Suicide mortality trends in people aged 60 years or more in the Brazilian states: 1980 to 2009

Evolução temporal da mortalidade por suicídio em pessoas com 60 anos ou mais nos estados brasileiros, 1980 a 2009

Liana Wernersbach Pinto [1]
Thiago de Oliveira Pires [1]
Cosme Marcelo Furtado Passos da Silva [2]
Simone Gonçalves de Assis [1]

Abstract *The scope of this paper is to determine the temporal evolution of mortality by suicide in people aged 60 or more per State in Brazil between 1980 and 2009. Historical mortality by suicide data (ICD-9 codes E950 to E959 and ICD-10 codes X60 to X84 and Y87.0) were obtained from the Mortality Information System (SIM / MS). Data regarding population counts were obtained from the Brazilian Institute of Geography and Statistics. In the assessment of temporal trends the Poisson regression model was used, in which the dependent variable was the number of deaths and the centralized calendar year was the explanatory variable. Statistically significant trends were considered those whose p-value was d" 0.05. The results revealed the presence of a statistically significant increasing trend in four states and a decrease in two (general population; 60 years or more). In the male population there was an increase in five states and a reduction in two. The female rate showed an increase in one state and a decrease in three. There was an increasing trend in Piauí, Ceará and Rio Grande do Norte and a reduction in Amazonas, Roraima, and São Paulo for people aged between 60 and 69. Increasing rates were observed in the population aged 70-79 in Piauí and decreasing trends in Roraima.*

Key words *Suicide, The elderly, Temporal trends, Poisson regression*

Resumo *Este artigo objetiva verificar a evolução temporal da mortalidade por suicídio em pessoas com 60 anos ou mais segundo a unidade da federação no período de 1980 a 2009. Na construção das séries históricas empregaram-se dados da mortalidade por suicídio (CID-9 códigos E950 a E959 e CID-10 códigos X60 a X84 e Y87.0) obtidos do Sistema de Informação sobre Mortalidade (SIM/MS). Dados referentes à contagem populacional foram obtidos do Instituto Brasileiro de Geografia e Estatística. Na avaliação da tendência temporal empregou-se o modelo de regressão de Poisson, no qual a variável resposta foi o número de óbitos e a variável explanatória o ano calendário centralizado. Foram consideradas tendências estatisticamente significativas aquelas cujo p-valor < 0,05. Os resultados mostram a presença de tendência estatisticamente significativa de aumento para quatro estados e de queda para dois (população geral; 60 anos ou mais). Na população masculina houve aumento em cinco e redução em dois. As taxas femininas exibiram aumento em um estado e queda em três. Verificou-se tendência de aumento no Piauí, Ceará e Rio Grande do Norte e de redução no Amazonas, São Paulo e Roraima para aqueles com idades entre 60 e 69 anos. Observaram-se taxas crescentes na população de 70 a 79 anos do Piauí e decrescentes em Roraima.*

Palavras-chave *Suicídio, Idosos, Tendência temporal, Regressão de Poisson*

[1] Centro Latino-Americano de Estudos de Violência e Saúde Jorge Careli, Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz. Avenida Brasil 4.036/700, Manguinhos. 21040-361 Rio de Janeiro RJ. lianawp@fiocruz.br
[2] Departamento de Epidemiologia e Métodos Quantitativos, Escola Nacional de Saúde Pública, Fundação Oswaldo Cruz.

Introduction

Suicide is a form of self-inflicted violence in which individuals intentionally take their own lives. Suicidal behavior ranges from ideations about killing oneself to coming up with a plan and obtaining the means to perform the act[1]. It is today an important public health problem worldwide[2].

According to the WHO elderly individuals are the population group with the highest risk of suicide. Despite this fact, the phenomenon still receives little attention from public health authorities, researchers and the media, who usually prioritize younger population groups in their considerations and actions[3].

In Brazil approximately 1,200 people who are 60 or older die each year of suicide[4]. According to the WHO, the worldwide suicide rate in 2000[5] among men aged 65 or older was 41 deaths for every 100,000 inhabitants. This rate is even higher if one takes into account only those aged 75 or older (50 deaths/100,000 inhabitants)[5]. Among women rates are usually lower; among women aged 75 or older the global female rate reaches a maximum of 15.8 deaths for each 100,000 inhabitants[5]. Still according to the WHO suicide rates (not considering the issue of age range) have increased by approximately 60% in the last 45 years[5].

The WHO provides data about suicide mortality trends for 104 countries[6]. Among those 91 have data generated from 2000 onward, that is, they provide information that may be considered recent and updated since this is a phenomenon that usually has a pattern across time. The steadiness with which data about suicide are sent to the WHO varies widely among member countries; only 11 have been providing information on a regular basis since 1950. There is nearly no information about countries in Africa. There is little data about Southeast Asia and the East Mediterranean region. Information about the phenomenon in Latin American countries and parts of the Western Pacific[7] is considered irregular.

