

# Epidemiological analysis of suicide in Brazil from 1980 to 2006

## Análise epidemiológica do suicídio no Brasil entre 1980 e 2006

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### Abstract

**Objective:** The objective of this study was to carry out an epidemiological analysis of the suicide rates found in Brazilian regions and state capitals between 1980 and 2006. **Method:** Data on mortality rates due to suicide were collected from the Departamento de Informática do Sistema Único de Saúde (Information Technology Department of the Brazilian Public Health System – DATASUS). **Results:** A total of 158,952 suicide cases were registered between 1980 and 2006, excluding those cases in which the individual was less than 10 years old ( $n = 68$ ). In the period under study, the total suicide rate in Brazil increased from 4.4 to 5.7 deaths per 100,000 inhabitants (29.5%). Higher average rates were found in the South (9.3) and Central-West (6.1) regions. Men were more likely to commit suicide. The highest suicide rates were found in the 70-years or above age range while the highest increases were found in the 20 to 59 year age bracket. The most dominant social-demographic characteristics of the persons who committed suicide in the period under study were low educational level and singlehood. The most common methods of suicide were hanging, fire arms and poisoning. **Conclusion:** Although in Brazil the rate increased 29.5% in 26 years, the national rate is still considered to be low when compared to worldwide suicide rates (average of 4.9 per 100,000 inhabitants). Suicide rates in Brazilian regions vary broadly, ranging from 2.7 to 9.3.

**Descriptors:** Suicide; Epidemiology; Gender; Elderly; Brazil

### Resumo

**Objetivo:** O objetivo deste estudo foi realizar uma análise epidemiológica dos índices de suicídio registrados entre 1980 e 2006 nas regiões e capitais estaduais. **Método:** Dados referentes à taxa de mortalidade devido ao suicídio foram coletados do Departamento de Informática do Sistema Único de Saúde. **Resultados:** Entre 1980 e 2006, foi registrado um total de 158.952 casos de suicídio, excluindo-se os casos nos quais os indivíduos tinham menos de 10 anos de idade ( $n = 68$ ). No período estudado, o índice total de suicídio cresceu de 4,4 para 5,7 mortes por 100.000 habitantes (29,5%). Os índices médios mais altos foram registrados nas regiões Sul (9,3) e Centro-Oeste (6,1). Os homens são os que têm a maior probabilidade de cometer suicídio. Os índices mais altos de suicídio foram registrados na faixa etária de 70 anos ou mais, enquanto que os maiores aumentos aconteceram na faixa etária dos 20 aos 59 anos. As principais características sociodemográficas das pessoas que cometeram suicídio durante o período estudado foram baixo nível educacional e estado civil solteiro. Os métodos mais comuns de suicídio foram por enforcamento, armas de fogo e envenenamento. **Conclusão:** Embora o índice brasileiro tenha crescido 29,5% em 26 anos, o índice nacional ainda é considerado baixo se comparado aos índices de suicídio mundiais (média de 4,9 por 100.000 habitantes). Os índices de suicídio nas regiões brasileiras variam muito, ou seja, estão entre 2,7 e 9,3.

**Descritores:** Suicídio; Epidemiologia; Sexo; Idoso; Brasil

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## Introduction

Suicide constitutes an important global public health issue. The World Health Organization (WHO) estimates that, in 2020, more than 1.5 million people will die from suicide.<sup>1</sup> In Brazil, the mortality rate due to suicide in 2005 is considered to be relatively low (5.6 deaths per 100,000 inhabitants) when compared to that of other countries. It ranks 67<sup>th</sup> in the world.<sup>2</sup> However, Brazil is among the 10 countries with the highest absolute numbers of suicide.<sup>3</sup>

Worldwide, the suicide rate among the elderly is higher than among young people; however, this trend has been changing around the world since 90s.<sup>4</sup> Suicide is one of the four leading causes of death among persons 15 to 44 years of age in both the developed and developing countries.<sup>5</sup>

According to the WHO,<sup>5</sup> suicide is the intentional act of an individual to take his/her own life. The main factors associated with suicide are: previous suicide attempts, mental illnesses (mainly depression and alcohol and drug abuse/dependence), lack of social support, a family history of suicide, strong suicidal intention, stressful life events, and social-demographic characteristics such as poverty, unemployment, and low level of education.<sup>6-11</sup>

Suicide rates around the world vary according to social-demographic, regional and cultural aspects, as well as according to the manner in which these deaths are recorded.<sup>5,12</sup> In Brazil, upon analysis of the reported suicide data, researchers have suggested that underreporting and the low quality of the information provided on death certificates require full attention since both may be factors that lead to the underestimation of death by suicide in reported mortality rates.<sup>13,14</sup>

