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VARIATION OF MORTALITY BY SUICIDE IN OLDER ADULTS IN THE SOUTHERN REGION OF BRAZIL: 2006 to 2015

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ABSTRACT

Objective: to analyze the average annual percentage variation in the mortality rate due to suicide in the older adult in southern Brazil between 2006 and 2015. **Methods:** a descriptive study with data from the Mortality Information System and the Brazilian Institute of Geography and Statistics. Deaths among the older adult (60-69, 70-79 and 80 years or more) were included in the study, according to ICD-10, referring to codes X60-X84, Y10-Y19 and Y87. **Results:** there was a significant increase in suicide mortality rates in Brazil (2008 to 2015) and in Paraná (2009 to 2015), and reduction in Paraná (2006 to 2009). When analyzing the age groups, there was a significant increase in the mortality rate due to suicide among the older adult from 70 to 79 years in Brazil (2008 to 2015) and in Paraná (from 2009 to 2015). For the 60-69 age group, there was a significant reduction in rates from 2006 to 2010 and an increase in death rates from suicide from 2010 to 2015 in Paraná and from 2006 to 2015 in Santa Catarina. **Conclusion:** there was an increasing trend of suicide mortality rate in the older adult, in the general group, in Brazil and Paraná. Mortality rates differed among states and age groups.

Keywords: Suicide. Aged. Mortality.

INTRODUCTION

Suicide is a deliberate, conscious and intentional act performed by the individual to extinguish one's own life. It is a global, complex and multifactorial phenomenon[1], responsible for 1.4% of all deaths in the world and considered the 17th leading cause of death in 2015[2], forming a serious public health problem.

Among the predisposing factors associated with suicide are mood disorders, such as depressive symptoms and anxiety[3-5], as well as functional disability and family history of suicide[4,5]. In the older adult, depression is usually followed by comorbidities[5] and social factors such as isolation, professional decadence, retirement and reduction of the pattern of living[3], impacted by the economic crisis.

The complexity and increasing importance of this issue led the Ministry of Health to institute the National Guidelines for Suicide Prevention in 2006, making it essential for epidemiological surveillance to record suicide attempts and suicides in Brazil[6]. In 2013, the World Health Organization (WHO), through the Mental Health Gap Action Program (mhGAP), prioritized suicide prevention. The WHO Comprehensive Mental Health Action Plan 2013-2020 proposes a 10% reduction in suicide mortality rates by the year 2020, with Brazil being one of the signatories of this plan. The first report on suicide highlighted the need for awareness of this act and its attempts to make suicide prevention a priority in the global public health agenda[7].

According to data from the Ministry of Health, 23% of suicide cases occur in the southern region of the country. The standardized mortality rate for suicide from 2010 to 2014 was 10.74 per 100,000 inhabitants in the South region, being the highest among the regions of the country[8]. In the older adult, death rates from suicide in individuals aged 60 years or older are high and differentially affected by gender[9]. In Brazil, these rates were basically constant between 1980 (7.4 deaths/100 thousand inhabitants) and 2009 (7.1 deaths/100 thousand inhabitants), including the analyzed age groups (60-69, 70-79 and 80 years or more). In the three southern states, rates were higher than the

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national mortality rate, and the time trend of suicide mortality remained stable in Paraná and Santa Catarina, but decreasing in Rio Grande do Sul[10]).

Considering that suicide is a public health problem, most of the cases of suicide in the older adult occur in the southern region of the country, in addition to the need for monitoring and monitoring of mortality rates for strategies to prevent this aggravation by managers and health professionals, this study has as a research question to verify what is the average annual percentage change in the mortality rate due to suicide in the older adult in the southern region of Brazil between 2006-2015? Thus, the objective of this study was to analyze the annual percentage change in the mortality rate due to suicide in the older adult in the southern region of Brazil between 2006-2015.

METHODS

This is an ecological study, with secondary data on cases of death by suicide collected from the Mortality Information System (SIM) and the Brazilian Institute of Geography and Statistics (IBGE). The study included suicide cases from 2006 to 2015, according to the age group (60-69, 70-79 and 80 years or older) of residents of the federal units of the southern region of Brazil. Cases with unknown gender and age data were excluded. Regarding the information related to the population of the southern states, data were collected from the IBGE from the 2010 censuses and from population estimates (from 2005 to 2009, and from 2011 to 2015).

