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Trends in suicide mortality among Brazilian adults and elderly, 1980 – 2006

ABSTRACT

OBJECTIVE: To describe mortality from suicide in Brazil, with emphasis on the older adult population.

METHODS: Temporal analysis and trend analysis by polynomial regression were conducted on suicide in the population above 10 years old in Brazil and the State of Rio de Janeiro (Southeastern Brazil) from 1980-2006. The data were extracted from the Mortality Information System, and the rates calculated by gender and age per 100,000 inhabitants, considering the resident population provided by DATASUS. For the period between 1980 and 1995, the ninth revision of International Statistical Classification of Diseases and Related Health Problems was used, and for 1996 to 2006, the tenth revision.

RESULTS: Suicide rates significantly increased in Brazil and in Rio de Janeiro (respectively reaching 5.7 and 3.1 deaths per 100,000 inhabitants in 2006). The change was caused by the increase in suicides among the male population at all ages. The increase occurred especially among men over 60 years. In Rio de Janeiro, the increase was not statistically significant among men, while there was a decrease among women. The principal means utilized for suicide by men were hanging, suffocation, strangulation and firearms. For women, death by hanging also ranks first, followed by ingestion of solids or liquids, smoke or fire, and jumping from heights. The high rate of suicide by unspecified means reveals problems with data quality.

CONCLUSIONS: Suicides are important events in the male population, especially among older men over time. In Rio de Janeiro, the suicide rate is also higher in men, although the difference is not statistically significant. According to the World Health Organization and the Ministry of Health, suicide is preventable, and established interventions exist for each age group.

DESCRIPTORS: Aged. Suicide, trends. Mortality.

INTRODUCTION

Having intent to die is a key element directly linked with violence and aggression. Therefore, suicide is categorized as an “external cause” by the International Classification of Diseases (ICD), a rubric that includes forms of violence and injuries. The World Health Organization (WHO)^a classifies suicide rates in four levels: low (less than five per 100,000 inhabitants); medium (from 5 to 15); high (from 15 to 30); and very high (above 30 per 100,000). The main risk factors for suicide are: mental illnesses and conditions; use of specific medications,

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^a World Health Organization. Guidelines for the primary prevention for mental, neurological and psychological disorders. Suicide. Geneva; 1993 [cited 2010 Oct 10]. Available from: http://whqlibdoc.who.int/hq/1993/WHO_MNH_MND_93.24.pdf

drugs, alcohol and intoxication; having a degenerative and terminal illness, social problems and influence from media.^{1-3,6-8,11,12,16,22,23}

According to information from WHO,²⁵ an estimated 815,000 people committed suicide in 2000, which represents a mortality rate of approximately 14.5 per 100,000 people or “one person every 40 seconds”, when considering the statistics of countries that report this event. Worldwide rates of suicide increased 60% in the last 45 years, and in some countries it is among the top three causes of death for age 15 to 44 years.

Suicide rates are unequally distributed across the world, across countries and between sexes, age groups and method used. The highest rates concentrate in Eastern Europe.²⁵ Suicide accounts for more deaths globally than homicide and war combined. In Latin America, suicide rates are relatively low compared to homicide rates.²⁵ In Brazil, suicide accounts for a small portion (0.6%) of total deaths and corresponds to 5.6% of deaths from external causes. Brazil recorded 4.9 deaths by suicide per 100,000 inhabitants in 2008, placing it in 73rd position globally and in the group with low although increasing rates (in comparison to the medium level). The State of Rio de Janeiro has the lowest rate among all of Brazil’s federal entities (2.2 deaths per 100,000 inhabitants in 2008).^b

Age is an important factor in the profile of suicides. Data from the WHO²⁵ show indices from 0.9/100,000 inhabitants among age five to 14 years and 66.9/100,000 among people above 75 years in 1995. Since the population above age 60 years is increasing as a proportion in Brazil, it is justified to study the rates of suicide in people at this life stage.

Likewise, there are important differences by sex; rates are higher among men than women in innumerable countries, varying from 1:1 to 10.4:1.²⁵ In Brazil, the ratio was 4:1 in 2006.

