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ORIGINAL ARTICLE

Mortality from mental and behavioral disorders in Brazil: an ecological study

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Abstract

Introduction: there are many distinct mental disorders, with different presentations. They are generally characterized by a combination of abnormal thoughts, perceptions, emotions, behavior, and relationships with others. Mental disorders include depression, bipolar disorder, schizophrenia, alcoholism, substance abuse disorders, psychosis in general, dementia, and developmental disorders, including autism. Even so, it is one of the areas that receives the least attention and funding from public health. Around 1 billion people live with a mental disorder, 3 million people lose their lives every year due to harmful alcohol use, and one person dies every 40 seconds by suicide.

Objective: to analyze mortality due to mental and behavioral disorders in Brazil from 2009 to 2019.

Method: this is a cross-sectional, observational, ecological epidemiological study using official data from the Mortality Information System (MSS) and the Hospital Information System. Data were collected by place of occurrence and place of residence among patients in Brazil from 2009 to 2019. Hospital Admission Authorization Forms and Admission Notification Forms were included. The data source was the Death Certificate.

Results: analyzing mortality due to mental and behavioral disorders between the sexes, it was noted that only male patients showed a reduction in the rate in all Brazilian regions, highlighting the Northeast (β = -0.27, p = 0.001), Southeast (β = -0.20, p = 0.003) and South (β = -0.19, p = 0.023) regions, which showed significant reductions. When making a comparison in the studied series, both sexes showed a reduction, but only the male sex had a significant decline (male: β = -0.20, p = 0.001; female: β = -0.03, p = 0.146).

Conclusion: mortality from mental and behavioral disorders revealed higher rates in 2011 (7,376), corresponding to a greater proportion of males (11.25), especially single individuals, in all regions of the Brazilian federation unit. Regarding the total analysis of deaths in the study series, there was an increase in mortality among females, with prevalence in the Northeast Region and in widowed marital status.

Keywords: mortality, incidence, mental disorders, behavioral.

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Authors summary

Why was this study done?
The study was conducted to analyze mortality from mental and behavioral disorders in Brazil between 2009 and 2019. The motivation for the research is based on the high incidence of mental disorders, the lack of national studies on the subject, and the need to better understand the factors that influence mortality related to these conditions, aiming to contribute to more effective public policies and health strategies.

What did the researchers do and find?
The researchers conducted an observational, ecological, epidemiological study using data from the Mortality Information System (SIM) and the Hospital Information System (SIH/SUS). The analysis revealed a reduction in mortality from mental and behavioral disorders in Brazil, especially among men, with more significant declines in the Northeast, Southeast, and South regions. However, an increase in mortality was observed among women, particularly in the Northeast region, and among widows.

What do these findings mean?
The findings indicate that, although there has been an overall downward trend in mortality from mental disorders in Brazil, significant disparities remain between genders and regions. The increase in mortality among women and widows suggests the need for more targeted mental health policies for these vulnerable groups. Furthermore, the research reinforces the importance of expanding access to mental health treatment and reducing the stigma associated with these conditions.

INTRODUCTION

The International Classification of Diseases (ICD-10) defines mental disorders as illnesses that present psychological changes that can lead to impairment of the individual's functional capacity, as they cause biological, social, psychological, genetic, physical, or even chemical disturbances. Furthermore, they are prone to changes in thinking or mood, which directly affect the patient's overall performance[1].

There are many distinct mental disorders, each with different presentations. They are generally characterized by a combination of abnormal thoughts, perceptions, emotions, behaviors, and relationships with others. Mental disorders include depression, bipolar disorder, schizophrenia, alcoholism, substance abuse disorders, psychosis in general, dementia, and developmental disorders, including autism[2,3]. Yet, it is one of the areas that receives the least attention and funding from public health. Around 1 billion people live with a mental disorder, 3 million people lose their lives every year due to the harmful use of alcohol, and one person dies every 40 seconds by suicide[2,3]. Health systems have not yet adequately responded to the burden of mental disorders. As a result, the gap between the need for treatment and its availability is wide worldwide. In low- and middle-income countries, between 76% and 85% of people with mental disorders do not receive treatment. In high-income countries, between 35% and 50% of people with mental disorders are in the same situation[2,3].