The 10th International Classification of Diseases and Related Health Problems (ICD-10), chapter 20 (codes X60-X84, Y10-Y19 and Y87) which classifies suicide as intentionally self-inflicted injury, exogenous intoxication of undetermined intent or the sequel of intentional self-harm was used to calculate the mortality rate by suicide. Exogenous intoxication of undetermined intention and the sequelae of intentional self-harm were inserted into the analysis since previous studies have described that there is a change in the categorization of deaths due to probable failures in coding the cause(11).

First, the specific mortality rates per 100 thousand inhabitants were determined with regard to the risk of death due to a certain characteristic: age. Next, the specific mortality rates were standardized by the direct method in order to mitigate the effects of the diversity of structures/age groups on the values of the gross mortality rate. The Brazilian population of the 2010 IBGE census was used as the standard.

The calculation of the standardized rates was used in the analysis of the mortality trend through the estimation of linear regression models. The moving average centered on three terms [Yi = (Yi-1 + Yi + Yi + 1)/3] was evaluated to mitigate the historical series due to the oscillation of the points, due to the small number of cases in certain strata.

For the calculation of the annual mortality variation from 2006 to 2014, the Joinpoint program, version 4.5.0.1 (Statistical Research and Applications Branch, National Cancer Institute, United States), provided online by the National North American Cancer Institute. This program provides a meticulous description of mortality trends, detecting the changes that have occurred over the years, and performs a linear regression (joinpoint regression) to determine the annual percentage change and detect points where there are changes in the trend. The chosen model is the one with the highest number of points, in which statistical significance is preserved ($p < 0.05$).

From the estimated slope for each straight line (regression coefficient), the annual percentage change (APC) and its statistical significance were estimated by the least squares method using a generalized linear model. For each line segment, with estimated slope, the limits of the 95% confidence interval (95% CI) were calculated.

Regarding ethical aspects, since it refers to secondary information provided by the Ministry of Health, available online and publicly owned, and because it has no variable (nominal data) that allows the recognition of the subjects of the research, this study did not require evaluation of ethics committee in human research.

RESULTS

In the study period (from 2005 to 2016), there were 20,059 deaths due to suicide in Brazil

among individuals aged 60 years or over. Of these, 1,215 occurred in Paraná, 3,382 in Rio Grande do Sul, and 1,270 in Santa Catarina. Table 1 shows the number of deaths per suicide (from 2005 to 2016) and gross and adjusted suicide rates in the older adult (in general, 80 and over, 70 to 79 years old, and 60 to 69 years), per 100 thousand inhabitants, in Brazil and in the three southern states of the country in the period from 2006 to 2015.

Table 1. Mortality rates specific to suicide in the older adult, per 100 thousand inhabitants, in Brazil and in the southern states (Paraná, Rio Grande do Sul and Santa Catarina). Florianópolis, SC, 2018