Improved understanding of the topic may contribute to a prevention agenda that transcends epidemiologic studies, since as Cassorla affirms⁴ the phenomenon of suicide includes complex factors that interact through infinite ways and cannot be understood through only one approach. Therefore, as recommended, comprehensive approaches are also performed through psychological autopsies.^{7,12,18,22,23}

The objective of this article was to describe mortality by suicide in Brazil and the State of Rio de Janeiro among people age 10 years or older, with emphasis on people age 60 years or older.

METHODS

Temporal analysis was performed of suicide mortality among people age over 10 years, with emphasis on the population age 60 years or older from 1980 to 2006, in Brazil and the State of Rio de Janeiro. The state was chosen due to its unique characteristic of having the highest proportion of its population in this age group and the lowest (and decreasing) suicide rates among the federal entities.

The data on suicides used to populate the historical series were extracted from the *Sistema de Informações sobre Mortalidade* (Mortality Information System of the Ministry of Health – SIM/MS). The population estimates by sex and age group were obtained from the *Instituto Brasileiro de Geografia e Estatística* (IBGE – Brazilian Institute of Geography and Statistics). The rates for Brazil and Rio de Janeiro were calculated according to sex and age group and presented per 100,000 inhabitants. To calculate the mortality rate, the number of suicide deaths per year was the numerator and the population the denominator. Information on mortality from 1980 to 1995, followed the 9th revision of the ICD (ICD-9, E950-E959) and from 1996 to 2006, the 10th revision (ICD-10, X60-X84 and Y87).¹⁵

Proportional mortality was calculated to analyze the suicide method used (ICD category). The ratio between the male and female rates was calculated for each year, in order to evaluate changes over time.

Trend analysis was performed by polynomial regression, which describes the curve that best fits the data in order to reveal the relationship between the dependent and independent variables. The suicide mortality rates were the dependent variable and the calendar year the independent variable. The variable year was transformed to avoid self-correlation between the terms of the equation, and a centralized version was utilized (year minus the midpoint of the study period). Model selection utilized dispersion diagrams, the coefficient of determination (R^2) and analysis of residuals (verification of homeodasticity). The simple linear regression models were tested at the second and third orders and with exponential functions. The trend was considered significant when $p < 0.05$.

SPSS for Windows® (version 19.0) was used to calculate suicide mortality rates and for trends analysis. The figures for the historical series were constructed with Excel® 2007.

^b Minayo MCS, Assis SG, Souza ERS, Correia BSC, Pacheco ML, Godinho PGD. Suicídios no Brasil: mortalidade, tentativas, ideação, comportamento autopunitivo e prevenção. Brasília (DF): RIPS/OPAS/MS; 2010.

RESULTS

There were small and continual increases in suicide mortality rates among all age groups (4.4/100,000 in 1980 to 5.8 in 2006). Over the period, 158,952 people died in Brazil and 8,353 in Rio de Janeiro, with an annual average of 5,887.1 and 309.4, respectively (among people above age 10 years) (Figure 1).

Throughout the 1980s, 43,131 deaths occurred by suicide among all age groups in Brazil (mean of 4,313.1 deaths/year), increasing to 60,543 in the 1990s (mean of 6,054.3 deaths/year). From 2000 to 2006, 55,278 suicides occurred in the total population (mean of 7,896.9 deaths/year), indicating a continued increase in these events. A similar situation was observed in Rio de Janeiro, although at lower levels: 2,503 deaths by suicide (mean of 250.3 deaths/year) in the 1980s; 2,956 (mean of 295.6 deaths/year) in the 1990s; and 2,894 (mean of 413.3 deaths/year) between 2000 and 2006.

The profile of suicide in Brazil was more stable than in Rio de Janeiro over the same period (Figure 1). The rate in the state fluctuated due to the small number of cases: 3/100,000 over the period, lower than the national average.

The trend analysis (Table 1) indicated increased suicide rates: the curve for Brazil highlighted the increase ($R^2 = 0.827$; $p < 0.001$) in comparison to the curve for Rio de Janeiro ($R^2 = 0.420$; $p = 0.005$).