Another problem that worries and worsens the health situation worldwide is mortality caused by mental disorders, with suicide being one of the main aggravating factors and means of such mortality, which is generally motivated by depression, schizophrenia, bipolar disorder, alcoholism, among others[4].

Many studies have noted substantial excess mortality in individuals with mental illness for nearly all psychiatric disorders and all major causes of death. In many places, a considerable portion of the population has already received psychiatric treatment. Many studies have observed high mortality rates for all psychiatric diagnoses, with the highest risks observed for organic psychoses, dementia, and drug and alcohol abuse. Mortality rates were also higher for long-term psychiatric patients. An important finding observed in studies is that a high risk persists even after hospital discharge[5,6,7].

The overall prevalence of mental and behavioral disorders does not appear to differ significantly between men and women. However, anxiety disorders and depression are much more common in women, while substance use disorders are more common in men[8].

In Brazil, studies on mental disorders are scarce, but what is perceived is that some affect mostly females. Among several factors when it comes to mental disorders (MD), they are mainly related to the use of psychoactive substances, such as alcohol, and, as an associated cause, they were important in the mortality of women of childbearing age[6,7,9].

Among the many problems caused by mental disorders, their mortality rate in Brazil, more specifically in the northern region, is an important factor to study, given the scarcity of studies on the subject and the significant damage that such a topic causes. yet provokes to the sector from the health, implying in the economy, node social and node scientific field of the region. Thus justifying the need for this study for a better understanding and possible solutions such as public policies on this topic

Therefore, the objective of this research was to analyze mortality due to mental and behavioral disorders in Brazil from 2009 to 2019.

METHODS

Study design

This observational, ecological, epidemiological study, with a cross-sectional approach, analyzed mortality from mental and behavioral disorders in Brazil from 2009 to 2019, based on unmanipulated official data from the Mortality Information System (SIM) and the Hospital Information System (SIH/SUS). Data were collected by location among patients during this period, and included Hospital Admission Authorization (AIH) and Hospitalization Notification Forms (FNI).

The data source was MS/SVS/CGIAE - Mortality Information System (SIM), http://tabnet.datasus.gov.br/cgi/deftohtm.exe?sim/cnv/obt10uf.def .

Study location and period

The research object was composed of patients in Brazil, covering the period from 2009 to 2019. During this period, data from the Brazilian Institute of Geography and Statistics (IBGE), referring to the 2018 update, indicated a population of 208.4 million inhabitants in the country, distributed in a territorial area of 8,515,767.049 km². This geographic scenario resulted in a population density of 24.47 inhabitants per square kilometer[10].

Study population and eligibility criteria

All deaths of residents in Brazil whose underlying cause of death was classified as a mental and behavioral disorder, Chapter V, Mental and Behavioral Disorders (F00-F99) were considered. The information was extracted from the Death Certificate, the SIM's core document, which records, analyzes, processes, and makes available data on deaths from natural and external causes. Therefore, it is a mandatory reporting system for all deaths in Brazil.

Death data by Chapter V, Mental and Behavioral Disorders (F00-F99), were collected using the tenth revision of the International Classification of Diseases (ICD-10) and stratified by sex (male and female), race/color, age groups (<10 years, 10-19 years, 20-49 years, 50 years and older), types of mental and behavioral disorders).

Deaths of children under one year of age were excluded from the study for methodological reasons. In this age group, mental and behavioral disorders are extremely rare or not accurately diagnosable, which could distort the mortality analysis.

Additionally, the mortality pattern in very young children is generally related to neonatal or congenital causes, which do not fall under the umbrella of mental and behavioral disorders.

The exclusion was based on similar studies that evaluate mortality in mental and behavioral disorders, where age groups without epidemiological relevance for these types of disorders are commonly omitted to ensure the robustness of the results (examples from the literature or reports from international institutions such as the World Health Organization (WHO) that follow this logic can be cited).

