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Descriptive study of suicide attempts in the Brazilian elderly population, 2000 – 2014

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Abstract *The study describes hospital admission rates for suicide attempts among the Brazilian elderly and discusses the weaknesses of data from information systems. Data were extracted from the Hospital Information System (HIS) and from the Violence and Injury Surveillance System (VIVA). The analyzes included: (1) temporal evolution of rates by age group (1-9; 10-19; 20-39; 40-59 and 60 or over) from 2000 to 2014 by region; (2) triennial hospital admission rates by sex for age groups 60-69, 70-79 and 80 or over by region and state; (3) hospital admission rates for the elderly from the two information systems. Temporal evolution showed higher rates in the north and lower ones in the northeast. The analysis by age group and sex showed higher rates for older men of the three investigated age groups. The comparison of rates obtained from the two information systems showed a gradual increase in rates from VIVA. After 2012, rates obtained from VIVA were higher in the Southeast, South and Midwest regions. The study highlights the need for further improvement of information on hospital morbidity and data from compulsory notification of violence.*

Key words *Elderly, Suicide attempt, Morbidity, Information Systems, Under-registration*

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Introduction

According to the document *Preventing suicide: A global imperative*[1], the World Health Organization (WHO) estimates 804.000 suicide deaths worldwide in 2012, representing a global age-standardized rate of 11.4 deaths per 100.000 people, higher among men (15.0) than among women (8.0). The highest rates are observed among men and women aged 70 and older in different regions of the world, except in some countries where the young group leads the statistics. The situation in middle and low-income countries is more serious, since 75% of suicides registered in the world occurred in these areas. Every year, the WHO informs that there is one suicide for every estimated 25 attempts[1,2], this is a warning for the fact that prior history of suicide attempt is the most important risk factor for suicide in the general population.

Attempts of self-inflicted death have a major individual and family impact, mainly due to the psychological and physical impact that follows them. But they also influence society at a community and institutional level, particularly for the use of health services to treat consequences of the attempt and disabilities or deficiencies from occurred injuries[1-3].

The difficulty in obtaining statistics on attempted suicide is even greater than in evaluating suicide. Suicide is known to be influenced by religious and financial issues, lack of a pension fund, impacting on the quality of the Mortality Information System (MIS). It is considered that the under-registration rate for suicide is higher than that associated with other external causes; and such situation is intensified when it refers to the elderly[4].

There are two main mechanisms for obtaining data on the dimension of attempts: population surveys containing self-report of suicidal behavior and, hospital records on treatment of self-inflicted injuries[1].

In Brazil, the Hospital Information System (HIS) has been used to understand the dimension of suicide attempts[5,6]. This system performs morbidity analysis using the Hospital admission Admission Authorization forms (AIH), and aims at obtaining funds for procedures performed during admissions in public or private hospitals in partnership with the Brazilian Public Health System (SUS). This particularity presents limitations such as: excess of information on expensive procedures, billing for unperformed interventions and performing medically unnecessary tests[7]. The HIS does not contemplate the total number of occurred admissions, as it excludes those occurred in emergency medical services (EMS) or emergency departments, which are privileged entry points of suicide attempt cases[8]. The inaccuracy in the diagnosis of injuries and traumas is another crucial factor that interferes in the quality of data referring to attempted suicides, since they are commonly not linked to the circumstances of origin [9].

The Violence and Injury Surveillance System (VIVA) is another source of information that allows investigating attempted suicides. Its continuous component integrates and is mainly fed by the individual notification/investigation form from the Notification Aggravation Information System (SINAN) for domestic, sexual and other violence, which must be filled out for every suspect or confirmed case attended in health services. As this is a recent system in its introduction phase, few studies use it as source of data on suicide attempts[10,11].

The challenge of analyzing suicide attempts in Brazil is increased when investigating the elderly, the fastest growing age group in the world and in the country, as a result of life and health condition improvements. The magnitude of the theme among the elderly is flagrant: the proportion is two to three attempts for every completed suicide, considering prior history of attempt an important predicting factor for accomplished suicide[12]. Another important aspect to be considered is the fact that suicide in the elderly grows as aging increases and factors associated with suicide in individuals aged 60 and older may differ from important factors in individuals aged 85 and older[13]. It is also worth considering that significant differences are observed in statistics on suicide and suicide attempts between countries, regions and cities of a same country, impairing the analysis[1].

Thus, the purpose of the present study is to present morbidity rates for attempted suicide in the Brazilian elderly from 2000 to 2014. The data were divided according to sex, Brazilian regions and states, considering the aging stages in the analysis.

Methods

This study is part of the project entitled *Study on attempted suicides in elderly under the public health perspective* developed by researchers of the Latin-American Center for Studies on Vio-

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lence and Health at the National School of Public Health, Oswaldo Cruz Foundation (CLAVES/ENSP/Fiocruz), which was approved by the Ethics Committee of the above-mentioned institution under protocol n. 403.515 of 2013.

This is a descriptive study that presents a temporal evolution analysis of notifications of self-inflicted injuries in people aged 60 and older from 2000 to 2014 per region and state. The data were collected from the Hospital Information System of the Ministry of Health (HIS/MS), available at the DATASUS site (www.datasus.gov.br), employing the 10th review of the International Classification of Diseases (CID-10), codes X60 through X84. The data were collected and analyzed in five three-year periods (2000-02, 2003-05, 2006-08, 2009-11 and 2012-14), according to age group (60 to 69, 70 to 79 and 80 and older) and sex (male and female).

For the calculation of rates, the number of hospital admissions for self-inflicted injuries occurred in the three-year period was employed as numerator and the population estimate supplied by the Brazilian Institute of Geography and Statistics (IBGE) for the middle year of the three-year period (years of 2001, 2004, 2007, 2010 and 2013) as denominator.

Additionally, data on self-inflicted injuries from the SINAN, Ministry of Health, available at the DATASUS site (www.datasus.gov.br) for people aged 60 and older from 2009 to 2014 were also analyzed. Similarly to what was done with the HIS data, hospital admission rates were also calculated having admissions as numerator and the population as denominator, supplied by IBGE for each year. In both analyses, the results were multiplied by 100,000 inhabitants.