A study conducted by De Leo et al.[8] analyzes suicide mortality in 32 countries and showed a decrease in suicide deaths among male and female populations older than 65 form the 1980's decade onward. According to the author, countries such as Australia, Singapore and United States have shown a decrease in male rates and Australia and Ireland have shown a decrease in female rates. Of all 32 countries included in the study only six showed an increase in male rates when comparing the first and final years within the study period (Ireland, Canada, Sweden, Hong Kong, Japan and South Korea). For women over 65 nine countries showed increased rates (Northern Ireland, Canada, New Zealand, Denmark, Finland, Greece, Hong Kong, Japan and South Korea).

A few national studies show details about suicide among the elderly. When analyzing suicide mortality from 1980 to 2006 in Brazilian regions and capital cities Lovisi et al.[2] found that deaths in the age range above 70 were predominant (average of 7.8 deaths in the period analyzed). According to those authors, when the first and final years were compared the age group from 20 to 59 had greater increase (30%) than the group of individuals over 60 (19%). Mello-Santos et al.[9] identified that elderly individuals over 65 years old had the highest suicide rates in the period ranging from 1980-2000 in Brazil when compared with other age ranges. A study conducted in Rio Grande do Sul about epidemiological features of suicide showed that the highest coefficients of mortality were found among the elderly; however authors state that rates are also increasing among the young[10]. A similar study conducted in the State of Santa Catarina showed the presence of increasingly higher coefficients with advancing age for both sexes in studied years[11].

This article proposes to analyze suicide mortality trends in individuals aged 60 or older from 1980 to 2009, by Brazilian state.

Methods

This paper presents an analysis of suicide mortality trends of individuals aged 60 or older from 1980 to 2009 by state (UF). Data about completed suicides that form time series were gathered from the Ministry of Health's Mortality Information System (SIM/MS), available from the DATASUS website[4]. From 1980 to 1995 the 9th Revision of the International Classification of Diseases (ICD) was used - events with codes E950-E959; from 1996 to 2009 ICD's 10th Revision was used - codes X60 to X84 and Y87.0.

When calculating suicide mortality rates we considered as numerator the number of deaths by suicide in a given year and as denominator the estimated population provided by the Brazilian Institute for Geography and Statistics (Fundação Instituto Brasileiro de Geografia e Estatística (IBGE)[12] for that particular year. We calculated suicide mortality rates according to sex (male, female) and age range (60-69 years old, 70-79 years old and 80 or older). Rates were standard-

ized by age according to WHO criteria[13] using Brazil's 2000 population as standard.

When conducting the initial exploratory analysis of time series using the autocorrelation function (ACF) and the Durbin-Watson test[14], we verified the presence of time dependence in series. Data were used as rates to conduct an initial exploratory analysis of time series.

The number of suicide deaths refers to a counting event; therefore we performed trend analysis by Poisson's regression method. We have used as dependent variable the expected values[15] for the number of deaths in each UF and as independent variable the centralized year[16]. We have identified trends in series (stable, increasing or decreasing) by analyzing relative risk obtained based on the coefficient of the regression model (RR = exponential of the coefficient of regression), as well as its 95% confidence interval (CI). We considered as decreasing trend series those whose relative risk values were less than 1, as well as the lower and upper CI limits. To diagnose an increasing trend, coefficient values and CI limits should be greater than 1. We considered as stable series whose lower CI limits were under 1 and whose upper limits were above 1.

This research was approved by the Research Ethics Committee of the National School of Public Health/Oswaldo Cruz Foundation, according to opinion number 119/10.

To perform analyses we used the *stats* and *lmtest* libraries of public domain software R 2.12.2[17].

Results

Figure 1 shows suicide mortality trends in Brazil among the elderly (aged 60 or older) according to sex. One notices that rates for the male population are substantially higher than those for the female population throughout the entire period of analysis. One also notices that male rates were above 10 deaths for every 100,000 inhabitants throughout the entire period of analysis, except for 1981 when they reached a low of 9.8 deaths for every 100,000 inhabitants. Female rates varied significantly throughout the years; overall, however, they ranged from 0 to 8 deaths for every 100,000 inhabitants throughout the entire period. The full line corresponds to the general population and is practically constant throughout 30 years, with rates ranging from 6 to 8 deaths for every 100,000 inhabitants.

Table 1 shows suicide rates among the elderly (aged 60 or older) by state in selected years (1980, 1990, 2000 and 2009) for the general population, male and female.

For states in the North region one observes floating rates ranging from zero to 184.1 deaths for every 100,000 inhabitants. This oscillation suggests issues with suicide reporting data in that region; it could also be caused by the effects of having a small population where a single case may cause the rate to change considerably.