There are only a few studies regarding rates epidemiological analysis of historical series of suicide in Brazil. In their analysis of suicide rates registered between the decades of 1980 to 2000, Mello-Santos, Bertolote & Wang found that, in this period, that rate had increased 21% (from 3.1 to 4.0 per 100,000 inhabitants).<sup>3</sup> Men and the elderly were still the majority of suicide cases, however, the number of cases in young adults aged between 15 and 24 years throughout these two decades increased even more (1900%). An investigation conducted in the state of Rio Grande do Sul between 1980 and 1999 reported suicide rates that ranged from 9.0 to 11.0 deaths per 100,000 inhabitants. Although the elderly accounted for the highest suicidal rate, the overall rate in the young adult population increased.<sup>15</sup> Suicide rates in Campinas from 1997 to 2001 were analyzed by gender. This investigation found higher mortality rates among men between the ages of 35 and 54. Hanging and the use of fire arms were the most common suicide methods used by men, while poisoning was most common among women.<sup>13</sup> Another study conducted by Souza et al. analyzed the suicide behavior of young adults living in nine Brazilian metropolitan areas.<sup>4</sup> Porto Alegre and Curitiba presented the highest suicide rates. The main methods of suicide were by hanging, strangulation and suffocation, especially in Porto Alegre, and by firearms in Belo Horizonte. Despite the importance of these four studies, these investigations were limited in scope. Three of them were limited to localized areas or populations (a state, city and nine selected state capitals and focused on young people). Only one of them<sup>3</sup> investigated suicide rates among the entire Brazilian population

(1980-2000). These studies highlight the need for investigations on the mortality rate due to suicide while taking into consideration the regional differences found in Brazil.

Brazil is a large country, characterized by different regions whose development levels are distinctively different. The epidemiological analysis of suicide among Brazilians from different regions is important for the development of public health policies. The development of effective programs to prevent suicidal behavior requires that our knowledge on the regional specificities with respect to this public health issue be expanded. Within this context, the main objective of this study was to carry out an epidemiological analysis of Brazilian suicide mortality rates by Brazilian regions and state capitals from 1980 to 2006.

## Method

This was a descriptive study on suicide mortality rates found in each Brazilian region and state capital during the period 1980 - 2006. Mortality and suicide data, as well as the rate of the socio-demographic and the clinical-epidemiologic characteristics were obtained from the Brazilian database *Sistema de Informações sobre Mortalidade*, (SIM, Mortality Information System) of the *Departamento de Informática do Sistema Único de Saúde* (DATASUS, Information Technology Department of the Brazilian Public Health System). Data on the estimated population were obtained from the *Instituto Brasileiro de Geografia* (IBGE, Brazilian Institute of Geography), which is also found in the SIM.

These data were coded E950-E959 (1980 to 1995) based on the 9<sup>a</sup> International Classification of Disease/ICD-9,<sup>16</sup> and X60-X84 (1996 to 2006) based on the 10<sup>a</sup> International Classification of Disease ICD-10.<sup>17</sup> Total suicide rates were calculated by dividing the absolute number of deaths due to suicide by the total Brazilian population of that same year. For the historical series (1980-2006), we calculated the median of each triennial suicide rate. This approach aimed at reducing the fluctuation that may have been present had longer periods of time such as median of quinquennial rates been used.

The levels of suicide mortality rates were classified according to the Diekstra & Gulbinat guideline: rates under 5 deaths/100,000 inhabitants were considered low, between 5 and 15 deaths/100,000 inhabitants were considered medium, between 15 and under 30 deaths/100,000 inhabitants were considered high and 30 or more deaths/100,000 inhabitants were considered very high.<sup>18</sup>

The TabWin program from DATASUS/Ministry of Health was used for tabulating the data and analyzing the variables. Suicide rates were collected for each Brazilian region and state capital according to age, sex and gender ratios. Ages were stratified according to the age groups available in DATASUS: 10 to 14, 15 to 19, 20 to 29, 30 to 39, 40 to 49, 50 to 59, 60 to 69, and 70 and above.

Proportions were used to present the social-demographic and clinical-epidemiological characteristics. They were calculated taking into consideration the absolute number of suicides from 1980 to 2006. The following variables were considered in this study: gender, age, marital status, educational level, suicide location and methods used for suicide. The different methods used for committing suicide were grouped into seven categories: poisoning, hanging, drowning,

firearms, sharp objects, jumping and others (car crashing smoke, fire, gas etc). Educational levels were characterized as low if the subject had attended 1 to 7 years of school, medium if he/she had attended 8 to 11 years of school, and high for those who has attended 12 years or more of school. Regarding suicide mortality rates according to state capitals, São Luis failed to report data for the year 1982, while Palmas did not report for the years 1982 to 1989, 1992 and 1994, and Cuiabá for the years of 1982 and 1990.