To compare the data from the two systems, SIH and SINAN/VIVA, annual hospital admission rates for self-inflicted injury in people aged 60 and older were also calculated employing HIS data. This procedure was necessary as the SINAN/VIVA system does not allow subdividing the 60+ age group

For a better view of the issue on self-inflicted injuries in elderly in the country and to allow comparison with other age groups, hospital admission rates were also calculated for the following age groups: 1 to 9; 10 to 19; 20 to 39; 40 to 59 and 60 and older, according to country region.

To analyze the quality of notification data for self-inflicted injuries, the proportion of hospital admissions was calculated by event with unknown intent, when it is not known if accidental, self-inflicted or aggression. Such proportion employed hospital admissions classified by ICD-10 codes Y10 through Y34 in each of the study years as numerator and, the total hospital admissions for external causes in the same period as denominator.

Excel and SPSS 20.014 programs were employed in the construction of database and calculation of rates.

Results

Figure 1 shows historical time series of hospital admission rates for attempted suicides according to region of the country for the following age groups: 1 to 9, 10 to 19, 20 to 39, 40 to 59 and 60 and older, from 2000 to 2014.

In the Northern region, rates tend to decrease in all analyzed age groups. It was verified that values fluctuate between 0.7 (age 1 to 9) and 19.5 (age 40 to 59) per 100.000 inhabitants. In the 40 to 59 age group the highest hospital admission rates were observed for practically the whole period. Nevertheless, quite similar standard of temporal series is noticed between the three age groups beginning at 20 years. It is in this region that the highest rates are observed for all age groups, except for age group 10 to 19 years.

In the Northeast region, it is noticed that rates vary between 0.7 (1 to 9 years) and 6.2 (20 to 39 years) per 100.000 inhabitants. Again, similar pattern and rates for age groups 20 to 39, 40 to 59 and 60 and older were observed. Curves referring to younger groups show lower values, with 3.8 hospital admissions the maximum per 100.000 inhabitants. There seems to be a slight tendency for an increase in hospital admissions in the last years of the series. The lowest rates were found in this region.

Rates in the southeast region vary between 1.1 (1 to 9 years) and 12.6 (20 to 39 years) hospital admissions per 100.000 inhabitants. The highest rates concentrate in the age group 20 to 39 years, followed by the age group 40 to 59 years with slightly lower rates. The lowest rates were observed in the age group 1 to 9 years. The series seem stable for age groups up to 19 years and for the elderly group. Nevertheless, curves for age groups 20 to 39 years and 40 to 59 years show decline, the first one from 2008 and the second, from 2005.

In the southern region, lower rates were observed than in other regions of the country, except for the northeastern region, which oscillated between 0.7 (1 to 9 years) and 7.1 (20 to 39 years)

