Mortality by suicide in the State of Pernambuco, Brazil (1996-2015)

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ABSTRACT
Objective: To describe the epidemiological characteristics of suicide mortality in the state of Pernambuco, from 1996 to 2015. **Method:** Study with data from the Sistema de Informações sobre Mortalidade. The simple linear regression model was used to verify the trend in the period analyzed. **Results:** There were 6,229 suicides, of which 3,390 (54.4%) occurred in the second decade of study. The mortality rate was 4.7 per 100,000 inhabitants. The temporal trend presented a decrease of 23.5% (p=0.031). For the male sex and the age range between 20 and 39 years, there was a decline in self-inflicted death of 23.8% (p=0.018) and 26.1% (p=0.046), respectively. **Conclusion:** The temporal analysis revealed a reduction in suicide mortality coefficients. This observation may contribute to better targeting of health interventions, optimizing resources and efforts, especially in suicide prevention.
Descriptors: Suicide; External Causes; Mortality; Vital Statistics; Trends.

RESUMO
Objetivo: Descrever as características epidemiológicas da mortalidade por suicídio no estado de Pernambuco, no período de 1996 a 2015. **Método:** Estudo com dados do Sistema de Informações sobre Mortalidade. Utilizou-se o modelo de regressão linear simples para verificar a tendência no período estudado. **Resultados:** Foram registrados 6.229 suicídios, dos quais 3.390 (54,4%) aconteceram na segunda década de estudo. O coeficiente de mortalidade foi de 4,7 por 100.000 habitantes. A tendência temporal apresentou decréscimo de 23,5% (p=0,031). No sexo masculino e faixa etária de 20 a 39 anos observou-se declínio na morte autoprovocada de 23,8% (p=0,018) e 26,1% (p=0,046), respectivamente. **Conclusão:** A análise temporal revelou redução dos coeficientes de mortalidade por suicídio. Essa observação poderá contribuir para melhores direcionamentos de intervenções em saúde, otimizando recursos e esforços, sobretudo na prevenção do suicídio.
Descritores: Suicídio; Causas Externas; Mortalidade; Estatísticas Vitais; Tendências.

RESUMEN
Objetivo: Describir las características epidemiológicas de la mortalidad por suicidio en el estado de Pernambuco, en el período de 1996 a 2015. **Método:** Estudio con los datos del Sistema de Informaciones sobre Mortalidad. Se utilizóel modelo de regresión lineal simple para verificar la tendencia en el período de estudio. **Resultados:** Se registraron 6.229 suicidios, de los cuales 3.390 (el 54,4%) ocurrieron en la segunda década de estudio. El coeficiente de mortalidad fue de 4,7 por 100.000 habitantes. La tendencia temporal presentó una disminución del 23,5% (p=0,031). E nel sexo masculino y el grupo de edad de 20 a 39 años se observó un descenso en la muerte autoprovocada del 23,8% (p=0,018) y el 26,1% (p=0,046), respectivamente. **Conclusión:** El análisis temporal reveló una reducción de los coeficientes de mortalidad por suicidio. Esta observación puede contribuir a mejores formas de intervenciones en salud, optimizando los recursos y esfuerzos, sobre todo en la prevención del suicidio.
Descriptores: Suicidio; Causas Externas; Mortalidad; Estadísticas Vitales; Tendencias.

INTRODUCTION

Suicidal behavior is referred to as a complex phenomenon that manifests itself through ideas and planning that may culminate in suicidal action, the outcome of which may or may not be fatal[1]. Suicide is defined as the intentional human act of ceasing with one's own life, an act influenced by demographic, biological and social aspects[2-3].

Among the factors associated with self-inflicted death are previous suicide attempts, presence of mental illness, aggressive and impulsive personality traits, past violence, and social isolation[4]. Some population groups, such as indigenous people, are at higher risk of committing suicide[5], which is also higher among males and individuals 65 years of age or older[6-7].

For the year 2015, the World Health Organization (WHO) estimated 788,000 deaths by suicide, indicating global mortality coefficient of 10.7 per 100,000 inhabitants[8]. However, the lack of data in some countries and the irregularity in sending this information to WHO limit the precise knowledge of this event in the world[6,9].