## Results

### 1. Suicide mortality rates from 1980 to 2006 in Brazil

A total of 158,952 suicide cases were reported from 1980 to 2006, excluding cases in which the individual was less than 10 years old ( $n = 68$ ). From 1980 to 2006, the total suicide rate in Brazil increased from 4.4 to 5.7 deaths per 100,000 inhabitants (29.5%).

Suicide mortality rates in Brazil remained stable between 1980 and 1994, with an average of 4.5 deaths per 100,000 inhabitants. In the triennial 1995-1997, these rates increased to a level which remained stable at an average of 5.4 deaths per 100,000 inhabitants until 2006. Mortality rates among women were stable throughout the period, with an average of 1.7 deaths per 100,000 inhabitants. Mortality rates among men were stable until the triennial 1992-1994, with an average of 5.1 deaths per 100,000 inhabitants. In the triennial 1995-1997, there was a considerable increase in the level of suicide rates among men. From this triennial to the end of the period under study, these levels remained stable at an average of 7.0 per 100,000 inhabitants (see Figure 1). The ratio between suicide rate and gender strongly indicates higher mortality among men, with an increase of 52% during the period under study (from 2.5 to 3.8). Whereas the increase in suicide rate in women was very low (1.0%), men presented an increment of 58% over this 26-year period of study.

When analyzing suicide mortality rates by age groups, we observed a predominance of individuals over 70 years (an average of 7.8 per 100,000 inhabitants), followed by persons aged between

50 to 59 years, and individuals between 60 to 69 years old (an average of 6.8 and 6.7 per 100,000 inhabitants, respectively). The 40 to 49 years of age bracket experienced the highest increase (43%) during the 26-year period. Suicide rates increased more among individuals between 20 and 59 years (30%) than in those over 60 years (19%). The lowest suicide rates were observed in the 10-14 (median of 0.5 per 100,000 inhabitants) and 15-19 (median of 3.1 per 100,000 inhabitants) age groups, with an increase of 20% and 3%, respectively (see Figure 2).

### 2. Social-demographic and clinical-epidemiologic suicide characteristics in Brazil

The following social-demographic and clinical epidemiologic characteristics were predominant in all analyzed cases (1980-2006): men (77.3%), aged between 20 and 29 (34.2%), single (44.8%) and having received little formal education (38.2%). Regarding the clinical-epidemiologic characteristics, we found that the home was the predominant suicide location (51%), followed by suicide at the hospital (26.1%). Concerning the methods used for suicide, the following methods were more predominant: hanging (47.2%), fire arms (18.7%), other methods (14.4%) and poisoning (14.3%). When poisoning was the suicide method used, 41.5% committed suicide by using pesticides and 18% by using medications. Concerning the total number of deaths that took place at home, 64.5% were caused by hanging and 17.8% by firearms. Otherwise, of all the deaths by poisoning, 37.1% happened at the hospital and only 5.8% at home. On the streets and public areas, the majority of deaths involved the use of firearms (24.7%).

### 3. Suicide mortality rates in Brazilian regions and state capitals

With an average of 9.3 deaths per 100,000 per inhabitants, the South region of Brazil presented the highest rates of suicide during the studied period, followed by the Central West region, with an average of 6.1 deaths per 100,000 inhabitants. The regions that presented the lowest suicide rates were the Northeast region, with