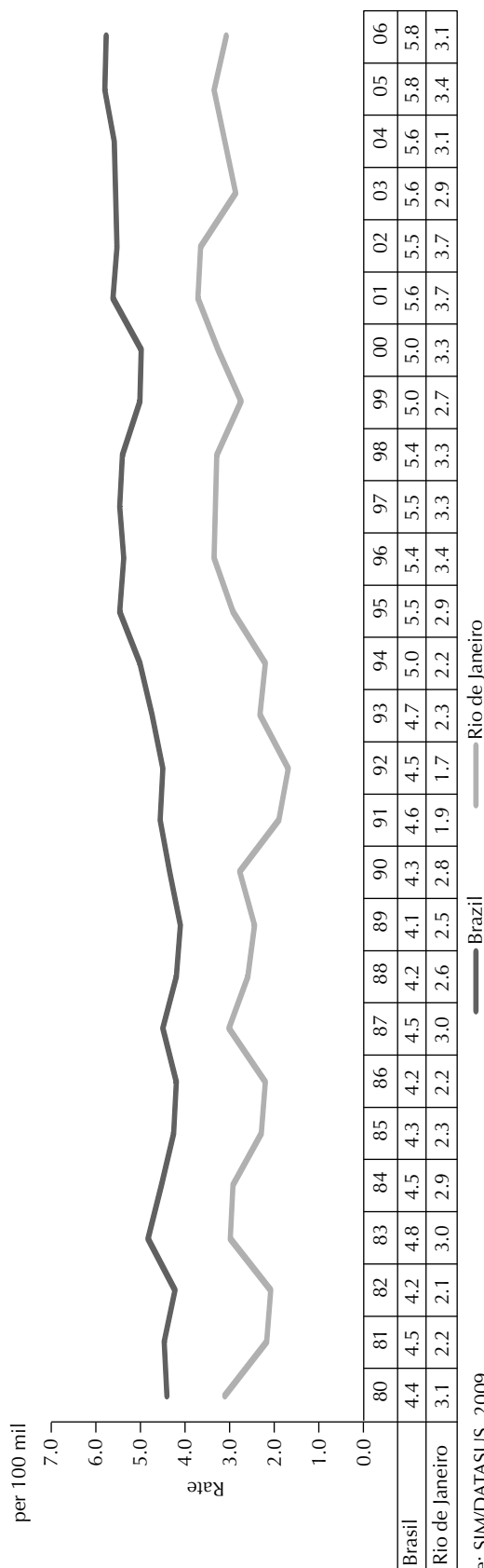
A progressive increase in deaths occurred among males of all ages in Brazil, from 6.2/100,000 in 1980 to 9.3/100,000 in 2006. The rates for Brazilian women fluctuated slightly and presented a small decrease: 2.6/100,000 in 1980 and 2.3/100,000 in 2006 (Figure 2).

Large variations in the suicide rates were observed among males in Rio de Janeiro, with the highest rate in 2001 (5.7/100,000) and the lowest in 1992 (2.7/100,000). The highest rate in females occurred in 1980 (2.3/100,000). The rate remained around 1.6/100,000 from 2000 to 2006. Data on suicides among women in Rio de Janeiro also fluctuated.

The trend analysis (Table 1) showed increases among men across Brazil and in Rio de Janeiro ($R^2 = 0.891$ and 0.451, respectively; $p < 0.001$). The profile was distinct for women: a decreasing trend nationally and increasing in Rio de Janeiro ($R^2 = 0.551$; $p < 0.001$ e $R^2 = 0.307$; $p < 0.035$, respectively).

In 1980, the death ratio was 2.4 men to women in Brazil and 1.7 in Rio de Janeiro. The ratio increased to four nationally and 2.9 in the state in 2006.

Deaths from self-inflicted injuries significantly increased among older adults: 5,953 suicides among older



Source: SIM/DATASUS, 2009

Figure 1. Suicide mortality rate in Brazil and Rio de Janeiro State, 1980-2006.