Brazil is among the ten countries that have the highest absolute numbers of death by suicide[9]. In 2015, there were 11,736 cases, with a mortality coefficient of 5.7 per 100,000 inhabitants[10]. In the state of Pernambuco, between 2011 and 2013, self-inflicted deaths accounted for 4.2% of all external causes[11].

Suicide mortality trend is influenced by factors such as sex, age and means employed[12-14]. Identifying temporal changes and the epidemiological profile of suicide is relevant to subsidize the planning of intervention actions of the health sector and related areas capable of minimizing its occurrence.

OBJECTIVE

To analyze the temporal tendency and the epidemiological characteristics of mortality by suicide in the state of Pernambuco, from 1996 to 2015.

METHOD

Ethical aspects

The research was approved by the Research Ethics Committee of the Health Sciences Center of the Federal University of Pernambuco. The study complied with national and international guidelines for research involving human subjects.

Design, study location and study period

This is an ecological study of temporal trend. The state of Pernambuco is located in the Northeast region of Brazil and has a land area of 98,076,021 km^2. Administratively, it is divided into 185 municipalities distributed into 12 Regional Health Departments. The estimated population for 2015 was 9,345,173 inhabitants[15].

The study analyzed the suicides occurred between 1996 and 2015 by residents of the state of Pernambuco. The data come from the Sistema de Informações sobre Mortalidade (SIM), corresponding to the large group of causes of self-inflicted lesions (X60-X84) of the 10th revision of the international classification of diseases (ICD-10). Population estimates were taken from the Brazilian Institute of Geography and Statistics (IBGE/2010)[15].

Inclusion and exclusion criteria

All suicide deaths occurred in residents of the state of Pernambuco aged 10 years or more between 1996 and 2015. The variables education and occupation were not analyzed due to the high proportion of incompleteness (39.4% and 25.6%, respectively).

Study protocol

The data used were obtained through a declaration of consent granted by the State Health Department of Pernambuco.

Analysis of results and statistics

The epidemiological characterization of the suicides was analyzed according to decades (1996–2005 and 2006–2015). The following variables were observed: sex, age, race/color, marital status, place of occurrence, Regional Health Department and method used for death. For each variable, the proportions and variation rates (Δ%) for the two decades were calculated using the formula: Δ% = ([Decade 2 - Decade 1]/ Decade 1) × 100.

For the temporal trend analysis, the simple linear regression technique was used. The suicide mortality coefficients ([suicide number/resident population of Pernambuco aged ten years or more] × 100,000 inhabitants) were considered the dependent variable, and the calendar year the independent variable. The program R version 3.4.1.was used for the descriptive analyses and obtaining the equations of the linear trends and adjustment statistics of the models. The level of significance was set at 5%.

In order to control the effect of different age and sex structures, simultaneous standardization by age and sex of gross suicide mortality coefficients was performed. The direct method of standardization was chosen, adopting the population of the state of Pernambuco from the 2010 IBGE census as the standard. Standardization was considered necessary to have mortality rates that were comparable to each other over the study period.

RESULTS

In the period studied (1996-2015), there were 6,229 suicides according to SIM, with a standardized mortality coefficient of 4.7 per 100,000 inhabitants. There was a decline in the total mortality coefficient, which went from 5.1 to 3.9 per 100,000 inhabitants, with a reduction of 23.5% (p=0.031) (Figure 1). The mean standardized coefficient of mortality in males was 7.4 per 100,000 inhabitants, with a reduction of -23.8 (p=0.018) (Table 1). Among women, this coefficient was 2.2 per 100,000 inhabitants, with a decrease of -22.2%. The ratio of the global mean coefficient between men and women was 3:1. As for the age group, it was verified that only the group between 20 and 39 years showed a decreasing tendency (R^2=0.204, p=0.046) (Table 1).

Analyses of the epidemiological characteristics of suicides are presented in Table 2. There was predominance of males, with 2,127 (74.9%) in the first decade and 2,525 (74.5%) in the second; however, there was a 1.6% increase in deaths among women. As for the age group, the highest concentration (>40%) is among young adults (20 to 39 years); however, the group from 40 to 59
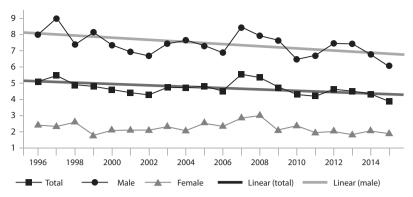
Figure 1 - Mortality coefficient by suicide of the total population of the state of Pernambuco, Brazil, by sex (1996-2015)