Considering the overall population only, one notices an increase in suicide mortality rates across all states in the Northeast between 1980 and 2009. The same occurred with the male population. In six out of nine northeastern states rates were higher than 10 deaths for every 100,000 inhabitants among the male population in 2009. The highest rate was found in the State of Rio Grande do

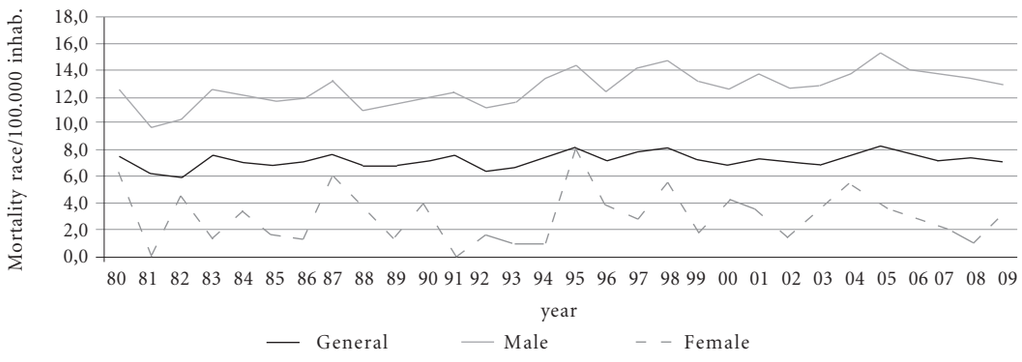

Figure 1. Suicide mortality trend of the Brazilian population aged 60 or older according to sex, 1980-2009.

Norte: 21.5 deaths for every 100,000 inhabitants, among males. Female rates ranged from zero to 4.3 deaths for every 100,000 inhabitants. Among women the highest rate was found in the State of Sergipe in 2009 (4.3).

Rates in the Southeast were low, fluctuating around 5 deaths for every 100,000 inhabitants in studied years. The lowest rate is found in the State of Rio de Janeiro (2.1) in 2009 and the highest is in São Paulo (10.1) in 1980. Rates are higher among the male population, especially in the State of São Paulo where rates remain above 10 deaths for every 100,000 in all four years presented. The rate was also above 10 in 2009 in the State of Minas Gerais (12.1). Once again female rates were much lower than male rates. The highest figure appeared in 1980 in São Paulo (4.1).

For the South region where rates are substantially higher in all states one notices a decrease in suicide rates among the overall population. However, rates are still high; over 14 deaths for every 100,000 inhabitants in the States of Santa Catarina and Rio Grande do Sul. One also observes a decrease in rates among male and female populations. However, rates are still at alarming levels in the States of Rio Grande do Sul (35.6) and Santa Catarina (27.3) among the male population in 2009.

In the Middle West region rates in the State of Mato Grosso do Sul (overall population) are particularly striking, at over 15 deaths for every 100,000 inhabitants in 2009. Among the male population the rate is above 10 deaths for every 100,000 inhabitants across all states; the highest

Table 1. Suicide mortality rates in people aged 60 or older for selected years (1980, 1990, 2000 and 2009) by state.