Data collection

The data were extracted through the file transfer system and then converted into a database using the TabWin program. Population data were obtained through estimates made by the IBGE.

Data analysis

The study population consisted of deaths from mental and behavioral disorders. Crude and age-standardized mortality rates were calculated using the WHO World Standard Population (WHO) data from 2000 to 2025. Crude mortality rates were presented by age group and sex to understand gender differences in mental and behavioral disorders. Several studies indicate significant variations in mortality rates between men and women due to biological, social, and cultural factors.

The analyses used the crude mortality rate and the standardized mortality rate, adjusted by age group using the WHO standard population, to minimize differences in the population's age structure over time and between regions. Rates were calculated per 100,000 population, by age group and year, for Brazilian regions. Annual Percent Change (APC) was calculated to quantify the annual percentage changes in mortality rates, allowing the identification of temporal trends (increasing, decreasing, or stationary).

A simple linear regression model was used to analyze the temporal trends of mortality rates from mental and behavioral disorders. In this model, the mortality rate was the dependent variable and time, in calendar years, was the independent variable. Linear regression was chosen because it is suitable for evaluating trends in time series when the objective is to determine whether there is a consistent increase or decrease in rates over time. The analysis was adjusted for age group and sex, as necessary, to ensure greater accuracy.

Marital status was included in the analysis as a stratification variable because it is a relevant social factor that can influence mortality in people with mental and behavioral disorders. Studies suggest that single, divorced, or widowed individuals may have higher mortality rates due to lower social support and greater vulnerability to adverse mental health conditions.

However, marital status was not mentioned in the previous sections to avoid information overload, being introduced in the mortality analysis to explore its possible associations with mental and behavioral disorders.

The late inclusion of marital status in this section was a strategic choice to focus the analysis on this specific point, facilitating the interpretation of the results. The confidence level adopted in the analyses was 95%. All analyses were performed using the statistical programs Data Analysis and Statistical Software for Professionals 16.0 (STATA) and/or The R Project for Statistical Computing (https://www.r-project.org/).

Ethical and legal aspects of the research

This research project was not submitted to the Research Ethics Committee for review, as it involved research using secondary databases from the SUS Information Technology Department (DATASUS) and the Violence and Accident Surveillance Information System (SIVVA). However, the recommendations of resolutions 466/2012 and 510/2016, as well as the interinstitutional prerogatives of the National Health Council, which establish specific ethical guidelines for the human and social sciences (CHS), were fully respected.

RESULTS

The North region showed a reduction in mortality among the younger age groups, however only at the ages of 25 to 29 years ($\beta = -0.43$, $p = 0.017$), 30 to 34 years ($\beta = -0.82$, $p = 0.035$) and 40 to 44 years ($\beta = -1.12$, $p = 0.046$), while for the age group of 55 to 59 years an increase was shown ($\beta = 0.92$, $p = 0.024$).

In the Northeast region, mortality showed a reduction in mortality at all ages below 69 years, but only

the ages of 15 to 19 years, 25 to 29 years, 30 to 34 years, 35 to 39 years, 40 to 44 years, 45 to 49 years and 60 to 64 years had significant reductions (β = -0.16, p = 0.044; β = -0.36, p = 0.006; β = -1.58, p < 0.001; β = -2.78, p < 0.001; β = -3.49, p < 0.001; β = -3.42, p < 0.001 and; β = -1.05, p = 0.043, respectively) (table 1).

For the Southeast region, only the ages 25 to 29 years (β = -0.37, p = 0.040), 30 to 34 years (β = -0.72, p = 0.003) and 40 to 44 years (β = -1.19, p <0.001), 50 to 54 years (β = -1.25, p = 0.003) and 75 to 79 years (β = -1.14, p = 0.033) showed a reduction in mortality. The ages 35 to 39 years (β = 1.40, p = 0.0301) and 60 to 64 years (β = 0.44, p = 0.035) had a statistically significant increase.

The South region had a reduction in the following ages, 25 to 29 years (β = -0.42, p=0.043), 30 to 34 years (β = -0.56, p=0.019), 35 to 39 years (β = -1.46, p=0.001), 40 to 49 years (β = -1.25, p=0.004), 45 to 49 years (β = -1.43, p=0.001) and 75 to 79 years (β = -1.08, p=0.037).