Table 1. Trends analysis of suicide mortality rates. Brazil and Rio de Janeiro State, 1980-2006.

| Group | Model | R ² | p | Trend |
|--------------------------------|---|----------------|---------|-----------------|
| Brazil | $4.784 + 0.096x + 0.002x^2 - 0.0003x^3$ | 0.827 | < 0.001 | Increasing |
| Rio de Janeiro | $2.647 + 0.079x + 0.003x^2 + 0.0004x^3$ | 0.420 | 0.005 | Increasing |
| Brazil – Men (years) | | | | |
| Total | $7.625 + 0.193x + 0.001x^2 - 0.001x^3$ | 0.891 | < 0.001 | Increasing |
| < 60 | $7.140 + 0.193x + 0.001x^2 - 0.001x^3$ | 0.885 | < 0.001 | Increasing |
| ≥ 60 | $12.463 + 0.139x$ | 0.588 | < 0.001 | Increasing |
| Brazil – Women (years) | | | | |
| Total | $2.070 - 0.006x + 0.003x^2$ | 0.551 | < 0.001 | Decreasing |
| < 60 | $1.975 + 0.007x + 0.003x^2 - 0.0001x^3$ | 0.656 | < 0.001 | Increasing |
| ≥ 60 | $2.774 - 0.022x$ | 0.248 | < 0.008 | Decreasing |
| Rio de Janeiro – Men (years) | | | | |
| Total | $4.219 + 0.077x$ | 0.451 | < 0.001 | Increasing |
| < 60 | $3.844 + 0.070x$ | 0.454 | < 0.001 | Increasing |
| ≥ 60 | $7.633 + 0.089x$ | 0.118 | 0.080 | Not significant |
| Rio de Janeiro – Women (years) | | | | |
| Total | $1.323 + 0.03x + 0.003x^2 - 0.0003x^3$ | 0.307 | 0.035 | Increasing |
| < 60 | $1.269 + 0.039x + 0.003x^2 - 0.0003x^3$ | 0.342 | 0.020 | Increasing |
| ≥ 60 | $1.981 - 0.033x$ | 0.165 | 0.036 | Decreasing |

adults in Brazil (average of 595.3 deaths/year) in the 1980s; 8,547 (average of 854.7 deaths/year in the 1990s); and 7,994 from 2000 to 2006, corresponding to an annual average of 1,142 deaths.

In Rio de Janeiro 427 older adults committed suicide during the 1980s, 522 in the 1990s and 517 between 2000 and 2006 (annual incidence increased from 42 deaths during the 1980s to 74 deaths from 2000 and 2006).

Suicides among younger men fluctuated between 5.7/100,000 and 8.8/100,000. Among older men, the rate reached 12.1/100,000 in 1980. The rates relative to the older male population increased beginning in 1995, and the peak of the increase occurred in 2005, with a rate of 15.4/100,000 inhabitants (Figure 3).

The patterns for men and women had substantial differences, and rates were smaller among females, fluctuating between 2.5/100,000 and 3/100,000 among all age groups during the study period.

The increase in suicide rates among men was reflected in the increased rates among the total population, contrary to the rates among females which were more or less constant with a small decreasing trend. The death ratio was four men to women in 1980 and 5.4:1 in 2006.

The trends analysis showed a significant increase in suicides among older Brazilian men ($R^2 = 0.588$; $p < 0.001$) and men less than 60 years ($R^2 = 0.885$; $p < 0.001$) (Table 1). Older women experienced decreased rates ($R^2 = 0.248$; $p = 0.008$), although among younger women there was an increasing trend ($R^2 = 0.656$; $p = 0.001$).

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Suicide rates fluctuated in Rio de Janeiro among people both younger and older than age 60 years (Figure 4). The rates in men age less than 60 years presented a slightly increased curve in the series after 1995, with peaks in 1987, 12.1/100,000; in 1998, 11.2/100,000; and in 2005, 11.0/100,000. The rates went from 7.4/100,000 in 1980 to 11/100,000 in 2005 and returned to 7.1/100,000 in 2006, demonstrating the oscillation. The data for women of all age groups in Rio de Janeiro also oscillated, and there were 1.9 suicides among men for each woman in 1980, increasing to 3.4:1 in 2006.

The trend analysis showed increased suicide among men younger than 60 years ($R^2 = 0.454$; $p < 0.001$) and among women of the same age group ($R^2 = 0.342$; $p = 0.020$) in Rio de Janeiro (Table 2). Among older women, there was a significant decrease ($R^2 = 0.165$; $p = 0.036$), which was not observed in men.