	Region/State	General population				Male				Female			
		1980	1990	2000	2009	1980	1990	2000	2009	1980	1990	2000	2009
Norte	Rondônia	0,0	4,0	4,0	5,4	0,0	0,0	7,1	6,2	0,0	9,6	0,0	4,3
	Acre	0,0	9,5	0,0	2,3	0,0	17,3	0,0	4,7	0,0	0,0	0,0	0,0
	Amazonas	6,2	4,0	4,2	3,2	8,9	8,4	5,6	5,5	3,3	0,0	2,8	1,0
	Roraima	84,2	0,0	9,4	0,0	184,1	0,0	19,3	0,0	0,0	0,0	0,0	0,0
	Pará	3,6	3,5	2,6	3,5	6,1	5,4	4,8	6,3	1,2	1,7	0,6	0,8
	Amapá	0,0	0,0	4,8	3,4	0,0	0,0	9,7	6,9	0,0	0,0	0,0	0,0
	Tocantins*	-	0,0	8,9	5,8	-	0,0	17,0	9,3	-	0,0	0,0	2,0
Northeast	Maranhão	1,8	2,0	1,7	4,9	1,8	4,1	2,5	7,8	1,7	0,0	0,9	2,4
	Piauí	0,8	2,4	5,9	10,1	1,6	2,5	9,9	18,7	0,0	2,3	2,3	2,7
	Ceará	2,4	3,1	5,4	5,9	3,0	6,2	10,0	11,8	1,8	0,4	1,6	1,4
	R.Grande do Norte	4,2	5,2	6,3	10,4	5,5	7,5	11,0	21,5	2,8	3,0	2,3	1,9
	Paraíba	5,5	7,7	1,4	7,3	8,5	14,2	3,2	13,1	2,6	2,0	0,0	2,7
	Pernambuco	2,6	6,2	6,8	5,1	4,5	10,5	12,1	9,0	0,9	2,7	2,8	2,0
	Alagoas	3,9	2,6	3,4	6,4	6,3	5,6	5,4	10,9	1,5	0,0	1,8	2,9
	Sergipe	0,0	3,1	2,0	10,5	0,0	4,4	3,2	18,3	0,0	1,9	1,1	4,3
	Bahia	1,2	1,6	3,4	4,5	2,2	2,4	6,5	8,1	0,3	1,0	0,8	1,5
Southeast	Minas Gerais	5,9	5,1	3,1	6,7	10,3	9,5	5,7	12,1	1,9	1,1	0,9	2,4
	Espírito Santo	8,6	2,4	5,6	5,8	15,9	2,8	11,6	9,1	1,6	2,3	0,8	3,1
	Rio de Janeiro	5,5	5,3	4,5	2,1	7,9	8,8	9,0	3,9	3,9	3,0	1,4	0,8
	São Paulo	10,1	7,3	6,2	6,6	17,6	12,5	11,6	11,6	4,1	3,4	2,1	2,7
South	Paraná	11,4	13,5	8,2	7,0	19,3	23,8	15,6	12,3	3,1	3,9	1,8	2,5
	Santa Catarina	10,8	19,8	18,1	14,5	19,0	30,4	32,6	27,3	3,7	10,9	6,3	3,8
	Rio Grande do Sul	22,4	18,8	22,1	18,1	41,3	33,0	41,6	35,6	7,5	8,7	8,2	5,3
Middle West	Mato Grosso do Sul	21,4	6,4	15,3	15,2	33,1	12,4	25,7	24,0	7,0	0,0	5,1	7,1
	Mato Grosso	0,0	9,0	6,5	9,2	0,0	16,6	11,0	16,9	0,0	0,0	1,3	1,0
	Goiás	4,3	9,5	11,2	7,2	6,2	15,8	19,4	13,1	2,3	3,2	3,2	1,8
	Distrito Federal	2,4	5,4	6,9	5,1	5,3	3,0	15,2	9,7	0,0	6,8	1,5	1,9
	Brazil	**7,4**	**7,1**	**6,9**	**7,1**	**12,5**	**12,0**	**12,6**	**12,9**	**3,0**	**3,1**	**2,3**	**2,4**

* Tocantins state was created in 1988.

Ciência & Saúde Coletiva, 17(8):1973-1981, 2012

rate is found in 2009 in the state of Mato Grosso do Sul. The highest female rate is also found in this state (7.1).

Brazilian rates for people aged 60 or older are approximately at 7 deaths in every 100,000 inhabitants throughout the entire period. Among the male population the rate remained at approximately 12 deaths for every 100,000 inhabitants in presented years. One notices a decrease in female rates, which fell from 3.0 (1980) to 2.4/100,000 inhabitants (2009).

Poisson's regression model adjustment to data about suicide among the population aged 60 or older, presented in Table 2, has shown there is an increasing trend in the following states: Tocantins, Piauí, Ceará and Bahia. A decreasing trend was found in Roraima and Rio Grande do Sul. Other states had stable rates, without any statistically significant trends.

For the male population we also identified an increasing trend in the states of Tocantins, Piauí, Ceará, Bahia and Pernambuco. Once again in Rio Grande do Sul and Roraima there was a decreasing trend; in the latter this decrease should be regarded with care due to highly unstable rates during that period. There were increasing rates for the female population in the state of Piauí only and decreasing rates for the states of Paraíba, Paraná and Santa Catarina.

Considering the overall Brazilian population and the male sex, rates remained stable throughout the period analyzed, with no statistically significant trends. There was a model convergence issue for the studied female population.

Table 2. Suicide mortality trends in people aged 60 years old or more by sex and state. Brazil, 1980 to 2009.