The Central-West region, the population aged 30 to 34 years (β = -1.14, p=0.010), 35 to 39 years (β = -1.51, p=0.003), 40 to 44 years (β = -1.79, p=0.016), 45 to 49 years (β = -1.65, p=0.040) had results of reduction in the mortality rate, only the population aged over 79 years showed an increase in mortality (β = 4.17, p=0.032) (table 1).

Table 1: Deaths from mental and behavioral disorders (CMD) in the Brazilian population by region and age group and linear regression estimate for the period 2009-2019

Regions	Deaths	Mortality put TMC			Mortality Proportional		
	n	β	p	r2	β	p	r2
North							
10 – 14	13	-0.72	0.262	14.00	-0.02	0.275	14.00
15 – 19	36	-0.10	0.305	12.00	-0.01	0.225	16.00
20 – 24	76	0.06	0.526	14.00	0.02	0.781	10.00
25 – 29	144	-0.43	**0.017**	48.00	-0.03	**0.007**	57.00
30 – 34	261	-0.82	**0.035**	40.00	-0.05	**0.043**	27.00
35 – 39	307	-0.61	0.104	27.00	-0.04	0.102	27.00
40 – 44	418	-1.12	**0.046**	37.00	-0.05	0.120	25.00
45 – 49	429	-0.68	0.219	16.00	-0.01	0.499	5.00
50 – 54	467	-1.02	0.078	31.00	-0.02	0.215	16.00
55 – 59	408	0.92	**0.024**	45.00	0.03	**0.011**	53.00
60 – 64	370	0.51	0.462	16.00	0.01	0.379	15.00
65 – 69	279	0.02	0.956	10.00	0.01	0.681	10.00
70 – 74	271	-0.31	0.522	15.00	-0.02	0.701	10.00
75 – 79	235	0.75	0.152	24.00	0.01	0.152	21.00
> 79	665	2.69	0.101	28.00	0.01	0.169	20.00
North East							
10 – 14	48	-0.08	0.058	34.00	-0.02	0.130	24.00
15 – 19	186	-0.16	**0.044**	38.00	-0.02	**0.002**	66.00
20 – 24	447	-0.14	0.060	34.00	-0.01	**0.022**	46.00
25 – 29	1085	-0.36	**0.006**	59.00	-0.03	**0.008**	56.00
30 – 34	2101	-1.58	**<0.001**	78.00	-0.08	**0.002**	68.00
35 – 39	3069	-2.78	**<0.001**	95.00	-0.13	**<0.001**	90.00
40 – 44	3932	-3.49	**<0.001**	89.00	-0.13	**<0.001**	86.00
45 – 49	4446	-3.42	**<0.001**	84.00	-0.1	**<0.001**	78.00
50 – 54	4382	-1.44	0.053	36.00	-0.03	0.132	23.00
55 – 59	3695	-0.82	0.131	24.00	-0.01	0.399	40.00
60 – 64	3086	-1.05	**0.043**	38.00	-0.02	0.070	32.00
65 – 69	2754	-0.59	0.117	25.00	-0.01	0.057	35.00
70 – 74	2353	0.03	0.945	10.00	0.01	0.832	10.00
75 – 79	2265	0.39	0.320	15.00	0.01	0.535	32.00
> 79	7467	2.44	0.164	20.00	0.02	0.416	35.00
Southeast							

Continuation - Table 1: Deaths from mental and behavioral disorders (CMD) in the Brazilian population by region and age group and linear regression estimate for the period 2009-2019