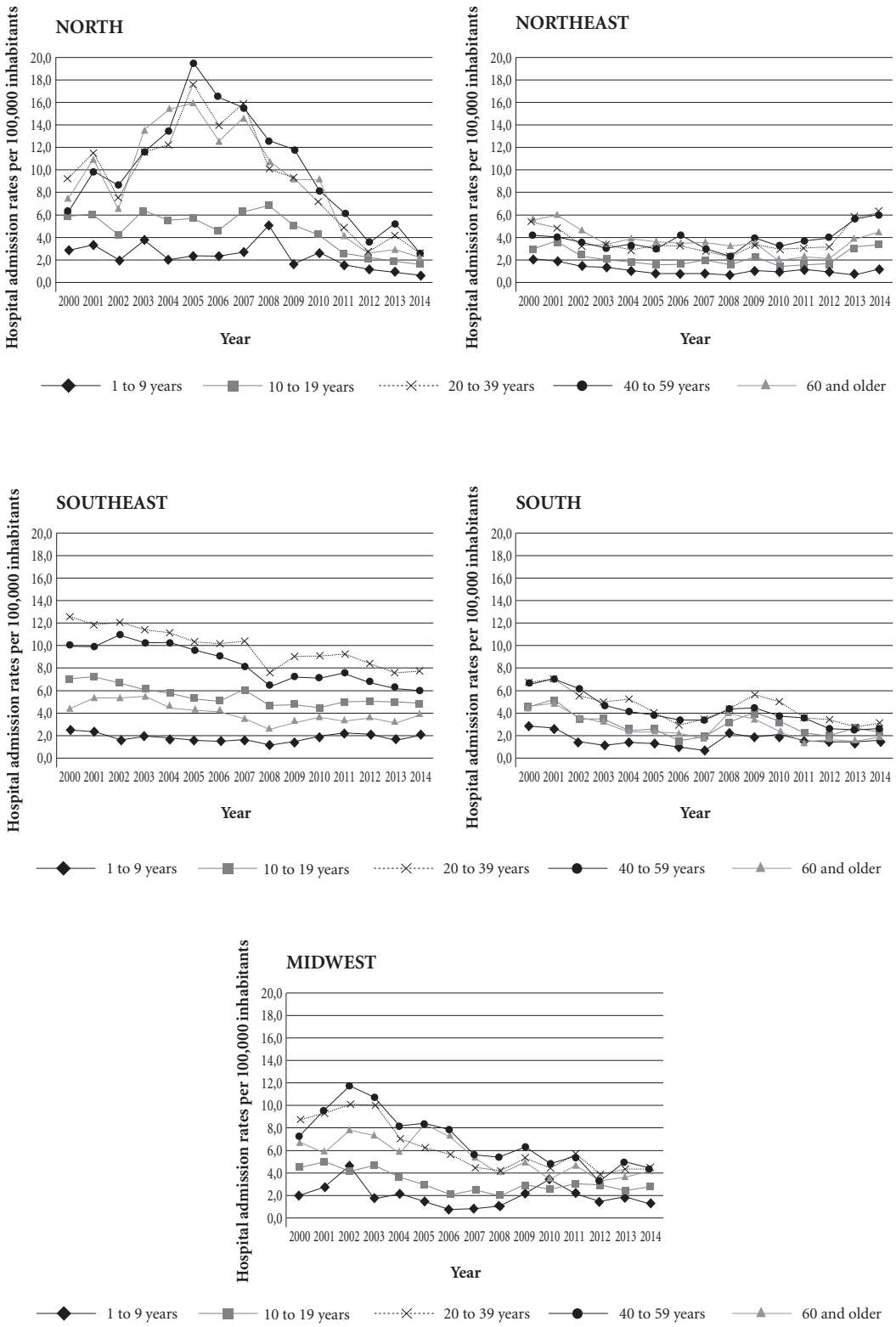

Figure 1. Temporal evolution of hospital admission rates for suicide attempts (per 100.000 habitants) in Brazilian regions according to age group, 2000 to 2014

Source: Ministry of Health, Hospital Information System, SUS (SIH/SUS).

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per 100.000 inhabitants. The figure shows a slight decline in hospital admission rates for age groups beginning at 20 years. The age groups 20 to 39 and 40 to 59 years presented similar rates along the years, varying between 2 and 7 hospital admissions per 100.000 inhabitants.

In the Midwestern region, hospital admissions rates between 0.8 (1 to 9 years) and 11.7 (40 to 59 years) were observed per 100.000 inhabitants. Again, age groups 20 to 39 and 40 to 59 years presented the highest rates, oscillating from 3 to 11 hospital admissions per 100.000 inhabitants. In the elderly group, rates presented values between 3.3 and 8.4 hospital admissions per 100.000 inhabitants. The figure shows a clear rate decline tendency.

The age groups data demonstrates that for the youngest age group (1 to 9 years) rates are higher in the North followed by the Midwest. In the age group 10 to 19 years, rates are higher in the Southeast and in the North. In the age group 20 to 39 years, rates exceed 10 hospital admissions per 100.000 inhabitants in three regions (North, Southeast and Midwest). The same occurs in the age group 40 to 59 years; however, this group presents higher values than the previous group in the Northern and Midwestern regions. As for the elderly (60 and older) it was verified that the highest rates are in the North and Midwest and the lowest rates in the Southeast and South.

Table 1 shows evolution of rates in the age group 60 to 69 according to sex, per country region and state. It can be observed that the highest rates for this age group are in the Northern region, varying between 4.1 and 51.6 hospital admissions per 100.000 inhabitants. Such fact occurs for the group as a whole and also when individuals are separated according to sex. Subsequently, the Midwestern region shows very high rates, exceeding 20 hospital admissions per 100.000 inhabitants in the first two three-year periods analyzed. In the three-year periods that follow, rates are still high, but they present significant reduction in the men's group, which makes the overall rate reduce as well.

The lowest rates are in the Northeast region, oscillating between 5.5 and 16.1 for men and between 4.4 and 10.5 per 100,000 for women. In the Southeast, rates above 20 were observed for men for the first two three-year periods, remaining high in the two following three-year periods at around 15 hospital admissions per 100,000 inhabitants.

In the region-based analysis, the highest hospital admission rates are always for men. The data per state also show that rates exceed 20 hospital admissions per 100,000 in the male group at several moments in the following states: Acre, Pará, Amapá, Tocantins, Ceará, Minas Gerais, Espírito Santo, Santa Catarina, Goiás and Distrito Federal. Rates from states of Acre, Pará and Paraíba stand out among women.

Table 2 presents data for age group 70 to 79 years for both sexes and separately for men and women. Again, the male group presents the highest rates in the North and Midwest regions. For women, the highest values are in the North and Northeast regions in almost all trienniums. Rates for the male population vary between 4.5 (2012-14) and 53.4 (2003-05) per 100,000 inhabitants and female rates between 3.0 (2012-14) and 49.6 (2003-05) per 100,000 inhabitants.

According to Table 2, the states of Acre, Pará, Paraíba, Minas Gerais, Espírito Santo and Goiás show high rates in nearly all trienniums for males. For women, the states of Acre, Pará, Tocantins and Paraíba present the highest rates.

When Tables 1 and 2 are compared, it is noticed that the elderly age group 60 to 69 years shows rates a little above those observed for age group 70 to 79 years in most Brazilian regions, both as a whole and for the male population. For women the situation is the opposite.

In the elderly age group 80 and older, data per region show much lower rates if compared with other age groups (60 to 69 and 70 to 79 years), including a reducing tendency. Nevertheless, in the North region the highest rates (22.3/100,000 for men and 27.6/100,000 for women) were observed for the people in this age group. The Northeast, Midwest and Southeast regions are respectively described below. The table shows reduction of rates for this age group in all regions. The data analysis according to state shows very oscillating and high rates in Acre, Pará, Tocantins and Paraíba.

Table 4 presents hospital admission rates for self-inflicted injury in age group 60 and older from 2009 to 2014 from two information systems, SIH and SINAN/VIVA. The data referring to year 2009 vary between 3.2 and 9.3 hospital admissions per 100,000 inhabitants in the SIH and between 0.3 and 2.2 in VIVA. Similar situation occurs with data of the following year (2010). In 2011, rates vary between 2.3 and 7.3 in the SIH and between 0.8 and 5.4 in VIVA. A gradual increase in rates from the VIVA system is noticed. Another interesting aspect to be highlighted is that, data according to regions in years 2012, 2013 and 2014 for the Southeast, South and

Table 1. Hospital admission rates for suicide attempts (per 100,000 habitants) in people aged 60 to 69 years according to sex and state, 2000-2014.