	Region/State	General population			Male			Female		
		RR	IC95%	Trend	RR	IC95%	Trend	RR	IC95%	Trend
Norte	Rondônia	0,990	0,939 - 1,046	Stable	0,993	0,942 - 1,050	Stable	0,931	0,842 - 1,026	Stable
	Acre	0,960	0,901 - 1,023	Stable	0,962	0,903 - 1,026	Stable	1,238	0,998 - 1,889	Stable
	Amazonas	0,914	0,821 - 1,004	Stable	0,916	0,823 - 1,006	Stable	-	-	-
	Roraima	0,899	0,865 - 0,933	Decreasing	0,901	0,867 - 0,935	Decreasing	1,028	0,929 - 1,168	Stable
	Pará	0,933	0,834 - 1,033	Stable	0,933	0,833 - 1,033	Stable	-	-	-
	Amapá	1,007	0,946 - 1,078	Stable	1,007	0,946 - 1,079	Stable	0,963	0,859 - 1,087	Stable
	Tocantins*	1,071	1,004 - 1,156	Increasing	1,072	1,005 - 1,157	Increasing	1,083	0,962 - 1,272	Stable
Northeast	Maranhão	-	-	-	-	-	-	-	-	-
	Piauí	1,087	1,014 - 1,181	Increasing	1,089	1,017 - 1,184	Increasing	1,363	1,070 - 2,137	Increasing
	Ceará	1,096	1,021 - 1,194	Increasing	1,100	1,025 - 1,199	Increasing	-	-	-
	R.Grande do Norte	1,009	0,962 - 1,061	Stable	1,013	0,966 - 1,065	Stable	1,106	0,981 - 1,310	Stable
	Paraíba	0,969	0,911 - 1,030	Stable	0,973	0,914 - 1,034	Stable	0,765	0,518 - 0,940	Decreasing
	Pernambuco	1,055	0,998 - 1,124	Stable	1,058	1,001 - 1,127	Increasing	0,972	0,845 - 1,116	Stable
	Alagoas	1,023	0,957 - 1,099	Stable	1,026	0,960 - 1,103	Stable	-	-	-
	Sergipe	1,062	0,995 - 1,147	Stable	1,065	0,997 - 1,149	Stable	1,032	0,931 - 1,167	Stable
	Bahia	1,509	1,11 - 2,764	Increasing	1,511	1,112 - 2,767	Increasing	-	-	-
Southeast	Minas Gerais	0,976	0,933 - 1,020	Stable	0,977	0,935 - 1,022	Stable	-	-	-
	Espírito Santo	0,980	0,938 - 1,026	Stable	0,983	0,941 - 1,029	Stable	0,922	0,788 - 1,053	Stable
	Rio de Janeiro	0,973	0,912 - 1,036	Stable	0,974	0,914 - 1,038	Stable	-	-	-
	São Paulo	0,967	0,928 - 1,008	Stable	0,969	0,930 - 1,010	Stable	0,855	0,535 - 1,097	Stable
South	Paraná	0,967	0,929 - 1,006	Stable	0,970	0,933 - 1,009	Stable	0,877	0,786 - 0,958	Decreasing
	Santa Catarina	0,973	0,945 - 1,002	Stable	0,975	0,947 - 1,004	Stable	0,944	0,899 - 0,990	Decreasing
	Rio Grande do Sul	0,963	0,938 - 0,988	Decreasing	0,964	0,939 - 0,989	Decreasing	0,966	0,927 - 1,006	Stable
Middle West	Mato Grosso do Sul	0,976	0,942 - 1,012	Stable	0,980	0,946 - 1,016	Stable	0,979	0,911 - 1,055	Stable
	Mato Grosso	1,016	0,969 - 1,071	Stable	1,020	0,972 - 1,074	Stable	1,035	0,875 - 1,321	Stable
	Goiás	0,968	0,929 - 1,010	Stable	0,971	0,931 - 1,012	Stable	1,030	0,901 - 1,228	Stable
	Distrito Federal	0,976	0,931 - 1,025	Stable	0,977	0,932 - 1,027	Stable	0,944	0,877 - 1,014	Stable
	Brazil	0,969	0,930 - 1,010	Stable	0,979	0,946 – 1,012	Stable	-	-	-

Table 3 shows results from Poisson's regression model adjustment to verify trends in time series of elderly individuals according to state and age range (60-69 years old; 70-79 years old; and 80 or older).

There is a statistically significant increasing trend in the states of Piauí, Ceará and Rio Grande do Norte among the population aged 60 to 69; within that same age range there is a decreasing trend in Amazonas, Roraima and São Paulo. Among the population aged 70 to 79 it was possible to identify an increasing trend in rates in the state of Piauí. Among individuals aged 80 or older we identified a decreasing trend in rates in Roraima.

Discussion

Results show that overall Brazilian suicide rates among the elderly have been stable throughout 30 years of analysis at 7 for each 100,000 for both sexes and 12 for each 100,000 inhabitants among men in that age range. Such results place Brazil on an *average level* of suicide episodes worldwide, according to the WHO (between 5-15 deaths for each 100,000 inhabitants). Among women rates have remained low (less than 5 for each 100,000 inhabitants)[18].

The decreasing trend stands out in a few states where rates have been historically the highest in the country (states in the South region, especially Rio Grande do Sul). However, despite the significant decreasing trend rates are still very high, which

Table 3. Suicide mortality trends in people aged 60 years or older by age and state. Brazil, 1980 to 2009.