Deaths by hanging and by firearm, according to the ICD categorization, were the first and second most common methods used among older men from 1980 to 1995 (Table 2). Among older men in Rio de Janeiro, hanging was more frequent, followed by other unspecified means and then suicide by firearms.

The most common means of suicide among men were hanging; smoke, fire and flames; firearms; and other unspecified means. Among women the most common

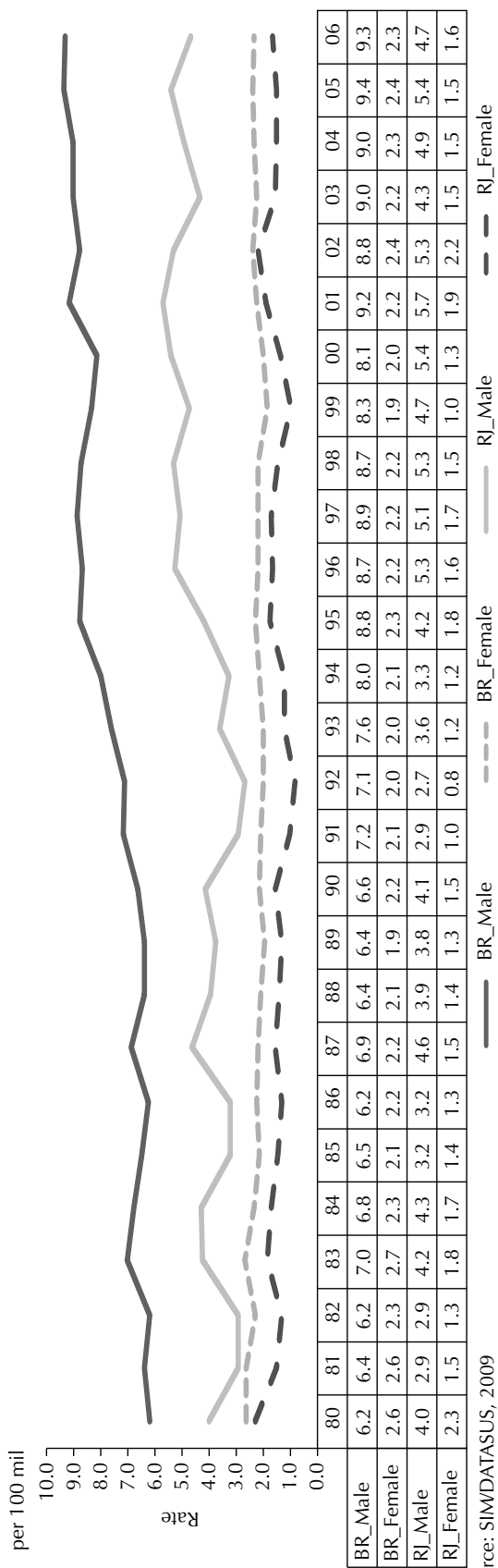


Figure 2. Suicide mortality rate in Brazil and Rio de Janeiro State, according to sex, 1980-2006.