				South Region								
	Brazil			Paraná			Rio Grande do Sul			Santa Catarina		
Year	Deaths	Rate gross	Rate adjusted*	Deaths	Rate gross	Rate adjusted*	Deaths	Rate gross	Rate adjusted*	Deaths	Rate gross	Rate adjusted*
General												
2005	1,400	8.99	-	84	9.83	-	222	19.72	-	84	17.96	-
2006	1,311	8.31	8.37	83	9.62	9.62	247	21.73	20.24	67	14.12	15.65
2007	1,409	7.74	8.02	95	9.10	8.97	257	19.03	20.49	83	14.31	14.09
2008	1,498	7.98	7.81	86	7.82	8.04	283	20.69	19.35	83	13.72	14.24
2009	1,500	7.72	7.76	83	7.26	7.89	261	18.42	18.67	93	14.68	15.33
2010	1,557	7.56	7.76	100	8.54	7.80	247	16.92	18.42	113	17.20	16.48
2011	1,659	8.00	8.13	88	7.47	8.15	291	19.88	19.92	114	17.18	17.71
2012	1,846	8.84	8.43	99	8.36	8.07	336	22.89	20.41	121	18.06	17.48
2013	1,864	8.44	8.40	109	8.39	8.32	299	18.34	19.16	128	17.08	17.13
2014	1,809	7.87	8.34	111	8.18	8.85	273	16.11	17.58	127	16.09	16.55
2015	2,067	8.63	8.38	140	9.89	9.15	319	18.12	17.78	136	16.37	15.46
2016	2,139	8.58	-	137	9.27	-	347	18.97	-	121	13.85	-
80 years or more												
2005	221	1.30	-	8	8.86	-	36	26.69	-	14	27.65	-
2006	200	10.11	1.41	18	19.77	1.76	36	26.45	3.36	7	13.63	2.94
2007	210	8.23	1.28	11	8.49	1.65	33	17.62	3.18	15	20.62	2.25
2008	229	8.58	1.20	9	6.44	1.03	44	22.76	3.02	10	13.00	2.12
2009	238	8.52	1.26	10	6.75	1.21	47	23.12	3.05	9	11.06	2.62
2010	279	9.50	1.29	18	12.36	1.36	37	18.33	3.21	25	30.96	2.64
2011	269	9.10	1.38	14	9.56	1.33	53	26.18	3.36	11	13.49	3.44
2012	311	1.45	1.39	9	6.11	1.03	53	26.11	3.52	23	27.94	2.58
2013	297	9.77	1.40	10	6.01	1.14	51	21.74	3.09	12	12.75	2.94
2014	290	9.15	1.34	21	11.96	1.19	42	17.12	2.76	21	21.10	2.56
2015	304	9.19	1.30	13	7.02	1.39	49	19.12	2.54	21	19.94	2.42
2016	314	9.08	-	20	10.24	-	46	17.20	-	11	9.86	-
70-79 years												
2005	438	9.05	-	21	8.11	-	75	21.18	-	28	19.39	-
2006	376	7.68	2.52	21	8.03	2.56	72	20.14	6.60	23	15.71	5.14
2007	453	7.97	2.41	29	8.91	2.36	100	23.38	6.80	27	15.28	4.55
2008	464	7.95	2.38	21	6.14	2.28	99	23.07	6.53	25	13.64	4.24
2009	444	7.39	2.40	26	7.33	2.26	77	17.49	6.19	24	12.60	5.03
2010	513	8.14	2.46	31	8.66	2.34	90	20.04	5.96	45	23.04	5.76
2011	544	8.57	2.58	25	6.94	2.44	94	20.87	6.48	41	20.78	6.16
2012	550	8.60	2.67	30	8.29	2.64	102	22.59	6.75	33	16.57	5.63
2013	589	9.03	2.63	41	10.59	2.79	109	22.63	6.50	38	17.80	4.88
2014	552	8.19	2.72	34	8.46	3.21	92	18.47	6.29	30	13.44	5.06
2015	661	9.46	2.73	52	12.44	3.12	106	20.51	6.28	43	18.36	4.57
2016	663	9.13	-	42	9.64	-	121	22.51	-	32	12.99	-
60-69 years												
2005	741	8.44	-	55	10.88	-	111	17.43	-	42	15.40	-
2006	735	8.26	4.44	44	8.62	5.30	139	21.61	10.27	37	13.37	7.56
2007	746	7.48	4.34	55	9.34	4.97	124	16.86	10.52	41	12.40	7.29
2008	805	7.85	4.23	56	9.07	4.73	140	18.79	9.81	48	13.92	7.88
2009	818	7.70	4.09	47	7.33	4.42	137	17.72	9.43	60	16.59	7.68
2010	765	6.74	4.01	51	7.64	4.09	120	14.84	9.24	43	11.29	8.08
2011	846	7.40	4.17	49	7.30	4.38	144	17.76	10.08	62	16.11	8.11
2012	985	8.55	4.37	60	8.89	4.40	181	22.25	10.15	65	16.73	9.28
2013	978	7.82	4.37	58	7.77	4.38	139	15.21	9.57	78	17.66	9.31
2014	967	7.40	4.28	56	7.19	4.44	139	14.62	8.53	76	16.30	8.93
2015	1,102	8.08	4.35	75	9.23	4.64	164	16.61	8.97	72	14.66	8.47
2016	1,162	8.18	-	75	8.86	-	180	17.58	-	78	15.12	-

*The coefficients of the years represent the average of a previous year, the year itself and a later year.