Region/State	Sex and triennium														
	General					Male					Female				
	00-02	03-05	06-08	09-11	12-14	00-02	03-05	06-08	09-11	12-14	00-02	03-05	06-08	09-11	12-14
North	23.9	39.8	36.7	22.1	7.6	33.4	51.6	47.4	27.8	4.1	14.0	27.4	25.9	16.2	4.2
Rondônia	12.9	8.2	10.2	11.9	10.5	19.5	11.1	16.2	17.0	12.7	4.8	4.6	3.6	6.2	8.1
Acre	57.3	187.5	166.3	156.5	17.9	76.1	315.2	282.3	274.7	35.8	36.3	45.3	51.0	37.4	0.0
Amazonas	1.2	1.1	3.9	3.3	0.0	2.4	0.0	6.0	3.3	0.0	0.0	2.2	1.9	3.3	0.0
Roraima	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pará	29.1	58.5	51.5	24.9	9.1	42.8	69.8	61.4	23.2	13.3	15.2	46.9	41.6	26.7	4.8
Amapá	41.5	0.0	12.2	5.0	18.0	66.1	0.0	24.7	9.9	26.8	16.6	0.0	0.0	0.0	9.0
Tocantins	38.9	16.6	14.1	9.2	5.8	40.7	23.4	10.2	17.6	5.6	36.8	8.8	18.3	0.0	5.9
Northeast	13.0	8.6	8.4	7.4	9.9	16.1	10.5	10.8	11.0	5.5	10.5	7.0	6.5	4.4	4.6
Maranhão	2.6	1.7	1.5	3.6	10.7	3.5	2.5	2.5	6.0	15.5	1.7	0.8	0.7	1.3	6.4
Piauí	3.8	7.4	4.8	9.6	9.7	4.8	9.4	10.2	8.4	12.4	2.9	5.6	0.0	10.8	7.3
Ceará	13.9	7.9	7.8	12.7	29.1	15.7	12.7	12.5	19.8	50.5	12.5	4.0	4.0	6.7	11.3
Rio Grande do Norte	7.9	9.9	7.8	0.6	2.1	10.5	15.3	7.2	1.2	4.7	5.7	5.5	8.2	0.0	0.0
Paraíba	75.4	50.8	47.1	18.2	2.6	84.7	46.7	43.9	21.3	3.9	68.1	54.1	49.6	15.6	1.5
Pernambuco	1.0	0.3	0.7	2.6	3.8	0.0	0.0	1.0	4.5	5.2	1.8	0.4	0.4	1.1	2.7
Alagoas	4.4	5.1	3.8	1.9	2.4	3.9	7.6	6.6	2.8	5.3	4.8	3.1	1.4	1.2	0.0
Sergipe	8.4	6.7	2.2	5.8	0.9	12.6	9.1	4.9	8.4	2.0	5.0	4.8	0.0	3.6	0.0
Bahia	11.1	5.4	7.8	8.2	8.8	18.5	8.7	12.3	13.7	14.2	4.8	2.5	3.8	3.4	4.1
Southeast	16.5	15.6	11.0	10.8	9.9	24.6	23.3	15.8	16.1	9.2	9.7	9.2	6.9	6.4	7.8
Minas Gerais	31.9	29.3	15.1	15.4	14.2	47.1	43.7	21.7	20.5	16.1	18.7	16.7	9.3	11.0	12.6
Espírito Santo	8.9	22.4	22.7	34.6	25.4	11.7	36.5	36.4	66.3	39.0	6.5	9.9	10.6	6.6	13.1
Rio de Janeiro	10.6	8.9	7.5	4.1	3.6	19.7	15.3	11.2	7.5	5.8	3.5	4.0	4.7	1.4	2.0
São Paulo	12.1	11.4	9.6	9.7	9.4	16.4	15.6	13.3	13.5	11.3	8.5	7.9	6.6	6.5	7.7
South	14.3	7.6	7.5	7.3	4.7	20.8	11.8	10.3	10.0	4.5	8.6	3.9	5.0	4.9	3.9
Paraná	8.5	5.6	7.1	9.3	5.8	10.7	8.0	10.4	10.5	6.0	6.4	3.5	4.2	8.2	5.6
Santa Catarina	25.9	10.6	8.2	9.5	6.6	38.4	16.0	10.2	13.9	7.6	14.8	5.7	6.3	5.5	5.6
Rio Grande do Sul	14.1	7.8	7.5	4.6	3.0	21.7	13.1	10.4	7.8	4.3	7.8	3.5	5.0	1.8	1.8
Midwest	22.6	21.8	14.2	13.3	9.2	34.3	33.6	19.4	18.0	3.1	10.9	10.0	9.2	8.9	2.8
Mato Grosso do Sul	16.0	12.3	12.9	10.4	4.7	25.2	22.3	19.4	12.1	9.9	6.5	2.1	6.7	8.7	0.0
Mato Grosso	23.9	10.4	11.5	11.8	8.1	36.4	11.6	11.0	16.0	10.9	9.4	9.1	12.1	7.2	5.1
Goiás	24.0	28.2	15.8	13.6	11.1	33.0	40.4	23.7	20.3	21.4	15.2	16.2	8.4	7.2	1.6
Distrito Federal	25.5	29.2	14.4	17.8	10.4	48.6	59.9	18.5	21.1	16.1	5.3	2.5	11.2	15.2	6.1

Source: Ministry of Health, Hospital Information System, SUS (SIH/SUS).

Midwest regions show that rates obtained from VIVA are higher than those from SIH. The information per state also shows improvement in the data from VIVA, especially from 2012 on, with gradual increase in the number of notified cases.

Regarding hospital admissions described as indeterminate intent (not presented data), the highest percentages occur in the North region, varying from 5.4% to 16.4%. In the Northeast, Southeast and South regions the percentage varies between 2.0 and 6.8%. Nevertheless, it is worth emphasizing that the data show a slight percentage increase in these regions over the last studied years for hospital admissions described as indeterminate intent.