Table 1 - Trend analysis and adjusted model of the standardized coefficient of total suicide, by sex and age, of the resident population of the state of Pernambuco, Brazil (1996-2015)

Variable	Category	Model	R²	p value	Δ %
Total	PE	y=75.77-0.035x	0.234	0.031	-23.5
Sex	Male	y=132.929-0.063x	0.273	0.018	-23.8
	Female	y=27.188-0.012x	0.048	0.352	-
Age group	10 to 19	y=-6.451+0.004x	0.004	0.792	-
	20 to 39	y=90.725-0.043x	0.204	0.046	-26.1
	40 to 59	y=79.059-0.037x	0.122	0.132	-
	60 e mais	y=198.089-0.095x	0.167	0.074	-

years presented an increase of 11.3%, with statistical significance (p=0.008). Brown and single individuals were the most affected, recording, respectively, an increase of 22.6% (p<0.001) and 6.3% (p=0.009). The most common place of occurrence was at home, with 1,250 (45.2%) deaths in the first decade and 1,563 (47%) in the second. In relation to Regional Health Departments, there was a higher frequency in the first one, with 1,046 (36.9%) between 1996 and 2005 and 1,237 (36.7%) between 2006 and 2015. Although not significant, Regional Health Department IX showed the highest percentage change deaths by suicide (10.9%).

In the male sex, hanging was the most used method in the execution of suicide, rising from 946 (44.5%) to 1,450 (57.4%) among the decades analyzed (increase of 29.0%) (Table 3). There was a difference in the pattern of the death method used by the female sex, in which hanging predominated during the first decade, with 197 deaths (27.7%), and pesticides prevailed in the second decade, with 290 deaths (33.5%), see Table 3. The use of firearms was significantly reduced (-58.6%) among men (p<0.001) and women (-63.2%) (p=0.001), as seen in the same table.

Table 2 - Epidemiological characterization of suicide deaths in the state of Pernambuco, Brazil, according to decades (1996-2005/2006-2015)

Variables	1996–2005		2006–2015		Δ%	p value
	n	%	n	%		
Total deaths	2,839	45.6	3.390	54.4	19.3	-
Sex						
Male	2,127	74.9	2.525	74.5	-0.5	0.714
Female	712	25.1	865	25.5	1.6	0.714
Age group						
10–19 years	325	11.4	353	10.4	-8.8	0.206
20–39 years	1,290	45.5	1.459	43	-5.5	0.061
40–59 years	781	27.5	1.037	30.6	11.3	0.008
≥60 years	443	15.6	541	16	2.6	0.728
Race/color						
Brown	1,367	65.1	2.613	79.8	22.6	**<0.001**
White	612	29.1	566	17.3	-40.5	**<0.001**
Black	104	5	80	2.4	-52	**<0.001**
Yellow	11	0.5	2	0.1	-80	0.002
Indigenous Peoples	7	0.3	13	0.4	33.3	0.884
Marital status						
Single	1362	57.4	1815	61	6.3	0.009
Married	872	36.7	884	29.7	-19.1	**<0.001**
Widowed	86	3.6	133	4.5	25	0.139
Divorced	35	1.5	104	3.5	133.3	**<0.001**
Common-law marriage	14	0.6	40	1.3	116.7	0.009
Others	4	0.2	0	0	-100	-
Place of death						
At Home	1,250	45.2	1.563	47	4	0.932
Hospital and other health facilities	938	33.9	988	29.7	-12.4	**<0.001**
Public road	287	10.4	393	11.8	13.5	0.242
Others	291	10.5	384	11.5	9.5	0.51

To be continued

Chart 2 (concluded)

Variables	1996–2005		2006–2015		Δ%	p value
	n	%	n	%		
Regional Health Department						
I	1,046	36.9	1,237	36.7	-0.5	0.855
II	222	7.8	247	7.3	-6.4	0.474
III	127	4.5	155	4.6	2.2	0.881
IV	467	16.5	528	15.6	-5.4	0.391
V	213	7.5	241	7.1	-5.3	0.605
VI	117	4.1	148	4.4	7.3	0.663
VII	54	1.9	59	1.7	-10.5	0.714
VIII	153	5.4	191	5.7	5.5	0.696
IX	155	5.5	206	6.1	10.9	0.313
X	64	2.3	83	2.5	8.7	0.663
XI	117	4.1	153	4.5	9.6	0.473
XII	99	3.5	127	3.8	8.6	0.619