Table 2 presents the percentage changes that occurred in the period studied. In the period from 2008 to 2015 there was a significant increase of 1.6% per year. The highest suicide rate occurred among those aged 70 to 79 years, who had a significant increase of 2.2% per year in the period from 2008 to 2015 (Table 2).

In the state of Paraná there was a significant reduction of 7.3% per year in the mortality rate from suicide in the older adult from 2006 to 2009; while in the period from 2009 to 2015 there was a significant increase of 2.8% per year. The highest mortality rate due to suicide was found among the older adult from 70 to 79 years, with a significant increase of 6.6% per year in the period from 2009 to 2015. Among the older adult of 80 years or more, there was stability in the period. Among the 60-69 years, there were two periods of variation, with a significant reduction in the period 2006 to 2010 (of 5.7% per year) and a significant increase in the mortality rate (of 1.9% per year) in the period

from 2010 to 2015 (Table 2).

The state of Rio Grande do Sul kept a stable mortality rate for suicide in the general group and in all age groups studied (Table 2). In Santa Catarina there was a significant increase in the mortality rate due to suicide only among the older adult of 60 to 69 years, which had a significant increase of 2.4% per year, without variations in the period. The remaining groups were stable (Table 2).

Table 2. Distribution of general annual percentage variation and of age group, in Brazil and in the southern states (Paraná, Rio Grande do Sul and Santa Catarina), from 2006 to 2014. Florianópolis, SC, 2017

	Brazil		South Region					
			Paraná		Rio Grande do Sul		Santa Catarina	
	Period	Variation	Period	Variation	Period	Variation	Period	Variation
General	2006-2015	0.2 (-1.2; 1.7)	2006-2015	-0.7 (-1.7; 0.3)	2007-2015	-0.9 (-2.3; 0.5)	2006-2015	1,4 (-0,4; 3,3)
	2006-2008	-3.7 (-0.8; 4.0)	2006-2009	**-7.3^ (-10.4; -4.2)**				
	2008-2015	**1.4^ (0.3; 2.4)**	2009-2015	**2.8^ (1.6; 4.0)**				
80 years or more	2006-2015	0.4 (-1.0; 1.8)	2006-2015	-3.1 (-6.9; 0.9)	2007-2015	-2.3 (-6.3; 1.9)	2006-2015	0.4 (-3.4; 4.4)
					2007-2013	1.3 (-2.0; 4.7)		
					2013-2015	-12.3 (-9.2; 8.7)		
70-79 years	2006-2015	1.1 (-0.1; 2.4)	2006-2015	**2.8^ (0.6; 4.9)**	2007-2015	-0.4 (-1.7; 0.9)	2006-2015	0.5 (-2.7; 3.7)
	2006-2008	-2.6 (-9.0; 4.2)	2006-2009	-4.5 (-10.9; 2.4)				
	2008-2015	**2.2^ (1.3; 3.1)**	**2009-2015**	**6.6^ (4.3; 9.0)**				
60-69years	2006-2015	-0.2 (-1.4; 1.1)	2006-2015	**-1.5^ (-2.2; -0.9)**	2007-2015	-1.1 (-2.5; 0.2)	2006-2015	**2.4^ (1.0; 3.8)**
	2006-2009	-2.9 (-6.7; 1.1)	2006-2010	**-5.7^ (-7.1; -4.3)**				
	2009-2015	1.2 (-0.2; 2.6)	2010-2015	**1.9^ (0.8; 3.0)**				

DISCUSSION

The analysis of the temporal trend revealed a different trend between the periods, age groups and states of the federation. There was a significant increase in the variation of suicide mortality rates in Brazil (from 2008 to 2015) and in Paraná (from 2009 to 2015). When analyzing the age groups, the suicide mortality rate among the older adult of 80 years or more remained stable in all states and in Brazil. Among the 70-79 age group, there was an increase in suicide mortality rates in Brazil (from 2008 to 2015) and in Paraná (2009 to 2015). And among the older adult from 60 to 69 years there was a significant reduction of rates in the state of Paraná (from 2006 to 2010), and increase in Paraná (from 2010 to 2015) and in Santa Catarina (from 2006 to 2015).