Discussion

The information presented herein emphasizes the relevance of the study on suicide attempts among the elderly, at a moment in which this age group is growing in the country and in the world. Such aspects relate the increase of suicide attempts to the following main factors: disease and mental disorders; use of determined medications, drugs,

Table 2. Hospital admission rates for suicide attempts (per 100,000 habitants) in age group 70 to 79 years according to sex and state, 2000-2014

Region/State	Sex and triennium														
	General					Male					Female				
	00-02	03-05	06-08	09-11	12-14	00-02	03-05	06-08	09-11	12-14	00-02	03-05	06-08	09-11	12-14
North	24.3	51.6	38.2	24.7	5.6	29.1	53.4	39.4	28.5	8.4	19.4	49.6	37.1	21.1	3.0
Rondônia	24.3	9.4	3.4	12.0	8.7	25.5	8.2	6.4	22.8	11.4	22.8	10.9	0.0	0.0	5.9
Acre	41.1	153.7	95.4	66.2	7.2	76.0	266.3	152.3	101.4	0.0	0.0	20.9	33.2	29.9	13.7
Amazonas	7.2	0.0	3.8	4.9	1.6	14.6	0.0	7.9	3.4	3.5	0.0	0.0	0.0	6.3	0.0
Roraima	0.0	0.0	0.0	0.0	16.1	0.0	0.0	0.0	0.0	31.2	0.0	0.0	0.0	0.0	0.0
Pará	21.9	82.7	61.3	37.3	7.4	27.1	77.5	58.2	39.1	11.8	16.9	87.7	64.2	35.7	3.5
Amapá	36.9	0.0	0.0	10.1	0.0	75.3	0.0	0.0	21.0	0.0	0.0	0.0	0.0	0.0	0.0
Tocantins	59.7	20.5	19.5	8.2	0.0	39.7	15.3	12.5	10.5	0.0	82.9	26.6	27.1	5.8	0.0
Northeast	15.1	9.9	9.7	7.3	7.9	14.1	9.6	12.6	10.2	12.1	15.9	10.1	7.4	5.0	4.8
Maranhão	1.7	0.0	2.1	4.5	7.3	1.7	0.0	1.5	5.8	8.2	1.6	0.0	2.6	3.3	6.5
Piauí	2.7	1.3	2.5	3.8	5.2	2.8	2.7	5.4	4.2	7.3	2.5	0.0	0.0	3.5	3.7
Ceará	10.9	7.0	12.1	13.4	23.9	15.8	11.4	18.5	16.1	37.2	6.7	3.2	7.3	11.4	13.9
Rio Grande do Norte	7.1	9.1	3.4	0.0	3.8	5.1	17.2	8.0	0.0	6.8	8.8	2.1	0.0	0.0	1.6
Paraíba	88.3	75.0	58.9	18.5	3.6	64.4	52.2	60.9	23.5	7.0	108.1	93.9	57.5	14.9	1.2
Pernambuco	1.3	0.4	0.4	2.4	2.5	3.0	0.0	0.9	5.8	4.4	0.0	0.8	0.0	0.0	1.2
Alagoas	9.7	3.2	1.4	1.2	0.0	10.7	6.9	3.2	2.8	0.0	9.0	0.0	0.0	0.0	0.0
Sergipe	7.3	2.3	6.1	1.8	1.8	0.0	0.0	14.5	4.3	4.4	13.1	4.2	0.0	0.0	0.0
Bahia	13.2	3.5	7.0	8.4	6.7	15.0	5.1	10.7	12.8	9.7	11.7	2.2	4.1	4.9	4.6
Southeast	13.1	11.7	7.9	9.0	8.1	17.5	16.7	11.2	11.7	10.3	9.9	8.0	5.4	7.0	6.5
Minas Gerais	23.1	23.2	13.2	14.4	10.5	28.2	31.7	19.6	18.1	11.3	19.0	16.3	8.2	11.4	9.8
Espírito Santo	9.0	14.8	10.5	12.4	21.0	13.9	21.4	14.9	18.0	30.9	4.8	9.1	7.0	8.0	13.4
Rio de Janeiro	7.6	5.8	5.1	3.9	4.6	13.4	9.7	7.0	6.9	7.3	3.7	3.3	3.8	1.8	2.8
São Paulo	11.3	8.8	6.3	8.3	7.4	14.3	12.0	8.4	9.9	9.2	9.0	6.3	4.8	7.1	6.0
South	11.2	7.1	7.5	7.0	4.0	13.7	11.5	9.2	9.0	4.5	9.3	3.8	6.2	5.5	3.6
Paraná	10.9	3.5	12.6	10.3	4.4	13.0	5.9	13.4	12.2	4.6	9.1	1.5	11.9	8.7	4.2
Santa Catarina	21.5	8.5	6.8	7.2	8.0	20.3	13.0	6.5	9.4	9.6	22.4	5.1	7.0	5.4	6.7
Rio Grande do Sul	7.4	9.2	4.0	4.2	1.9	11.5	15.5	6.8	5.9	2.0	4.5	4.9	2.0	3.0	1.8
Midwest	17.1	22.0	15.0	9.7	10.5	21.8	28.7	24.7	16.3	11.8	12.5	15.3	6.1	3.6	9.4
Mato Grosso do Sul	19.2	14.4	9.4	5.5	9.3	25.5	16.4	9.6	8.4	11.4	12.9	12.4	9.2	2.7	7.4
Mato Grosso	10.0	7.2	13.7	5.7	8.1	13.8	8.9	19.8	8.2	5.4	5.5	5.2	7.1	3.0	10.8
Goiás	19.0	36.5	18.5	14.1	12.2	19.3	48.1	32.9	25.9	16.6	18.8	25.1	5.2	3.4	8.4
Distrito Federal	16.4	3.1	13.5	7.0	10.1	38.3	7.2	27.1	8.1	6.8	0.0	0.0	3.9	6.2	12.5

Source: Ministry of Health, Hospital Information System, SUS (SIH/SUS).

alcohol and intoxication; suffering from terminal and degenerative diseases; socio-environmental, micro-social, social problems such as existing structural and socioeconomic crisis in the existing context; and media influence[1,3,15].