Source: Sistema de Informação sobre Mortalidade[16]

Table 3 - Characterization by sex of the suicide method used in the state of Pernambuco, Brazil, according to decades (1996-2005 and 2006-2015)

Root Cause (CID)	Male						Female					
	1996–2005		2006–2015			p value	1996–2005		2006–2015			p value
	n	%	n	%	Δ %		n	%	n	%	Δ%	
Medications X60 to 64	63	3.0	56	2.2	-26.7	0.129	65	9.1	58	6.7	-26.4	0.091
Pesticides X68	259	12.2	386	15.3	25.4	0.004	141	19.8	290	33.5	69.2	**<0.001**
Chemicals and unspecified harmful substances X69	106	5.0	81	3.2	-36	0.003	54	7.6	52	6.0	-21.1	0.254
Hanging, strangling and suffocation X70	946	44.5	1.450	57.4	29	**<0.001**	197	27.7	262	30.3	9.4	0.278
Drowning and submersion X71	28	1.3	25	1.0	-23.1	0.359	10	1.4	15	1.7	21.4	0.75
Firearms X72 to X74	469	22.0	229	9.1	-58.6	**<0.001**	83	11.7	37	4.3	-63.2	**<0.001**
Smoke, fire, flames, steam, gases or hot objects X76 and X77	54	2.5	36	1.4	-44	0.008	80	11.2	44	5.1	-54.5	**<0.001**
Sharp, penetrating or blunt object X78 and X79	82	3.9	116	4.6	17.9	0.254	35	4.9	39	4.5	-8.2	0.794
Precipitation of a high place X80	40	1.9	51	2.0	5.3	0.827	24	3.4	26	3.0	-11.8	0.789
Other specified and unspecified means X83 and X84	56	2.6	67	2.7	3.8	1	15	2.1	32	3.7	76.2	0.089
*Remaining X65, X66, X67, X75, X81, X82	24	1.1	28	1.1	0	1	8	1.1	10	1.2	9.1	1
Total	2,127	100.0	2,525	100	-	-	712	100	865	100	-	-

Source: Sistema de Informação sobre Mortalidade[16]
Note: * X65 Alcohol; X66Intentional self-intoxication by organic solvents, halogenated hydrocarbons and their vapors; X67 Intentional self-intoxication by other gases and vapors; X75 Explosive devices; X81 Precipitation or permanence in front of a moving object; X82 Impact of a motor vehicle.

DISCUSSION

The results demonstrate a reduction in the suicide mortality coefficient for the period analyzed. A similar trend was observed in global suicide rates, with a reduction of 26% between 2000 and 2012[17]. A study on the trend of self-inflicted mortality in the United States and in 25 European countries (1990-2010) identified a 20% drop in mortality rates in 15 European countries and a 3.5% drop in the United States[18]. In Brazil, from 1990 to 2015, there was a decrease in suicide mortality coefficients in some states, such as Rio de Janeiro (58.8%), Pernambuco (27.2%), Paraná (27.1%), Santa Catarina (24.3%) and Rio Grande do Sul (21.6%)[19].

The mean coefficient of suicide mortality in the state of Pernambuco (4.7 per 100,000 inhabitants) was lower than that observed in Brazil between 2000 and 2012 (5.7 per 100,000 inhabitants)[20]. These coefficients are distributed differently among the regions of the country, being influenced by cultural aspects and ease of access to the medium used[5,10,20-21]. In 2010, the South Region recorded a coefficient of 7.7 per 100,000 inhabitants, while the Northeast Region had a rate of 4.6 suicides per 100,000 inhabitants, suggesting that self-inflicted death is more common in regions with higher quality of life[22]. This relationship, however, is not fully understood, since different research has linked a higher risk of death by suicide to conditions of socioeconomic disadvantage[23-26].

In this study, a significant reduction in the trend of self-inflicted death among males and people aged between 20 and 39 years was identified. In Brazil, there was an increase (2000–2012) in the suicide coefficient for men (24.6%) of this age group (22.7%)[20]. Explanations such as the expansion of economic and educational opportunities and greater ideological emancipation may be associated with a decrease in suicide rates in young adults[27].