	Region/State	60-69 years			70-79 years			80 years or older		
		RR	IC95%	Trend	RR	IC95%	Trend	RR	IC95%	Trend
Norte	Rondônia	1,021	0,941 - 1,122	Stable	0.963	0,881 - 1,059	Stable	0.867	0,749 - 2,777	Stable
	Acre	0,942	0,877 - 1,009	Stable	1.106	0,853 - 1,893	Stable	0.930	-	-
	Amazonas	0,861	0,695 - 0,995	Decreasing	0.957	-	-	0.937	-	-
	Roraima	0,935	0,888 - 0,985	Decreasing	0.963	0,887 - 1,052	Stable	0.789	0,708 - 0,859	Decreasing
	Pará	0,964	-	-	0.965	-	-	0.945	-	-
	Amapá	1,053	0,963 - 1,181	Stable	1.001	0,920 - 1,100	Stable	0.889	0,635 - 1,14	Stable
	Tocantins*	1,073	0,984 - 1,197	Stable	1.338	0,991 - 2,717	Stable	0.944	-	-
Northeast	Maranhão	0,974	-	-	0.975	-	-	0.945	-	-
	Piauí	1,270	1,084 - 1,631	Increasing	1.628	1,049 - 4,895	Increasing	0.954	-	-
	Ceará	1,296	1,07 - 1,806	Increasing	1.958	0,997 - 2,429	Stable	0.959	-	-
	R.Grande do Norte	1,205	1,057 - 1,472	Increasing	1.314	-	-	0.959	-	-
	Paraíba	1,024	0,924 - 1,148	Stable	0.980	-	-	0.960	-	-
	Pernambuco	1,002	0,913 - 1,107	Stable	0.976	-	-	0.957	-	-
	Alagoas	0,979	-	-	0.979	-	-	0.958	-	-
	Sergipe	1,040	0,947 - 1,165	Stable	0.978	-	-	0.959	-	-
	Bahia	0,976	-	-	0.974	-	-	0.954	-	-
Southeast	Minas Gerais	1,211	0,901 - 2,597	Stable	0.966	-	-	0.952	-	-
	Espírito Santo	1,008	0,91 - 1,132	Stable	0.945	0,787 - 1,116	Stable	0.953	-	-
	Rio de Janeiro	0,977	-	-	0.968	-	-	0.957	-	-
	São Paulo	0,859	0,713 - 0,980	Decreasing	0.963	-	-	0.952	-	-
South	Paraná	0,97	0,929 - 1,014	Stable	0.967	0,871 - 1,073	Stable	0.949	-	-
	Santa Catarina	0,969	0,931 - 1,01	Stable	0.959	0,915 - 1,006	Stable	0.949	-	-
	Rio Grande do Sul	0,966	0,929 - 1,005	Stable	0.969	0,929 - 1,010	Stable	0.883	0,735 - 1,012	Stable
Middle West	Mato Grosso do Sul	1,007	0,955 - 1,068	Stable	0.984	0,908 - 1,072	Stable	1.003	0,787 - 1,413	Stable
	Mato Grosso	1,033	0,968 - 1,114	Stable	1.019	0,926 - 1,143	Stable	0.982	0,767 - 1,350	Stable
	Goiás	1,046	0,988 - 1,118	Stable	0.982	0,888 - 1,095	Stable	0.943	-	-
	Distrito Federal	0,987	0,911 - 1,077	Stable	0.916	0,788 - 1,047	Stable	0.919	0,697 - 1,188	Stable
	Brazil	1,021	0,910 - 1,168	Stable	0.967	-	-	0.953	-	-

Ciência & Saúde Coletiva, 17(8):1973-1981, 2012

requires further studies to expand knowledge about this issue and to foster action being taken by authorities. The state of Mato Grosso do Sul also has high rates throughout the entire period of analysis. In the abovementioned states a possible explanation is the influence of pesticides used in farming and the significant numbers of individuals from European and Indigenous descent[10,19,20].

Santa Catarina, Rio Grande do Sul and Mato Grosso do Sul stand out for showing *high* rates in some years of the series (between 15 and 30 for each 100,000 inhabitants), according to WHO criteria. For male elderly individuals the rates in the latter two states in some of the years are considered *very high* (above 30 for each 100,000)[18].

Evidence of higher rates among male elderly individuals throughout the entire period confirms the results of national and international studies. Such differences may be related to the fact that women use less lethal means in their suicide attempts and seek more help in the social environment where they live, according to several authors[2,21-24].

In this study, which used standardized rates, we have not found higher rates among older elderly individuals, as other authors have[9,24,25]. A Brazilian study that used non-standardized rates found higher coefficients among elderly individuals older than 70 when compared with the group aged 60-69, from 1980 to 2006[2]; among elderly individuals aged 60 to 69 there was a higher increase in rates, 27% (comparing the first triennium, 1980-1982, with the last, 2004-2006), than among individuals aged 70 and older (12.5%). However, according to this study the latter group had higher rates throughout the entire studied period.