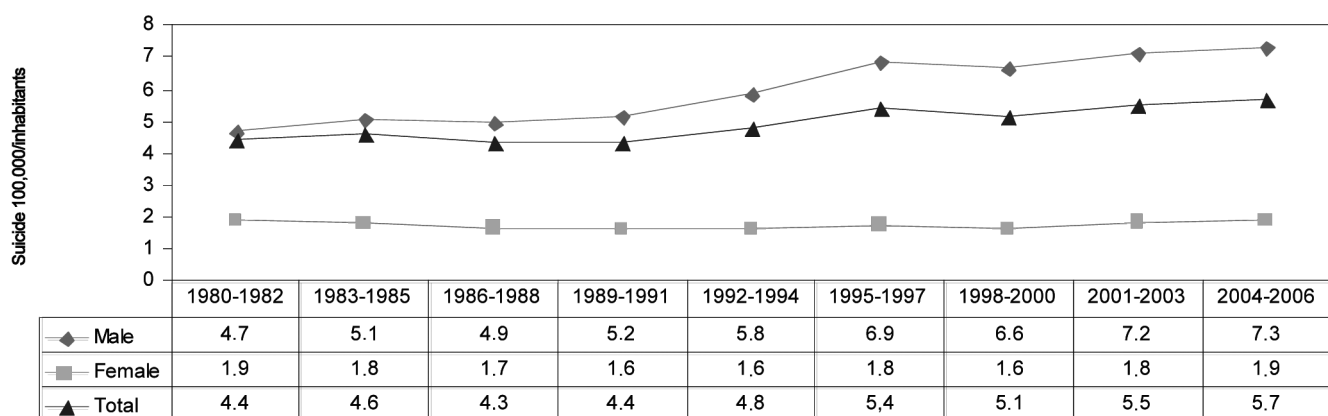


Figure 1 - suicide rates of in Brazil by gender from 1980 to 2006<sup>54</sup>

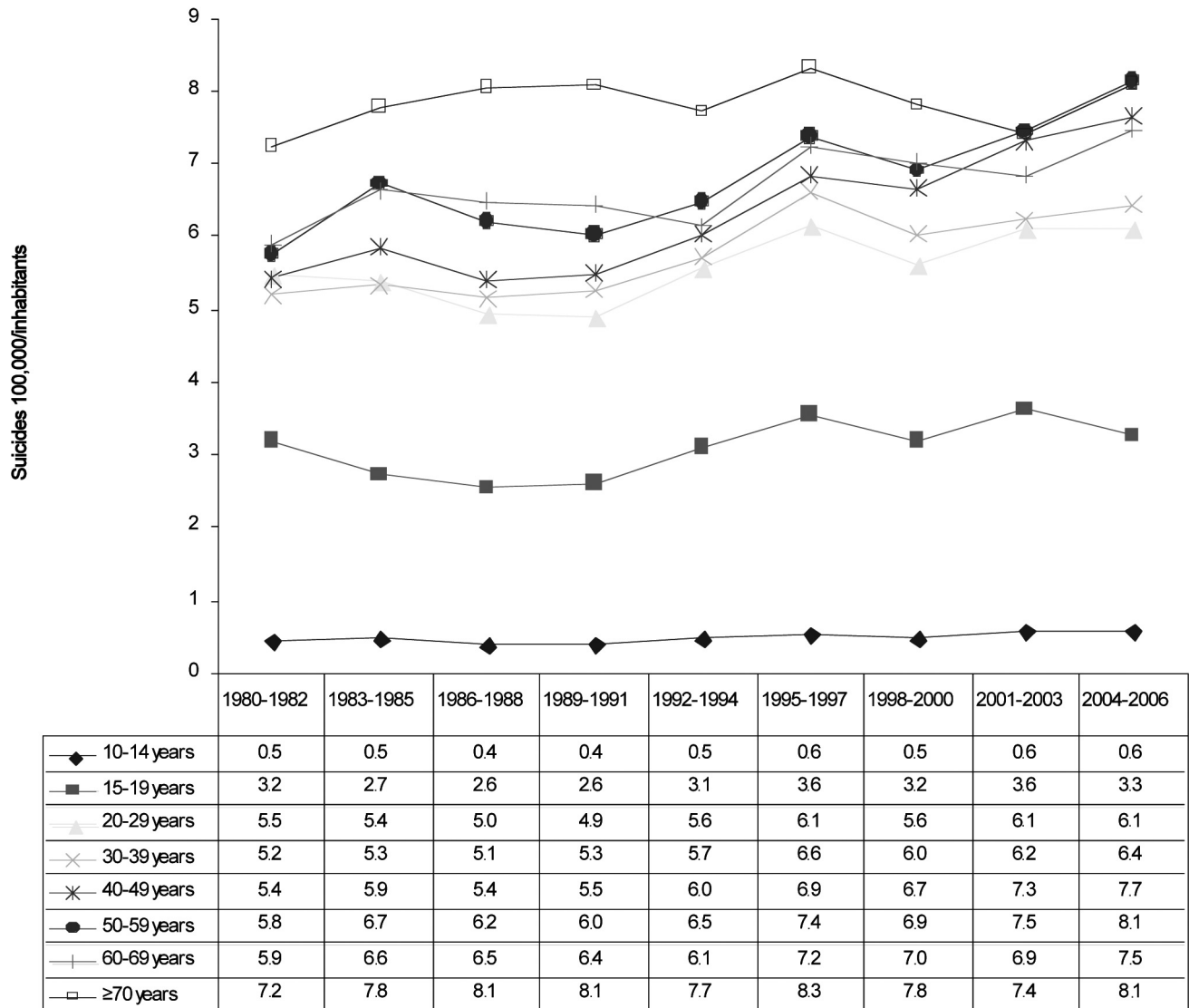


Figure 2 – Suicide rates in Brazil by age groups from 1980 to 2006

an average of 2.7 deaths per 100,000 inhabitants, and the North region, with an average of 3.4 deaths per 100,000 inhabitants. Nevertheless, the highest increases were seen in the Northeast region, which experienced an increment of 130% and in the Central West region, with an increment of 68% from 1980 to 2006 (see Table 1). The state capitals that showed the highest average rates during the entire period under study were Boa Vista (7.6 deaths per 100,000 inhabitants), Porto Alegre (7.3 deaths per 100,000 inhabitants) and Florianópolis (6.5 per 100,000 inhabitants). The state capitals with the lowest average rates were Salvador (1.2 deaths per 100,000 inhabitants) and Rio de Janeiro (2.4 deaths per 100,000 inhabitants) - Table 2. State capitals that showed the highest increase in suicide rates between 1980 and 2006 were Goiânia (156%), Aracaju (143%) and Macapá (142%), and Cuiabá which, in this period, showed an increase of 750% (see Table 1). This finding concerning Cuiabá was considered to be extremely

high and quite discrepant compared to the other findings of this study. Therefore, this result needs to be interpreted with caution.

Men presented higher suicide mortality rates in all regions, particularly in the South region, with an average of 11.7 per 100,000 inhabitants, and in the Central West region, with an average of 7.1 per 100,000 inhabitants. The lowest suicide mortality rate in men was found in the Northeast region, with an average of 3.3 deaths per 100,000 inhabitants. However, men from the Northeast experienced the highest increase (190%) during the period under study. Women presented higher average rates in the South region, namely 3.2 per 100,000 inhabitants, and the lowest in Northeast region, i.e., 0.9 per 100,000 inhabitants (see Table 2).