A retrospective cohort that analyzed the profile of individuals who attempted suicide between 2003 and 2009 in Barbacena (MG, Brazil), investigating deaths up to 12 months after the last attempt, from police reports and death certificates showed that among 807 individuals who attempted suicide in the period, 52 deaths occurred, 12 from suicide. Ninety percent of the investigated deaths occurred within 24 months after the attempt. A significant increase in the risk of death was verified among men, married people and in the population aged 60 and older (22.7% of those aged 60+ died). The results of the study showed that the mortality rate among those who attempted suicide was higher than that expected in the general population[16].

Another study on the quality of data of external causes is that of Cavalini and Leon[17] who propose a method for correction of incomplete information for the Mortality Information System (SIM) and for the Hospital Information

Table 3. Hospital admission rates for suicide attempts (per 100,000 inhabitants) in age group 80 and older according to sex and state, 2000-2014.

Region/State	Sex and triennium														
	General					Male					Female				
	00-02	03-05	06-08	09-11	12-14	00-02	03-05	06-08	09-11	12-14	00-02	03-05	06-08	09-11	12-14
North	13.4	24.9	14.4	5.9	2.2	12.2	22.3	12.4	7.6	3.2	14.5	27.6	16.4	4.3	1.2
Rondônia	48.2	0.0	0.0	8.3	0.0	90.4	0.0	0.0	16.0	0.0	0.0	0.0	0.0	0.0	0.0
Acre	48.4	67.9	35.2	30.8	51.3	0.0	88.1	63.5	30.7	110.0	99.6	46.5	0.0	30.9	0.0
Amazonas	0.0	0.0	9.1	7.2	0.0	0.0	0.0	20.4	8.3	0.0	0.0	0.0	0.0	6.4	0.0
Roraima	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pará	25.7	98.0	58.2	17.6	4.8	25.6	107.5	49.5	23.8	7.5	25.8	91.2	65.3	12.9	2.8
Amapá	0.0	0.0	0.0	23.0	0.0	0.0	0.0	0.0	55.2	0.0	0.0	0.0	0.0	0.0	0.0
Tocantins	110.9	38.9	15.1	6.3	7.0	102.0	19.7	0.0	12.4	0.0	119.5	57.5	31.9	0.0	13.6
Northeast	14.8	10.4	8.4	4.2	4.5	13.8	7.8	7.9	3.9	6.0	15.3	12.7	8.3	4.5	3.4
Maranhão	3.5	0.0	4.4	0.0	5.3	3.9	0.0	6.8	0.0	9.9	3.1	0.0	2.6	0.0	2.2
Piauí	0.0	6.0	11.9	0.0	15.7	0.0	6.7	0.0	0.0	27.4	0.0	5.4	21.8	0.0	8.5
Ceará	14.6	10.1	9.6	11.1	28.5	23.5	6.8	14.5	9.3	43.4	7.5	12.6	6.1	12.4	19.0
Rio Grande do Norte	9.6	4.7	23.4	5.0	1.9	10.5	10.2	29.4	7.9	4.8	0.0	0.0	0.0	2.8	0.0
Paraíba	240.4	187.7	113.5	31.3	3.2	192.4	136.7	80.6	15.3	4.0	279.1	228.7	140.4	42.4	2.6
Pernambuco	1.0	0.0	0.8	2.8	4.8	2.4	0.0	0.0	5.3	2.2	0.0	0.0	1.5	1.2	6.4
Alagoas	3.3	6.4	3.1	2.6	2.8	0.0	7.2	7.2	6.4	0.0	5.9	5.7	0.0	0.0	4.5
Sergipe	19.0	0.0	12.0	3.5	0.0	32.5	0.0	18.2	9.0	0.0	8.5	0.0	7.1	0.0	0.0
Bahia	13.6	5.8	7.7	8.6	8.2	19.5	5.5	9.8	11.6	11.9	9.2	6.0	6.0	6.6	5.9
Southeast	5.4	5.8	3.5	4.5	4.7	7.0	7.4	3.6	4.4	5.4	4.2	4.6	3.4	4.6	4.3
Minas Gerais	31.3	28.6	9.8	13.3	13.3	43.4	41.0	11.7	15.7	14.2	23.5	20.4	8.5	11.9	12.7
Espírito Santo	6.5	15.6	8.9	15.3	13.6	8.0	30.8	10.7	24.0	25.6	5.5	5.2	7.6	9.5	5.6
Rio de Janeiro	6.3	6.7	3.9	3.3	5.1	11.0	10.7	6.2	3.0	6.3	4.0	4.6	2.7	3.4	4.4
São Paulo	9.8	12.7	8.9	10.6	9.6	14.6	16.8	9.0	11.2	13.5	7.0	10.3	8.8	10.3	7.4
South	3.9	3.9	3.5	2.5	1.6	5.1	4.7	2.2	1.6	1.7	2.9	3.3	4.5	3.2	1.5
Paraná	10.4	7.9	12.3	8.9	3.0	16.5	8.1	9.1	3.4	4.3	6.0	7.8	14.8	12.7	2.1
Santa Catarina	12.7	18.3	8.2	6.2	4.3	16.5	26.4	7.0	3.4	2.9	10.3	13.2	9.0	7.8	5.1
Rio Grande do Sul	10.1	9.8	5.9	3.5	3.4	15.9	15.5	3.1	5.9	5.0	7.1	6.9	7.4	2.2	2.6
Midwest	6.3	7.3	8.6	7.3	2.8	8.2	8.7	8.7	7.3	2.7	4.5	6.0	8.6	7.3	2.8
Mato Grosso do Sul	10.6	10.2	18.1	12.9	6.2	23.0	11.1	7.7	14.3	14.0	0.0	9.5	27.4	11.7	0.0
Mato Grosso	0.0	13.0	13.4	7.8	0.0	0.0	26.6	17.7	7.9	0.0	0.0	0.0	9.1	7.6	0.0
Goiás	25.6	29.5	20.4	23.9	9.9	33.4	32.1	25.4	26.5	9.4	19.0	27.3	16.0	21.8	10.3
Distrito Federal	18.2	8.6	33.1	22.1	7.4	26.1	24.5	44.3	24.1	0.0	14.0	0.0	27.8	20.9	11.8

Source: Ministry of Health, Hospital Information System, SUS (SIH/SUS).