With respect to trends between 1980 and 2009, our study used Poisson's regression model (with standardized rates) and found a significant increasing trend in four states and decreasing trend in two states. Among the male population there was an increasing trend in five and decreasing trend in two states. Female rates increased in one state and decreased in three. Considering the subdivision into age ranges (60-69, 70-79 and 80 or older), we have verified an increasing trend in Piauí, Ceará and Rio Grande do Norte and a decreasing trend in Amazonas, São Paulo and Roraima. We have observed increasing trends among the population aged 70 to 79 in Piauí and decreasing trends in Roraima.

Those results differ from the ones found by Brzozowski et al.[25], who studied the period ranging from 1980 to 2005 and found an increase in male rates (aged 60 or older) across 14 states and a decrease in two states; female rates (aged 60 or older) decreased in seven states and increased in four, by using Prais-Winsten generalized linear regression models to verify the trend. Differences in results may arise from using different models for analysis (Poisson's Regression and Linear Regression) and/or from result standardization performed by the authors of this study.

Results should be interpreted with care. Data provided by some states should be analyzed carefully, since a sharp increase or decrease in rates suggests there are problems with case reporting, or it could be a consequence of a small elderly population - in this case a single death can result in high rates.

Another aspect worthy of attention is that detailed analysis results by age range (60-69, 70-79 and 80 or older) were compromised by excessive zeros across the time series. This was especially the case with the age range of individuals aged 80 or older and in such cases the chosen Poisson model did not converge. Additionally, deaths by suicide are known to be underreported[26], despite the declining percentage of deaths from unclear causes in the country in the last two decades, from 20% to 13%[275]. This precariousness may hide the real situation of suicide statistics throughout different states and municipalities in Brazil[28].

Final Considerations

This paper is part of a study about elderly suicide in Brazil where magnitude and meanings were crossed in an attempt to understand the problem and possibilities for action toward prevention. Several perspectives related both to promoting quality of live and specific attention and care are described in the other articles published in this edition. This research was conducted using standardized rates; therefore it presents different results in Brazil than those cited in national and international literature, which show higher suicide rates among the population older than 75. In any case, there is evidence that suicide among elderly males is relevant across the country, especially in states in the South and Middle West.

The fact that statistics show decreasing rates in southern States, especially Santa Catarina and Rio Grande do Sul – although they are still the highest in the country – shows that it is possible to take preventive action to decrease self-inflicted

deaths. Such action is being taken in several municipalities in the last few years.

The healthcare and social sectors have a crucial role providing support and protection to elderly individuals, above all to encourage them to feel useful, active and socially integrated. Those who start losing physical, psychological and economic autonomy require more care and therefore their lives tend to lose some meaning. The WHO[29] and the Ministry of Health[30] provide guidelines that help professionals who work in this field, especially those in Mental Health, to take effective preventive action and to promote life.

Collaborations

LW Pinto, TO Pires, CMFP Silva and SG Assis participated equally in all stages of preparation of the article.