We found higher percentages among single individuals in all regions, particularly in the Southeast and South regions (19.6%) (10.5%). Low educational levels were more frequent in the Southeast (16.7%), South (12%) and Northeast regions (4.9%). Those who

had a high level of education were more prevalent in the Southeast (2.4%), South (0.6%) and Northeast regions (0.6%). However, it should be noted that the databases used for this investigation had a large amount of missing information regarding the educational level of the persons who committed suicide (43.5%).

In the majority of the regions, the most commonly used suicide methods were hanging, firearms and poisoning while in the Northeast region, hanging (48.8%), poisoning (18.2%) and firearms (16.9%) were the predominant suicide methods. In the Southeast, hanging (39.6%), other methods (24.2%) and firearms (16.5%) predominated. In the cases of suicide by poisoning, the use of pesticide did stand out, particularly in the Southeast (29.7%), South (28.6%) and Northeast (19.8%) regions. The highest rates proportions of medication use as a suicide method were the found

in the Southeast (7%), South (4.1%) and Northeast (3.7%) regions. Men predominated in all methods used, with the exception of medication use, where women scored a higher percentage (48.6% vs. 51.4%).

#### Discussion

The rate of suicide mortality is underestimated in many countries,<sup>5</sup> thus making it difficult to have a more accurate measure of this type of death. When analyzing a study on suicide, the underreporting of data on suicides is one of the most critical aspects requiring our consideration. This underreporting may be caused by factors such as the erroneous filling out of death certificates in cases of suicide, clandestine cemeteries and family requests to change the cause of death.<sup>1,13,14</sup>