For the general group, as in the study by Pinto et al.[10], the Rio Grande do Sul and Santa Catarina rates were very high, as well as in all age groups, when compared to Brazil and even compared with Paraná, although they will show a downward trend in certain periods. The rates of these states are higher than that of the European region (of 15.4 per 100 thousand inhabitants), which is considered by WHO as the highest rate in 2016[12]. The high suicide mortality in Rio Grande do Sul and Santa Catarina can be explained by a combination of factors, not just one. These include cultural aspects, climatic aspects and European colonization[13]; however, there are also descendants of slaves in these places, which could be better explored by regions of each state. Studies indicate that the western regions of Santa Catarina[14] and center-east of Rio Grande do Sul[13] show higher rates of suicide. There is a high prevalence, when compared to the other states, in the Lutheran religion, which has a more reserved behavior and with less socialization.

Another factor that may be associated with the high suicide mortality rate in these states is agriculture as a way of income, the cultivation of tobacco with pesticides and the lack of information about the use of these without protective equipment, which can lead to neurological intoxication. In addition, farmers become indebted to the rigid technological model (selected seeds, agrochemicals, fertilizers and greenhouses), having to sell their properties to multinational companies, and are eventually subordinated to international capital as temporary workers[13].

In the age group of 80 years or older, there

was stability of the suicide mortality rate, with no statistically significant trend in the period from 2006 to 2015 in all states. The trend of suicide mortality rates in this age group has remained stable for some time, according to time trends in suicide mortality from 1980 to 2009[10].

Still regarding to the stability of suicide mortality rate in this age group, adversities persist to counteract reporting inconsistencies. Deaths resulting from suicide may not be properly examined or may not receive proper attention from the professionals involved, being reported as accidents or deaths due to natural causes, because the deceased was "old", contributing to the underreporting of suicide in this population and to stability of these rates[15]. In addition to the neglect of underreporting, there is also a precariousness of actions for promotion, prevention and permanent education, and coordinated protocols that share a common language among professionals[16].

According to the results, in Brazil, a significant increase of 2.2% per year in the mortality rate from suicide during the period from 2008 to 2015 was observed in the 70-79 age group, and specifically in the state of Paraná, in the period from 2009 to 2015, there was an increase of 6.6%. A study of the temporal trend of suicide mortality in the older adult, according to age group and federal unit in Brazil, from 1980 to 2009, showed a stable trend in the 70-79 age group in all states of South and Brazil[10].

Still in this age group, factors such as social isolation due to loss of professional status, financial disadvantage after retirement, hassles to fulfill family care activities, affective, environmental losses, widowhood, and psychological and degenerative diseases contribute to increased decision of the older adult to end their life[17]. In this age group, socio-environmental, psychological, family and health vulnerabilities, when associated with depressive symptoms, may trigger suicidal crisis[5].

The results showed a significant reduction of 5.7% per year in the mortality rate from suicide in the period from 2006 to 2010 among the older adult from 60 to 69 years old in the state of Paraná. However, in the period from 2010 to 2015, there was an increase of 1.9%. In Santa Catarina there was also an increase in the rate of 2.4% per year in the period from 2006 to 2015. This period of life is marked by the egress from the labor market and the retirement of many older adult, although this is not always the case. A study confirmed the association of the work activities of the older adult with better social conditions and physical health. In addition, it showed that the maintenance of work activities was associated to higher satisfaction with life, regardless of the socioeconomic and clinical characteristics of the older adult[18].

Physical exercises are also highlighted as positive alternatives in this context [19]. A study that sought to identify what motivates the older adult to participate in physical activity programs pointed to the prevention of health problems and the improvement in quality of life as the main reason for compliance [20]. Thus, it can be inferred that physical activity considerably reduces depressive symptoms linked to suicidal ideation[19].

This study is limited by the quality of the data recorded in the SIM, as well as the possible underreporting of suicide cases and the incorrect classification of deaths.