References

1. World Health Organization (WHO). *World Report on Violence and Health*. Genève: WHO; 2002.
2. Lovisi GM, Santos AS, Legay L, Abelha L, Valencia E. Análise epidemiológica do suicídio no Brasil entre 1980 e 2006. *Rev Bras Psiquiatr* 2009; 31(Supl. 2): S86-S93.
3. O'Connell H, Chin AV, Cunningham C, Lawlor BA. Recent developments: Suicide in older people. *BMJ* 2004; 329(7471):895-899.
4. Datasus. *Sistema de Informações sobre Mortalidade*. [página da Internet]. [acessado 2012 mar 6]. Disponível em: http://www2.datasus.gov.br/DATASUS/index.php?area=0205&VObj=http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sim/cnv/ext10
5. World Health Organization (WHO). *Suicide rates per 100,000 by country, year and sex* (Table). [página da Internet]. [acessado 2012 mar 6]. Disponível em: http://www.who.int/mental_health/prevention/suicide_rates/en/index.html
6. World Health Organization (WHO). *Suicide Prevention – SUPRE*. 2002. [página da Internet]. [acessado 2012 mar 6] Disponível em: http://www.who.int/mental_health/prevention/suicide_rates/en/index.html
7. Bertolote JM, Fleischmann A. A global perspective in the epidemiology of suicide. Suicidologi 2002; 7(2):6-8.
8. De Leo D, Padoani W, Scocco P, Lie D, Bille-Brahe U, Arensman E, Hjelmeland H, Crepet P, Haring C, Hawton K, Lonnqvist J, Michel K, Pommereau X, Querejeta I, Phillipe J, Salander-Renberg E, Schmidtke A, Fricke S, Weinacker B, Tamesvary B, Wasserman D, Faria S. Attempted and completed suicide in older subjects: results from the WHO/EURO Multicentre study of suicidal behavior. *Int J Geriatr Psychiatry* 2001; 16(3):300-310.
9. Mello-Santos C, Bertolote JM, Wang YP. Epidemiology of suicide in Brazil (1980 – 2000): characterization of age and gender rates of suicide. *Rev Bras Psiquiatr* 2005; 27(2):131-134.
10. Meneghel SN, Victora CG, Faria NMX, Carvalho LA, Falk JW. Características epidemiológicas do suicídio no Rio Grande do Sul. *Rev Saude Publica* 2004; 38(6):804-810.
11. Schmitt R, Lang MG, Quevedo J, Colombo T. Perfil epidemiológico do suicídio no extremo oeste do estado de Santa Catarina, Brasil. *Rev psiquiatr RS* 2008; 30(2):115-123.
12. Departamento de Informática do SUS (DATASUS). *Informação de saúde*. População residente por ano segundo município período: 1980-2009. [documento na Internet]. 2012 jul. [acessado 2012 jul 09]. Disponível em: http://tabnet.datasus.gov.br/cgi/tabcgi.exe?ibge/cnv/popbr.def
13. Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M. Age standartization of rates: a new who standard. *World Health Organization - GPE discussion papers series*. 2000; 31:1-14.
14. Durbin J, Watson GS. Testing for Serial Correlations in Least Squares Regression. *Biometrika* 1951; 37(3/4):409-428.
15. Berry JG, Harrison JE. *A guide to statistical methods for injury surveillance*. Injury Technical Paper Series No 5. (AIHW cat. no. INJCAT 72). Adelaide: AIHW; 2005.
16. Oliveira TCR, Latorre, MRDO Tendências da internação e da mortalidade infantil por diarréia: Brasil, 1995 a 2005. *Rev Saude Publica* 2010; 44(1):102-111.
17. R 2.12.2. [computer program]. Viena; The R Foundation for Statistical Computing: 2012. [acessado 2012 jul 2]. Disponível em: http://www.r-project.org.
18. World Health Organization (WHO). *Guidelines for the primary prevention for mental, neurological e psychological disorders*. Suicide. Geneva: WHO; 1993. [citado 2010 out 10]. Disponível em: http://whqlibdoc.who.int/hq/1993/WHO_MNH_MND_93.24.pdf
19. Santos J. *Suicídio em Mato Grosso do Sul, Brasil*: fatores sociodemográficos [dissertação]. Campo Grande (MS): Escola Nacional de Saúde Pública - Fiocruz; 2010.
20. Pires DX, Caldas ED, Recena MCP. Uso de agrotóxicos e suicídios no Estado do Mato Grosso do Sul, Brasil. *Cad Saude Publica* 2005; 21(2):598-605.
21. Marín-León L, Barros MBA. Mortes por suicídio: diferenças de gênero e nível socioeconômico. *Rev Saude Publica* 2003; 37(3):357-363.
22. Brasil. Ministério da Saúde (MS). *Mortalidade por Suicídio*. In: Saúde Brasil 2006 – Uma análise da desigualdade em saúde. Brasília: MS; 2006.
23. Australia. Australian Government Department of Health and Ageing. Australian Institute for Suicide Research and Prevention. *International Suicide Rates – Recent Trends and Implications for Australia*. Canberra; Australian Government Department of Health and Ageing: 2003.
24. Conwell Y, Duberstein PR, Cain ED. Risk factors for suicide in later life. *Biol Psychiatry* 2002; 52(3):193-204.
25. Brzozowski FS, Soares GB, Benedet J, Boing AF, Peres MA. Suicide time trends in Brazil from 1980 to 2005. *Cad Saude Publica* 2010; 26(7):1293-1302.
26. Laurenti R, Mello Jorge MHP, Lebrão ML, Gotlieb SLD, Almeida MF. Estatísticas Vitais: contando os nascimentos e as mortes. *Rev Bras Epidemiol* 2005; 8(2):108-110.
27. Rede Interagencial de Informações para a Saúde (RIPSA). *Indicadores e Dados Básicos IDB-2004*. Brasília: RIPSA; 2005.
28. Pinto LW, Assis SG, Pires TO, Minayo MCS. Mortalidade por suicídio em pessoas com 60 anos ou mais nos municípios brasileiros no período de 1996 a 2007. *Cien Saude Colet* 2012; 17(8):1963-1972.
29. Organização Mundial da Saúde (OMS). *Prevenção do Suicídio*: um manual para profissionais da saúde em atenção primária. Genebra: OMS, 2000.
30. Brasil. Ministério da Saúde (MS). Portaria n.1.876, de 14 de agosto de 2006. Define diretrizes nacionais de prevenção ao suicídio. *Diário Oficial da União* 2006; 15 ago.

Artigo apresentado em 21/03/2012
Aprovado em 10/05/2012
Versão final apresentada em 06/06/2012