**Table 1 - Distribution of suicide rates in Brazilian regions and state capitals 1980 to 2006<sup>54</sup>**

	1980-1982	1983-1985	1986-1988	1989-1991	1992-1994	1995-1997	1998-2000	2001-2003	2004-2006
<b>North</b>	<b>2.7</b>	<b>2.6</b>	<b>2.9</b>	<b>3.2</b>	<b>3.2</b>	<b>3.6</b>	<b>3.9</b>	<b>4.2</b>	<b>4.3</b>
Rio Branco	4.2	3.2	4.4	8.4	9.0	5.3	6.2	9.8	5.2
Porto Velho	5.6	6.0	4.2	6.1	7.1	3.5	4.8	5.5	5.3
Palmas	0.0	0.0	0.0	5.7	2.9	3.4	3.9	6.7	4.8
Manaus	4.7	4.8	5.1	3.8	5.1	7.1	5.8	5.1	4.9
Macapá	3.6	8.0	5.6	4.7	4.9	7.0	4.6	10.9	8.7
Boa Vista	6.7	2.7	3.7	6.7	8.3	11.6	11.9	7.7	9.3
Belém	5.6	4.4	4.7	4.7	5.1	7.1	5.3	4.3	2.4
<b>Northeast</b>	<b>2.0</b>	<b>1.8</b>	<b>1.8</b>	<b>2.1</b>	<b>2.6</b>	<b>3.0</b>	<b>3.0</b>	<b>4.0</b>	<b>4.6</b>
Teresina	5.0	3.8	4.3	3.1	4.6	6.0	5.5	6.8	6.8
São Luís	3.1	1.3	2.6	2.8	2.7	4.0	3.4	4.3	3.7
Salvador	1.6	1.3	1.4	1.0	1.2	1.2	0.4	1.0	2.2
Recife	3.1	2.4	1.6	3.6	5.7	5.6	4.6	4.1	3.9
Natal	5.2	3.8	3.7	4.3	2.7	5.1	1.8	3.2	2.2
Maceió	4.7	4.1	4.8	3.0	5.3	3.9	3.1	3.3	3.2
João Pessoa	4.1	3.1	4.3	2.6	2.8	3.0	2.0	3.3	4.2
Fortaleza	5.9	3.8	2.7	4.3	4.7	5.9	4.7	6.6	7.3
Aracaju	2.1	2.0	1.2	2.0	6.2	3.6	2.4	6.4	5.1
<b>Southeast</b>	<b>4.7</b>	<b>4.8</b>	<b>4.5</b>	<b>4.3</b>	<b>4.7</b>	<b>5.2</b>	<b>4.5</b>	<b>4.9</b>	<b>4.9</b>
Vitória	3.2	2.1	3.3	5.2	4.3	6.7	6.0	4.5	4.8
São Paulo	5.9	5.8	6.0	5.6	6.1	6.7	5.5	4.3	4.7
Rio de Janeiro	1.9	2.8	2.6	2.2	1.1	2.4	2.4	3.7	2.9
Belo Horizonte	5.4	4.6	4.7	5.0	5.4	6.5	5.1	5.6	4.7
<b>South</b>	<b>8.1</b>	<b>9.4</b>	<b>8.6</b>	<b>8.7</b>	<b>8.9</b>	<b>10.3</b>	<b>10.4</b>	<b>9.9</b>	<b>9.8</b>
Porto Alegre	6.1	6.8	5.9	4.9	6.3	10.3	9.6	7.5	7.5
Florianópolis	4.0	4.4	6.0	6.3	7.2	8.0	9.3	6.2	7.0
Curitiba	4.4	6.3	5.0	5.8	5.3	6.3	5.7	6.0	6.4
<b>Central-west</b>	<b>4.4</b>	<b>4.6</b>	<b>5.1</b>	<b>4.9</b>	<b>6.2</b>	<b>7.4</b>	<b>7.0</b>	<b>7.7</b>	<b>7.4</b>
Goiânia	2.5	1.5	4.2	2.9	5.8	7.3	6.4	7.5	6.4
Cuiabá	0.6	1.0	1.6	0.9	0.6	5.1	2.1	3.8	5.1
Campo Grande	3.7	4.2	3.4	4.3	6.6	8.4	6.0	5.4	6.9
Brasília	3.0	2.7	3.9	6.3	7.1	7.8	5.2	4.9	5.3
<b>Total Brazil</b>	<b>4.4</b>	<b>4.6</b>	<b>4.3</b>	<b>4.4</b>	<b>4.8</b>	<b>5.4</b>	<b>5.1</b>	<b>5.5</b>	<b>5.7</b>

Rates per 100,000 inhabitant.

**Table 2 - Distribution of suicide rates in Brazilian regions by sex from 1980 to 2006<sup>54</sup>**

Regions	1980 a 1982		1983 a 1985		1986 a 1988		1989 a 1991		1992 a 1994		1995 a 1997		1998 a 2000		2001 a 2003		2004 a 2006	
	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F	M	F
North	2.5	1.2	2.7	0.9	3.0	1.1	3.4	1.0	3.5	1.2	4.0	1.3	4.3	1.4	4.7	1.5	4.9	1.4
Northeast	2.0	0.8	2.0	0.7	2.0	0.6	2.4	0.8	3.0	0.8	3.7	1.0	3.7	1.0	4.9	1.4	5.8	1.5
Southeast	5.2	2.1	5.4	2.0	5.2	1.8	5.3	1.6	6.0	1.6	6.8	1.7	6.1	1.4	6.5	1.6	6.5	1.7
South	9.0	3.4	10.8	3.6	10.1	3.3	10.4	3.4	11.2	2.9	13.4	3.2	13.9	3.1	13.4	2.9	13.2	3.0
Central-west	4.3	2.0	4.8	2.0	5.3	2.4	5.7	1.8	7.2	2.3	9.0	2.6	8.6	2.5	9.7	2.7	9.1	2.8

Rates per 100,000 inhabitants.