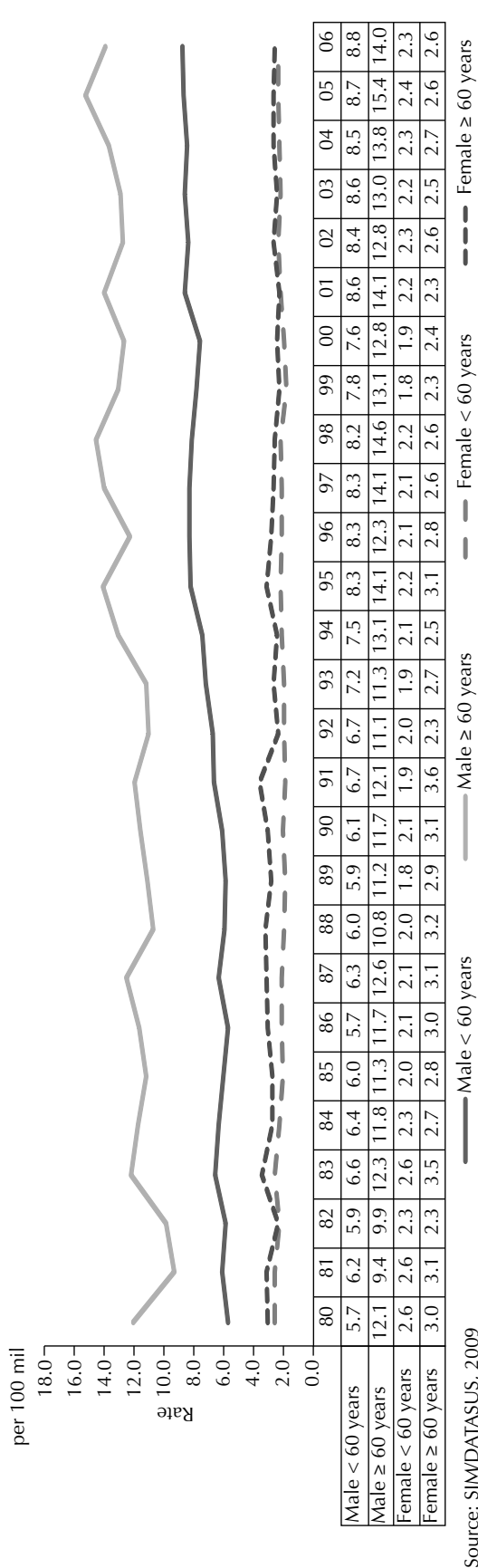


Figure 3. Suicide mortality rate in Brazil according to sex and age group, 1980-2006.

Table 2. Cause of death as a percentage of suicides, according to the categories of the International Statistical Classification of Diseases and Related Health Problems. Brazil and Rio de Janeiro State, 1980-2006.

| Category | Brazil (%) | | | Rio de Janeiro (%) | | |
|--|------------|------|--------|--------------------|------|--------|
| | Total | Male | Female | Total | Male | Female |
| ICD-9 1980-1995 ^a | | | | | | |
| E953 Hanging, strangulation and suffocation | 51.7 | 52.3 | 49.8 | 29.3 | 34.8 | 16.1 |
| E958 Other and unspecified means | 17.9 | 16.2 | 23.9 | 32.9 | 26.8 | 47.3 |
| E955 Firearms and explosives | 16.6 | 19.6 | 6.1 | 16.2 | 20.1 | 6.8 |
| E950 Ingestion of solids or liquids | 7.5 | 6.7 | 10.2 | 6.1 | 5.9 | 6.3 |
| E957 Jumping from high place | 1.7 | 1.3 | 3.2 | 10.7 | 8.8 | 15.1 |
| ICD-10 1996-2006 ^b | | | | | | |
| X70 Hanging, strangulation and suffocation | 56.2 | 57.8 | 49.4 | 34.0 | 38.4 | 17.6 |
| X74 Other and unspecified firearm discharge | 13.4 | 15.4 | 4.4 | 15.6 | 18.9 | 3.1 |
| X84 Unspecified means | 5.0 | 4.8 | 5.9 | 12.8 | 12.9 | 12.6 |
| X68 Intentional self-poisoning by and exposure to pesticides | 4.8 | 4.7 | 5.3 | 7.0 | 5.7 | 11.9 |
| X72 Handgun discharge | 3.1 | 3.5 | 1.3 | 3.2 | 3.5 | 1.9 |
| X69 Exposure to other and unspecified chemicals and noxious substances | 3.0 | 2.8 | 4.0 | 3.3 | 2.7 | 5.7 |
| X80 Jumping from a high place | 2.8 | 2.0 | 6.4 | 8.6 | 5.5 | 20.1 |
| X76 Smoke, fire and flames | 2.6 | 1.2 | 9.2 | 4.2 | 3.0 | 8.8 |

ICD: International Statistical Classification of Diseases and Related Health Problems

^a Period 1980-1995: Brazil - N_Total = 10671; N_Male = 8276; N_Female = 2396; Rio de Janeiro - N_Total = 693; N_Male = 488; N_Female = 205

^b Period 1996-2006: Brazil - N_Total = 11591; N_Male = 9502; N_Female = 2087; Rio de Janeiro - N_Total = 758; N_Male = 599; N_Female = 159

means was hanging followed by smoke, fire and flames. Jumping from a high place was the principal means among older women in Rio de Janeiro, followed by hanging, strangling and suffocation.