In 2006, the National Guidelines for the Prevention of Suicide Directive was instituted in Brazil[28]. In that same year, the Ministry of Health launched a Suicide Prevention Manual for mental health teams, whose objective was to detect conditions associated with the phenomenon of suicide earlier[29]. Such initiatives may have reflected in the reduction of suicide mortality in Pernambuco, since they foment prevention strategies, stimulate the permanent education of health professionals and sensitize society about this public health problem.

The model of mental health care, implemented through the Psychosocial Care Network, provided the expansion of services and access to the treatment of psychopathologies[30]. According to the Ministry of Health, the presence of Psychosocial Care Centers (CAPS) in municipalities can reduce the risk of suicide by 14%[31]. CAPS implementation has grown significantly throughout the country[32]. In Pernambuco, CAPS increased during the study period, from 11 to 129 units[33].

Other factors are related to the reduction of the mortality of those who attempt suicide, such as the adequate support and the time of care provided between the trial and the hospital admission, besides the availability of urgent and emergency care offer[34]. Among the existing equipment in the network of mental health care for suicidal behavior are hospital emergencies and resources provided by prehospital care[35]. The state of Pernambuco has a robust hospital network consisting of 27 urgency and emergency services of the Unified Health System[36]. There was also an increase in the number of prehospital services. The emergency care units implemented in 2010 currently total 15, and the population coverage of the Mobile Emergency Care Service (SAMU) increased from 20.8% to 61.8% between 2004 and 2015, respectively[36].

There was a greater frequency of suicide among men. This result is consonant with the national and international literature[6,9,18,20,37-39]. Among the possible explanations is the use of more lethal means and the higher prevalence of alcohol consumption[40-42].

Hanging was the main method used in suicide among men. In women, there was a difference in the profile of the method used, with death by hanging being predominant in the first decade and pesticides in the second. Throughout the world, suicide methods vary and depend on factors such as availability of access and cultural and sociodemographic aspects[43]. According to the WHO, pesticide ingestion is the most widely used medium in the world[44]. In general, men use more lethal suicide methods than women[38-39]. Female predilection for less violent means may be tied to the lower level of knowledge and technical skills to handle more brutal methods such as firearms, as well as the concern that the body or face are not seriously injured[37-38]. Male predilection for high-risk methods may be related to the desire not to fail, in order to demonstrate resilience, power, and emotions[37].

In Brazil, hanging is the most commonly used medium for self-inflicted death[10,20]. An international study conducted in an Asian country found similar results[45]. This is a method whose access is difficult to control, and the early identification of the individual at risk for the adoption of measures that restrict its use is crucial[20]. Among the possible causes of increase in the use of pesticides is the fragility in the control of production and inspection of these substances[20].

There was a significant reduction in the use of firearms with both sexes. A survey conducted in Paraná (1996–2012) revealed a decline in self-inflicted mortality with firearms among women (-60.3%) and men (-48.5%)[46]. A relevant hypothesis concerns the rigor of registration, possession and commercialization of this object.

Although suicide is a preventable event, avoiding self-inflicted death requires the efforts of various public sectors and society. To reduce the impact of these deaths, it is necessary to understand their aspects and to identify vulnerable subgroups. This study allowed to identify the behavior of suicide mortality, aside from pointing out the epidemiological characteristics that may contribute to the formulation of prevention strategies.

Limitation of the study

The use of secondary data represents a limitation to the study, especially since there are faults in filling out the collection instrument (death certificate). However, the quality of these data has improved substantially in recent years. Another limitation is the under-reporting of suicide cases, often caused by strong stigma and failure to accurately determine the cause of death.

Contributions to the area of nursing, health or public policy

The presence of specific groups that are more affected by suicide was verified through epidemiological characterization. This fact reveals that the guidelines for health interventions that seek to reach these populations are opportune. The results achieved in this article are expected to be useful for future suicide prevention, control, and follow-up strategies.

CONCLUSION

The temporal trend identified the decrease of suicide in the general population, in men and with age group between 20 and 39 years. Male subjects, the age group of 20 to 29 years old, single and brown individuals were the most affected. Differences in suicide media revealed by female subjects indicate the adoption of measures that systematically and efficiently control and monitor the commercialization and use of pesticides. Such findings may contribute to better targeting of health interventions, optimizing resources and efforts, especially with regard to suicide prevention.

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