In spite of the increased rates seen during the period 1980-2006, Brazil still registered a low suicide rate for this period (an average rate of 4.9 per 100,000 inhabitants).<sup>18</sup> The national rate is considered low when compared to that of European countries such as Lithuania (51.6 per 100,000 inhabitants), Russia (43.1 per 100,000 inhabitants) and Belarus (41.5 per 100,000 inhabitants), as well as when compared to that of some countries in the Americas such as Argentina (8.7 per 100,000 inhabitants), Uruguay (12.8 per 100,000 inhabitants) and Canada (15.0 per 100,000 inhabitants).<sup>5</sup>

However, this study shows that there is a considerable variability in the distribution of suicide rates throughout the different Brazilian regions. Rio Grande do Sul has the highest suicide rates in Brazil, especially among farm workers and fishermen.<sup>15</sup> This high suicide rate among farm workers may, in part, result from the precarious living conditions of this population and/or from their high exposure to pesticides. This exposure may lead to depression disorders, which are triggered by neurological or endocrinal mechanisms.<sup>6,19,20</sup> The increased rates of suicide observed in the Central West region in more recent periods could be partially explained by the high mortality of the indigenous people (*Guaraní-Kaiowá*) living in the city of Dourados, state of Mato Grosso do Sul.<sup>21</sup> The suicide rate among the *Guaraní-Kaiowá* was 10 times higher than the rate registered in the state of Mato Grosso do Sul, and 19 times higher than the national rate. Those deaths have disproportionately affected adolescents and young adults from the *Guaraní-Kaiowá* indigenous community. These data (2000-2005) were based on a study developed by the National Health Foundation (FUNASA) of the Brazilian Ministry of Health.<sup>22</sup> International studies also showed high suicide rates among the indigenous people of Canada, New Zealand and Brazil. These studies pointed out to cultural disintegration, marginalization and alcohol abuse as the probable explanation for such high suicide rates.<sup>23,24</sup>

The state capital cities of Boa Vista and Porto Alegre had the highest suicide rates in the period under study, and Salvador and Rio de Janeiro had the lowest. In this study, it was impossible to establish a casual relationship among these findings. Nevertheless, we may infer that the rates found in Boa Vista might be influenced by the existence of a high suicide mortality rate among the indigenous people in the area.<sup>23-25</sup> For Porto Alegre, a possible hypothesis is that

this is due to the European influence on the Southern region, since suicide is more frequent in European countries than it is in Brazil.<sup>4</sup> Also, the South region has a high proportion of elderly people, a group whose risk for suicide is higher.<sup>15,26</sup>

Although Rio de Janeiro and Salvador have the lowest suicide rates, they reported homicide rates that are among the highest in Brazil (38.1 and 42.3 per 100,000 inhabitants, respectively). Researchers have discussed the possible existence of a relationship of inverse proportionality between homicide and suicide.<sup>27-30</sup> Within this context, it could be inferred that underemployment/unemployment, associated with the strong social inequality found in those cities, rather than in suicide, could result in higher interpersonal violence (aggravated assaults and homicides). However, more studies aiming at shedding light on the different suicide mortality rates in the capitals and regions of Brazil are needed.

In relation to gender, our study is in agreement with both national and international study findings i.e., that the suicide mortality rate is higher among men. Hawton highlights the differences between genders when it comes to suicidal tendencies.<sup>31</sup> Although women tend to attempt suicide more often than men, men succeed more often. This suggests that men have a stronger death intention and, thus, they tend to use more lethal methods. However, Canetto & Sakinofsky reported that the method lethality is not directly related to the death intention itself but to the gender-preferred suicide method.<sup>32</sup> For instance, for women, the use of medication as a method of suicide is more socially accepted than it is for men. Likewise, firearms, despite being accessible to both genders, would be more socially acceptable as a method of suicide for men than it would for women. Other factors may influence the lower suicide mortality rate among women including a lower prevalence of alcoholism, stronger religious beliefs, better social support and a higher disposition to seek help for their mental disorders and suicidal ideation.<sup>33</sup>

Even though the suicide rate among the elderly is the highest, a growing increase in the rates of the age group 20-59 has been observed in both genders. Some researchers have characterized the suicide rate increase in these groups as a global trend.<sup>1,15</sup> Studies carried out in Western and Eastern countries had reported similar results. In Taiwan, for instance, an increase in the suicide mortality rate among young men was observed from 1991 to 2005.<sup>34</sup>