System of SUS (SIH/SUS). The authors point that, for the SIM, an addition of 55,671 deaths was obtained, resulting in a percentage of correction of under-registrations of 5.85%, which was more effective in the extreme age groups, in perinatal and undetermined causes, and in the Northeastern region. With the redistribution of undetermined death causes, change in the structure of proportional mortality was observed in the North and Northeast regions.

As for the distribution of attempts according to *age group* , the relevance of the study with the elderly is emphasized, especially in the North, Northeast and Midwest, where the highest rates are found. Differences were noted in attempted suicide rates according to aging level with higher values for the age group 60-60 years and regression of rates in two following groups, in disagreement with what has been presented worldwide[13]. In the comparison between age groups, it was noticed that the attempts registered in the SIH are higher among adults than among the elderly.

Due to the lack of information on attempted suicide at a national level[1], it is difficult to compare it with other countries. Hence, the WHO affirms that the variability of suicide rates per

Table 4. Comparison of hospital admission rates for self-inflicted injuries (per 100,000 habitants) in age group 60 and older according to region and state obtained from SIH and SINAN systems, 2009 to 2014

Region/State	SIH						SINAN/VIVA					
	09	10	11	12	13	14	09	10	11	12	13	14
North	9.3	9.1	6.4	2.5	1.9	2.3	0.4	0.7	0.8	1.7	2.9	1.4
Rondônia	5.1	3.5	3.5	3.5	2.5	3.1	0.0	0.0	0.0	0.0	0.0	0.8
Acre	68.7	29.8	23.0	4.1	12.6	2.0	0.0	4.3	0.0	12.4	2.1	2.0
Amazonas	0.5	1.9	1.4	0.0	0.0	0.4	0.0	0.0	0.5	0.5	1.8	0.4
Roraima	0.0	0.0	4.0	3.9	0.0	0.0	0.0	0.0	0.0	23.3	12.1	11.3
Pará	10.6	14.0	6.8	3.3	1.6	3.1	0.0	0.0	0.4	0.2	0.5	0.2
Amapá	6.9	2.9	5.7	5.6	2.8	2.6	0.0	0.0	0.0	5.6	0.0	0.0
Tocantins	1.0	0.0	7.6	0.8	1.7	1.6	3.9	5.1	5.1	2.5	17.6	8.0
Northeast	3.6	1.9	4.1	2.2	2.4	4.6	0.5	0.8	1.6	2.2	2.7	2.2
Maranhão	0.6	0.9	4.4	2.4	3.3	2.9	0.0	0.2	1.4	1.9	1.9	1.1
Piauí	2.5	1.5	5.4	2.7	2.9	3.1	1.1	2.4	5.1	6.5	2.9	2.2
Ceará	5.8	4.2	5.5	2.7	7.5	16.6	0.0	0.3	0.3	0.8	2.4	1.5
Rio Grande do Norte	1.0	0.0	1.2	1.1	1.4	0.0	0.0	0.3	2.3	2.3	3.7	2.2
Paraíba	19.0	2.0	2.4	1.1	0.9	0.9	0.0	0.9	1.3	2.2	2.1	2.3
Pernambuco	0.6	1.0	2.5	1.6	0.9	1.0	0.9	1.0	1.8	2.4	5.1	3.8
Alagoas	1.2	0.0	1.8	1.1	0.0	0.7	4.4	3.6	7.5	10.0	6.7	6.1
Sergipe	0.6	1.1	2.7	0.0	0.0	1.0	0.0	0.0	0.0	0.5	0.0	1.0
Bahia	2.3	2.4	5.9	3.0	1.1	3.9	0.1	0.4	0.5	1.0	1.3	1.2
Southeast	3.2	3.7	6.5	3.6	2.0	3.9	0.6	1.1	2.4	4.3	4.4	4.4
Minas Gerais	4.0	5.6	8.9	4.3	3.4	5.4	0.2	0.8	2.9	6.3	8.1	8.4
Espírito Santo	6.2	8.5	22.0	11.9	4.4	6.9	0.0	0.0	1.1	1.3	3.2	5.5
Rio de Janeiro	1.2	1.8	2.3	1.5	0.4	2.2	0.2	0.6	0.6	1.7	2.0	1.9
São Paulo	3.5	3.2	6.0	3.4	1.9	3.7	1.1	1.5	3.0	4.6	3.7	3.5
South	3.2	1.9	2.7	1.5	0.8	1.6	0.3	2.3	5.4	8.7	9.1	9.3
Paraná	6.2	2.6	2.5	1.6	1.5	2.0	0.5	1.0	1.9	3.0	4.1	4.9
Santa Catarina	3.3	2.4	6.0	3.7	0.8	2.4	0.3	2.1	5.3	8.4	11.1	15.3
Rio Grande do Sul	1.3	1.9	1.6	0.7	0.6	1.4	0.0	3.5	8.2	13.5	12.2	10.0
Midwest	5.0	3.4	7.3	3.3	1.8	4.2	2.2	2.1	3.1	5.1	6.0	4.4
Mato Grosso do Sul	3.6	2.1	5.8	2.9	0.8	2.6	8.1	6.3	8.7	14.7	12.5	13.1
Mato Grosso	3.1	2.5	7.4	3.7	0.4	3.3	0.4	0.8	1.2	1.2	2.3	1.1
Goiás	7.2	4.1	6.0	2.6	2.9	5.6	1.0	1.6	2.1	3.7	5.7	2.8
Distrito Federal	2.7	4.0	12.5	5.4	1.7	3.5	1.1	0.0	1.5	2.5	3.7	2.7

Source: Ministry of Health, Hospital Information System, SUS (SIH/SUS) and Notification Aggravation Information System (SINAN/SUS).

age is even higher than per world regions. For instance, the WHO informs that there is a great difference between high-income countries and low- and middle-income countries. In these last two, the highest rates are in groups of young adults and older women. In richer countries, the main victims are middle-aged men. According to the WHO, among the difficulties in studying the theme, prevalence, characteristics and methods used to attempt suicide vary widely between communities, demographic groups and along time[1].

