup>

Despite the fact that male mortality is superior to female mortality, the profile of female deaths deserves a debate as well. A systematic review over the global prevalence of homicides committed by partners revealed that approximately 40% of all female homicides in the world are committed by an intimate partner,<sup>20</sup> showing the high occurrence of domestic violence around the world. A study over female deaths due to assault in Brazil, held in the period between 2001 and 2011, found an average daily occurrence of 13.5 female deaths due to assaults and a profile of most of these deaths

consisting of domestic and family violence situations against the woman.<sup>21</sup>

According to data analyzed in this study, transport accidents were the second main cause of youth death in Brazil. The younger age is a factor associated to the higher probability to getting involved in a traffic accident.<sup>22</sup> Duarte et al,<sup>23</sup> in a study held in 2012 over the National Adolescent School-based Health Survey (PeNSE) data, pointed to an alarming triad of frequent alcohol intake, low use of the seat belt and the frequent habit (12.9%) amongst underage scholars of driving.

In this specific study, it was not possible to investigate the role of alcohol in youth mortality. Nevertheless, a research over the global burden of diseases revealed that, among teenagers and young adults, between 10 and 24 years of age, the main risk factors for disability adjusted life years (DALY) were the alcohol intake (7%), unprotected sex (4%), the lack of birth control methods (2%) and the use of illegal drugs (2%).<sup>24</sup>

The excessive use of alcohol increases the risk of getting involved in violence or accident episodes,<sup>25</sup> and its early introduction in life represents an important Public Health problem. It is important to perfect the legal measures and to increase the strictness in selling alcohol to adolescents, as alcohol is an important risk factor to early mortality.

The deaths related to pregnancy, childbirth and the post-partum presented in this research are alarming, though; they support national research data, regarding the year of 2011, which found a maternal mortality ratio of 60.8/100 thousand live births. Although this finding represents a decrease in comparison to previous years, it is still 3 to 4 times higher than the estimative in the developed countries.<sup>26</sup> Social, economic and healthcare factors – the latter related to pre-natal care and childbirth; i.e. labors financed by private health insurance plans –, related as determining to the performing of caesarian sections in primipara adolescents,<sup>27</sup> can be a direct contributing factor to the high proportion of maternal deaths, as well as illegal abortions. Other studies are necessary to better understand the maternal death of youngsters and its associated factors.

Amongst limitations found in this study, those related to the secondary data usage of the SIM system should be highlighted. Despite the expansion of areas covered and the improvement of the information about mortality in the country, observed by Szwarcwald et al,<sup>9</sup> inequalities in the coverage and in the quality of

the *SIM* data may have impaired this analysis, when comparing the indicators between different periods and geographical areas. The limitation related to the coverage was minimized upon the sub register adjusted factors applied to the macroregions. However, there was no adjustment regarding deaths due to ill-defined causes, once the study itself aimed at investigating the share of mortality due to these causes. Therefore, it is possible that there still might be an underestimation of mortality, especially regarding mortality analysis on groups of causes. It is important to highlight that, in the period this research was held, there was a significant reduction in the proportion of deaths due to ill-defined causes in most regions – with the exception of the Southeast –, among men.

In Brazil, there are some remarkable policies aiming at reducing violent deaths: VIVA Youth Plan;<sup>28</sup> National Policy of Accidents and Violence Mortality Reduction;<sup>29</sup> and National Policy of Health Promotion.<sup>30</sup> The high youth mortality, especially due to external causes, confirmed by this study is a warning regarding the need to implement specific policies directed to this population, such as the ones already quoted in the Statute of Youth. Besides inter-sector public policies, more effective actions to prevent deaths due to external causes, and more measures to promote health to the

Brazilian youth – that include the confrontation of drugs and alcohol abuse –, as well as the encouragement to a peace culture, are needed. To young males, these actions must have as a main goal the prevention of homicides related to urban violence and deaths caused by land transport accidents. Whilst for young women, the expected actions must also include the prevention of domestic and family related violence and maternal deaths.

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### Authors' contributions

Neves ACM contributed to the conception of the study, to the analysis and interpretation of data, and to the critical writing of the manuscript's intellectual content.

Garcia LP contributed to the conception of the study and to the critical review of the manuscript.

Both authors approved the manuscript's final version and declared to be responsible for all aspects of the study, assuring its accuracy and integrity.

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