The authors considered that this increase might be related to the economic crisis that that country went through. After analyzing the social-demographic and clinical profile of suicide cases in Colombia during the period 2000 to 2003, Palacio-Acosta et al. also concluded that unfavorable social-economic conditions resulted in higher mortality among young men.<sup>35</sup>

The most prevalent social-demographic characteristics of the persons who committed suicide in the studied period included having a low educational level and being single. More recently, studies have repeatedly shown that social characteristics such as a low level of education, unemployment, poverty, singlehood, divorce or widowhood are risk factors associated with suicide.<sup>36</sup> Brazil is a developing country facing serious economic problems. One to two thirds of the total population lives in extreme poverty.<sup>37</sup> More than twenty seven percent of the Brazilian workers have informal jobs. The unemployment rate is 9.8% and affects young adults disproportionately. Thirty and a half percent of Brazilians are functionally illiterate.<sup>38</sup>

The literature has shown that social-economic adversities and lack of social support increases suicide risks in those who are vulnerable such as people with a history of previous suicide attempts, mental disorders (mainly depression and anxiety) and co-morbidities such as alcohol/drug abuse/dependence.<sup>10,34,39-43</sup>

Wunderlich et al. found that those who had two mental disorders had a suicide attempt risk that is 3.5 times higher than to those who had none.<sup>44</sup> Although mental disorders are associated with more than 90% of all suicide cases, suicide may be the result of many complex social and cultural factors. Suicide is more likely to be committed during periods of social-economic, family and individual crises like in the case of the loss of a loved one.<sup>5</sup>

As shown in this investigation, the most common methods of suicide used in Brazil were hanging, fire arms, and poisoning. The methods used to commit suicide depends on specific local customs, as well as on different historical contexts.<sup>4,15</sup> Anthropological studies have shown that the choice of hanging in the South region is culturally defined.<sup>45</sup> The use of firearms may be explained by the desire of urban populations to protect themselves from violence, as well as by the fact that they are readily available in Brazil.<sup>4</sup> The

WHO reported that poisoning by pesticide constitutes an important world health concern, mainly in the developing countries.<sup>46</sup> Bertolote et al. estimated that 60% to 90% of deaths by suicide in China, Malaysia, Sri Lanka and Trinidad and Tobago were committed with the use of pesticides.<sup>47</sup> They also stated that WHO registered an increment in the number of deaths due to pesticide use in the majority of the countries in Asia, Central and South America (e.g. Brazil, El Salvador, Guatemala and Paraguay). They pointed out that handling, storage and access to pesticide, especially in rural areas, needed to be regulated in order to curtail the suicide rate using pesticide.

In this investigation, in terms of methods of choice for suicide, women only predominated over men in terms of their use of medication as a suicide method of choice.

This result is in agreement with national and international study findings on the use of medications as a method to attempt and accomplish suicide.<sup>48-52</sup> The abusive use of psychoactive medications has become a national health concern. According to the WHO, more than 500 million daily doses of tranquilizers were taken by the Brazilian population in 1990. This is three times higher than the expected.<sup>53</sup> In attempting to address this problem, the National Health Surveillance Agency (ANVISA) has tightened the control on the regulations on the production and distribution of those medicines.

In addition to already known factors such as depressive disorders and alcohol dependence/abuse, there is also the need to investigate the cultural, social and economical aspects that may influence suicidal behavior in different regions of Brazil. Our findings suggest that suicide prevention needs to be comprehensive and multi-sectorial and include both health and non-health related sectors. It needs to contemplate and take into consideration the specificity and diversity of the various Brazilian regions.

## Disclosures

Writing group member	Employment	Research grant <sup>1</sup>	Other research grant or medical continuous education <sup>2</sup>	Speaker's honoraria	Ownership interest	Consultant/ Advisory board	Other <sup>3</sup>
Giovanni Marcos Lovisi	UFRJ	-	-	-	-	-	-
Simone Agadir Santos	UFRJ	-	-	-	-	-	-
Leticia Legay	UFRJ	-	-	-	-	-	-
Lucia Abelha	Columbia University	-	-	-	-	-	-
Elie Valencia	UFRJ	-	-	-	-	-	-

\* Modest

\*\* Significant

\*\*\* Significant. Amounts given to the author's institution or to a colleague for research in which the author has participation, not directly to the author.

Note: UFRJ = Universidade federal do Rio de Janeiro.

For more information, see Instructions for authors.

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