Regarding differences between sexes, in general, more increased rates for older men of the three investigated age groups were found in this study. Among women, increased rates in the states of Acre, Pará and Paraíba stood out, where the problem seems significant. Data from the WHO inform that for each woman who dies in Brazil from suicide, irrespective of age group, there are 3-3.9 men dying from the same cause. This fact specifically places the country in a similar scenario as that of higher-income countries. In middle- and low-income countries, the man/woman mortality ratio is 1.6. Among the reasons that interfere in the differentiation of suicide rates between sexes are equality issues; methods

of dealing with stress and conflicts, viability and preference for determined methods of suicide, access to alcohol and drugs and different search for mental health support[1].

There are important methodological difficulties in the investigation and understanding of data on attempted suicide. The discrepancy between prevalence data from population surveys and hospital admission statistics (in general, dealing with the most serious extreme of a continuous suicidal behavior) is an aspect to be considered. The prevalence of attempted suicide in residents of Campinas (SP, Brazil) throughout their lifetime is 2.8% (CI 95%: 0.09; 4.6), without significantly differing from values found in countries like Europe and the United States (3% to 5%). Among the elderly, the prevalence is 0.8% (0.03-4.69)[18,19]. For every three attempts, only one is attended in the emergency service when the injury is very serious. But problems with access or with relying on the health system, population stigma towards suicidal behavior and fear of criminalization are fundamental aspects for both absence or lack of notification[18 ,20]. Therefore, every epidemiological study needs to consider the deficiency of reliable statistics on the subject.

Under-registration is another factor that hinders understanding: hospital admissions classified as external causes of undetermined intent present high rates, especially in the Northern region. The situation has worsened in some regions and in states over the last years. Such condition can be observed in other studies, which highlight problems in the quality of data of external causes and self-inflicted injuries.

In 2004, in Londrina and Maringá (PR, Brazil), Mathias et al.[21] analyzed the agreement rate involving all hospital admissions for self-inflicted injuries in the SIH, with information from medical records, finding moderate (kappa 0.56) and acceptable (kappa 0.28) agreement rate, respectively. Under-registration of external causes repeats in these cities, evidencing low sensibility (57.3%) in Maringá and 73% in Londrina, giving emphasis to self-inflicted injuries[5].

Santos et al.[11] examined cases of suicide attempts by exogenous intoxication in Rio de Janeiro, by crossing data from the SINAN, SIM and from the Poison Control Center. They found 68.8% of the 948 registrations of the Control Center reported by health professionals, but only 2.6% were in the other systems. Mathias et al.[21] reported that the concern with the improvement of information quality on external causes of hospital admissions in Brazil is not recent, it is an international issue[22,23]. In the United States, it was noticed that the quality of data varies greatly between states; better quality is found where well-established codification rules are found and where compliance is officially controled[24].

Melione et al.[25] emphasizes another possibility of evaluating the poor classification of suicide attempt through hospital admissions data: the analysis of hospital admissions under natural causes at the SIH/SUS which would in fact be external causes. These authors remember that hospital admissions financed by the public sector in Brazil represent nearly 75% of admissions, varying between regions and states, due to the population that uses health plans or private hospitals.

It is important to highlight that there is under-registration in the VIVA system data, despite the growing increase of attempted suicide registration among older people in recent years. It is worth emphasizing that data registered in this system should be more reliable, since it includes information on cases that do not require hospital admission. However, it is a very recent system and only now studies on coverage and quality of data are being reported. Abath et al.[26] analyzed data of the SINAN from Recife (PE, Brazil) between 2009 and 2012 and reported a 283.9% increase in the number of notifications of violence. The mean percentages of completeness, consistency and duplicity of data were, respectively, 70.3% (regular), 98.5% (excellent) and 0.2% (acceptable). The authors emphasize that, although Violence Surveillance has been incorporated to the SINAN since 2009, only in 2010 an Ordinance of the Ministry of Health (MS/GM n. 2.472, August 31st, 2010) included this aggravation in the "List of Compulsory Notification in Sentinel Units". However, only in 2011, with Ordinance n. 104 MS/GM, of January 25th 2011, violence started to compose the "List of Universal Compulsory Notification of Diseases". From then, there was increase of information and strengthening of VIVA.

All these mentioned aspects contribute to a perplexing feeling and great limitation in the understanding of the studied phenomenon. In a prior study[27], it was noticed that Southern states are among the highest death rates of older people by suicide. In the present study, the lowest hospital admission rates for attempts are exactly in this region according to the SIH, although according to the VIVA system, attempts start from lowest to highest values between regions. How much of the divergence between deaths and attempts evaluated by SIH can be explained by employed suicide attempt methods, access to private health

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services, prejudice following suicidal behavior or fragility of information systems, among other possible causes? So many questions will only be answered following great effort at improving services offered to people who attempt suicide, investing in different information systems and performing further studies on the subject.

Final considerations

The present study highlights the necessity of analysis and improvement of hospital morbidity data (SIH) and of compulsory violence notification (VIVA). It particularly emphasizes the reduction of hospital admission rates in several regions and the slight increase of rates obtained from the VIVA data, system that still lacks a more solid implementation in the country. Such aspects reinforce the importance of improving the understanding on attempted suicide in Brazil, especially concerning the elderly population, as they constitute a group in which attempted suicide is more frequent due to physical, emotional, social and contextual aging difficulties. Greater death risk is added after the attempt of self-inflicted death.

Investment on the Health Information System must be done by improving the quality of mortality and morbidity systems, as well as through population surveys that support the understanding of such a complex phenomenon, and also through the active search for cases and studies in different contexts, increasing thus the possibility of greater explanation for such stigmatized and under-registered phenomenon.

Collaborations

LW Pinto SG and Assis participated in all stages of the manuscript preparation.

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