DISCUSSION

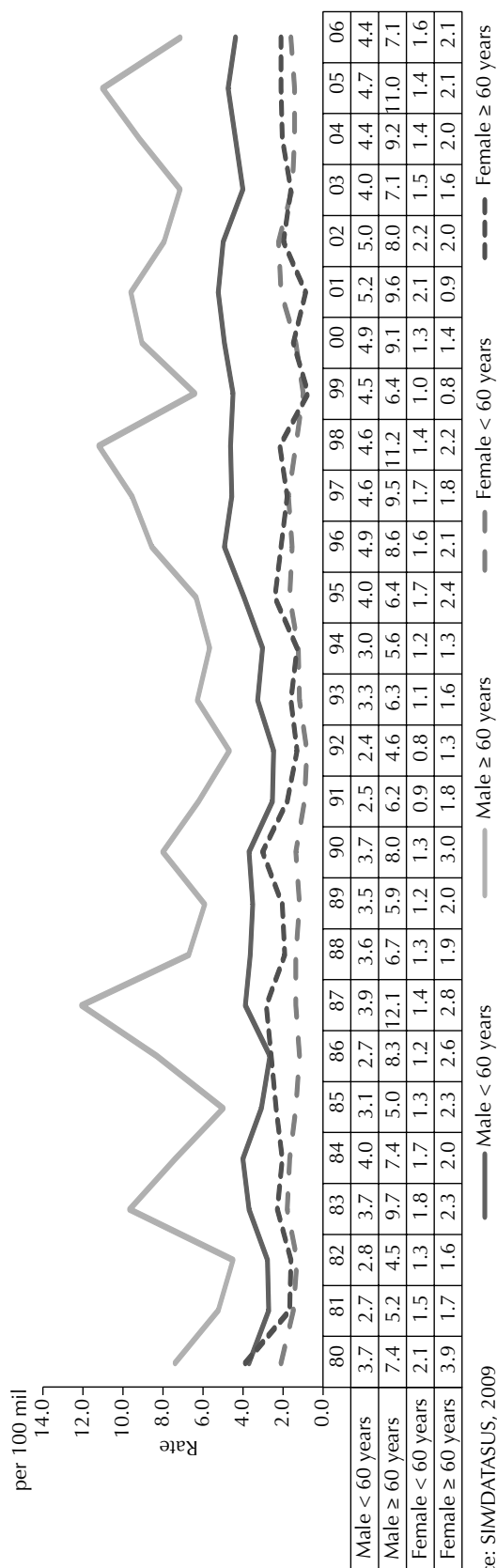
The profile of suicide over time differs in Brazil and Rio de Janeiro State, and there are differences by age group, sex and means of perpetration. Nonetheless these differences reflect reality, as emphasized by Durkheim's research,¹⁰ in which he defends the structural character of violence in general and suicide in particular. According to Durkheim, variations are explained by particular social processes and not only demographics, and these variations suggest sociocultural changes and profound crises in contemporary society, in this case in regards to older adults. The WHO considers the increase in deaths among older adults as notable in comparison to 50 years ago, when there was little variation by age.²⁵

The present study agrees with international studies and shows an increased suicide rate in the Brazilian population (4.4 to 5.8 per 100,000 inhabitants during the period), which places Brazil in the second level as defined by WHO (between five and 15 per 100,000

inhabitants). This increase affects men of all ages and younger women. For the overall population in Rio de Janeiro, the increase is more considerable in the younger population. The increase in the rates among older Brazilian males was marked, in contrast to the rates of older women which remained structurally low (between two or three per 100,000 inhabitants) with a decreasing trend in Rio de Janeiro and the nation. The principal mean utilized in suicide in Brazil is strangulation, which also occurs globally. In the United States, though, the most common method used by older men is firearms and in China, poisoning by pesticides. Around the world, older women tend to utilize less traumatic means.²⁵

The prominence of suicide among men and the decreasing trend among women occurred both in Rio de Janeiro and Brazil. Nonetheless, there were differences in the magnitude of the overall rates and the rate in men, when comparing Brazil to Rio de Janeiro. In males the national rates are almost twice the rates in Rio de Janeiro, and the rates among women in Rio de Janeiro are slightly less than the rates for females across Brazil.