CONCLUSION

The results allow us to observe the trendto increase the mortality rate due to suicide in the older adult in Brazil (from 2008 to 2015) and in Paraná (from 2009 to 2015). When analyzed by age group, the temporal trend suffers oscillations, being specific for each group and each state of the South region, with a trend to increase in the mortality rates in Brazil (from 2008 to 2015) and in Paraná (from 2009 to 2015) between the older adult from 70 to 79 years. On the other hand, among the older adult from 60 to 69 years old, there was a significant reduction in death rates from suicide in Paraná (from 2006 to 2010), as well as an increase in rates in Paraná (from 2010 to 2015) and in Santa Catarina (from 2006 to 2015).

The presented data can contribute to subsidize the implementation of public health policies that ensure actions of promotion and prevention of suicide for each age group, with their specificities. At the local level, the data alert health professionals about suicide prevention and the need for a closer look at the older adult, assisting in the early detection and

promotion of mental health at this point in life. Still, it is essential to permanent education in order to know and recognize the signs of ideation and suicide plans in this age group.

VARIAÇÃO DA MORTALIDADE POR SUICÍDIO EM IDOSOS DA REGIÃO SUL DO BRASIL: 2006 A 2015

RESUMO

Objetivo: analisar a variação anual percentual média da taxa de mortalidade por suicídio em idosos na região Sul do Brasil entre 2006 e 2015. **Métodos:**estudo descritivo com dados do Sistema de Informação sobre Mortalidade e Instituto Brasileiro de Geografia e Estatística. Foram incluídos óbitos de idosos (de 60-69, 70-79 e 80 anos ou mais) cujacausa básica foi suicídio, de acordo com a CID-10, referentes aos códigos X60-X84, Y10-Y19 e Y87. **Resultados**: houve aumento significativo na variação das taxas de mortalidade por suicídio no Brasil (2008 a 2015) e no Paraná (2009 a 2015), e redução no Paraná (2006 a 2009). Ao analisar os grupos etários, houve aumento significativo na taxa de mortalidade por suicídio entre os idosos de 70 a 79 anos no Brasil (2008 a 2015) e no Paraná (de 2009 a 2015). Para o grupo etário de 60 a 69 anos, houve redução significativa das taxas, de 2006 a 2010, e aumento das taxas de mortalidade por suicídio de 2010 a 2015 no Paraná, e de 2006 a 2015 em Santa Catarina. **Conclusão**: constatou-se tendência crescente da taxa de mortalidade por suicídio em idosos, no grupo geral, no Brasil e Paraná. As taxas de mortalidade se diferenciaram entre os estados e grupos etários.

Palavras-chave: Suicídio. Idosos. Taxa de mortalidade.

VARIACIÓN DE LA MORTALIDAD POR SUICIDIO EN ANCIANOS DE LA REGIÓN SUR DE BRASIL: 2006 A 2015

RESUMEN

Objetivo: analizar la variación anual porcentual media de la tasa de mortalidad por suicidio en ancianos en la región Sur de Brasil entre 2006 y 2015. **Métodos:** estudio descriptivo con datos del Sistema de Información sobre Mortalidad e Instituto Brasileño de Geografía y Estadística. Fueron incluidos óbitos de ancianos (de 60-69, 70-79 y 80 años o más), cuya causa básica fue el suicidio, de acuerdo con la CID-10, referentes a los códigos X60-X84, Y10-Y19 y Y87. **Resultados**: hubo un aumento significativo en la variación de las tasas de mortalidad por suicidio en Brasil (2008 a 2015) y en el estado de Paraná-Brasil (2009 a 2015), y reducción en Paraná (2006 a 2009). Al analizar los grupos de edad, hubo aumento significativo en la tasa de mortalidad por suicidio entre los ancianos de 70 a 79 años en Brasil (2008 a 2015) y en Paraná (de 2009 a 2015). Para el grupo de edad de 60 a 69 años, hubo reducción significativa de las tasas, de 2006 a 2010, y aumento de las tasas de mortalidad por suicidio de 2010 a 2015 en Paraná, y de 2006 a 2015 en Santa Catarina-Brasil. **Conclusión**: se constató una tendencia creciente de la tasa de mortalidad por suicidio en ancianos, en el grupo general, en Brasil y Paraná. Las tasas de mortalidad se diferenciaron entre los estados y grupos de edad.

Palabras clave: Suicidio. Anciano. Tasa de mortalidad.

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