The methods utilized by women in Rio de Janeiro (jumping from a high place, strangulation and drug poisoning) differ from those utilized by men (strangulation and firearms). The means among men also differ from the means used by females nationally (hanging,



Source: SIM/DATASUS, 2009

Figure 4. Suicide mortality rate in Rio de Janeiro State, according to sex and age group, 1980-2006.

followed by smoke, fire and flames). In contrast, the most common means among older adults in Rio de Janeiro are frequently reported by WHO²⁵ in men and women of this age group globally, although several differences exist between countries.

The lower occurrence of suicide among women – in Rio de Janeiro and nationally – is attributed to the low prevalence of alcoholism, flexible attitudes in regards to social abilities, religion and the performance of their culturally distinct roles. Women also have greater facility to recognize signs of depression, seeking help and social support in moments of crises with greater frequency.^{11,17,18,23} The results observed in males involve macho and aggressive behaviors such as competition, impulsiveness and an affinity for firearms. In older age adults, when professional life ends, many men associate the new moment in life as a failure of their traditional role as the economic provider and as a reference for the family, and they retract socially, which increases risk of isolation, sadness, stress and desire to end life.^{11,16,17,19,23}

The low rates of self-inflicted deaths among older adults in Rio de Janeiro is a positive social occurrence, especially because the highest proportion of older adults live in this state, when compared to other federal entities. Data from this study do not provide an understanding of the significance of the state context, which is in a way privileged. There is a trend to attribute low rates of suicide to climate and the weather. In his study, Durkheim¹⁰ showed that these two elements did not influence suicide in France. Researchers such as Chesnais⁵ also analyzed the relationship between these two elements and self-inflicted deaths, but did not find a significant association. A social environment that is happy, open and welcoming, though, appears to have a consistent protective association.^{6,7,19,21-23} The culturally diverse surroundings, the multiple possibilities for recreation and the outdoor lifestyle in Rio de Janeiro may be factors protective of suicide. Nonetheless this hypothesis should be cautiously examined, since the quality of death records in the state is considered unsatisfactory, with 10.4% of deaths from unspecified cause among men and 11.9% among women.²⁰ Difficulties were also encountered with the high level of suicides by unspecified causes in the state, indicating weaknesses in detecting this mode of death.

The use of two classifications (ICD-9 and ICD-10) complicated simple comparison. The most recent system (ICD-10) expanded the number of categories in regards to the previous one, improving the description and providing more detail on the circumstances of the event. Nonetheless, when considering suicide, the problem is not only greater precision in classification. According to Cassorla,⁴ more than 50% of suicides with a high degree of intentionality are classified as

accidents. Family, friends and health professionals tend to misclassify due to social disapproval.

It is necessary to understand the situation of older men – the most vulnerable group – and to treat the post-professional moment and retirement time as opportunities for new realizations. The creation of friendships, relationships, human contact and intergenerational dialogue should be cultivated as protective of depression and self-destruction among older adults. This recommendation was reinforced by the research of Duberstein et al⁹ and Beeston,² who argue that a social support network for these people should be established as a priority (p.39).²

In addition to investment in primary care and in secondary health prevention, it is important to equip mental health units to work with older adults and against depression in daily life, as recommended by WHO.^a Depression is considered the principal contributory factor for suicide^{2,3,6,11,12,20,21,23,24} and as an illness that results from aspects related to health and social life. Its

causes are innumerable and can be found in genetic, biologic or psychological factors and in social and environmental circumstances.^{2,9,13,23} Minor depression leads to isolation, which is associated with suicide in extreme cases.^{13,14} In the older population, the influence of these factors is stronger, not because they are naturally depressive due to age, as recalled by Beeston,² but because profound changes tend to occur in the way people live and face their lives

It is necessary to provide specialized attention to this critical social group so that older adults receive guidance and motivation to live and not die.³ A strategy to approach aging in a comprehensive and systematic way is necessary, in order to improve quality of life and the delivery of careful and effective care that works to improve life and prevent suicide.

Research about suicide in older Brazilian adults is incipient and should supplement epidemiologic, clinical, environmental and psychological studies.

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