Regions	Deaths	Mortality put TMC			Mortality Proportional		
	n	β	p	r2	β	p	r2
10 – 14	47	-0.01	0.935	10.00	0.01	0.457	30.00
15 – 19	403	0.08	0.383	8.00	0.02	0.170	20.00
20 – 24	651	0.13	0.081	22.00	0.02	**0.011**	53.00
25 – 29	1037	-0.37	**0.040**	40.00	-0.01	0.347	10.00
30 – 34	1965	-0.72	**0.003**	65.00	-0.02	0.173	20.00
35 – 39	3234	1.4	**0.001**	75.00	0.05	**0.030**	43.00
40 – 44	4366	-1.9	**<0.001**	80.00	-0.03	0.055	35.00
45 – 49	5697	-1.82	**<0.001**	79.00	-0.01	0.142	22.00
50 – 54	6077	-1.25	**0.003**	64.00	0.01	0.935	10.00
55 – 59	5683	-0.16	0.475	5.00	0.02	**0.009**	55.00
60 – 64	4594	0.44	**0.035**	41.00	0.02	**<0.001**	78.00
65 – 69	3780	-41	0.324	11.00	0.01	0.464	16.00
70 – 74	3383	0.4	0.118	25.00	0.01	0.217	18.00
75 – 79	4083	-1.14	**0.033**	41.00	-0.01	0.311	11.00
> 79	20582	-2.55	0.144	22.00	-0.03	0.088	30.00
South							
10 - 14	24	-0.03	0.502	5.00	-0.03	0.881	10.00
15 - 19	85	-0.11	0.265	14.00	-0.01	0.742	74.00
20 - 24	202	-0.28	0.209	17.00	-0.01	0.518	14.00
25 - 29	442	-0.41	**0.043**	38.00	-0.02	0.630	20.00
30 - 34	782	-0.56	**0.019**	47.00	0.01	0.704	16.00
35 - 39	1236	-1.46	**0.001**	47.00	-0.03	0.169	20.00
40 - 44	1813	-1.25	**0.004**	62.00	-0.001	0.989	35.00
45 - 49	2420	-1.43	**0.001**	70.00	0.03	0.774	19.00
50 - 54	2683	-0.14	0.650	2.00	0.05	**0.001**	71.00
55 - 59	2655	0.28	0.585	3.00	0.04	**0.007**	57.00
60 - 64	2084	0.59	0.309	11.00	0.03	**0.028**	43.00
65 - 69	1800	-0.17	0.743	10.00	0.02	**0.040**	39.00
70 - 74	1261	-1.16	0.075	31.00	-0.01	0.636	25.00
75 - 79	1087	-1.08	0.122	24.00	-0.05	0.556	30.00
> 79	2412	-5.58	**0.037**	40.00	-0.03	**0.040**	39.00
Center- Oes							
10 - 14	15	-0.19	0.304	12.00	-0.04	0.358	29.00
15 - 19	62	-0.32	0.081	30.00	-0.03	0.105	26.00
20 - 24	117	0.03	0.909	10.00	0.01	0.527	45.00
25 - 29	253	-0.03	0.929	10.00	0.02	0.421	17.00
30 - 34	538	-1.14	**0.010**	54.00	-0.03	0.233	15.00
35 - 39	772	-1.51	**0.003**	65.00	-0.05	0.057	35.00
40 - 44	1040	-1.79	**0.016**	50.00	-0.03	0.347	26.00
45 - 49	1201	-1.65	**0.040**	39.00	-0.01	0.790	13.00
50 - 54	1166	-0.18	0.804	10.00	0.04	0.112	26.00
55 - 59	936	0.75	0.397	30.00	0.05	0.054	35.00
60 - 64	782	-0.1	0.889	20.00	0.01	0.417	24.00

Continuation - Table 1: Deaths from mental and behavioral disorders (CMD) in the Brazilian population by region and age group and linear regression estimate for the period 2009-2019

Regions	Deaths	Mortality put TMC			Mortality Proportional		
	n	β	p	r2	β	p	r2
65 - 69	685	-0.02	0.982	10.00	0.02	0.252	14.00
70 - 74	506	0.24	0.721	10.00	0.02	0.131	23.00
75 - 79	495	0.29	0.805	10.00	0.02	0.445	44.00
> 79	1558	4.17	**0.032**	50.00	0.03	**0.014**	51.00

Deaths: International Classification of Diseases, 10th revision, Codes F 00 - F 99. Linear Regression: β : regression slope; r2: predictive capacity; 95% CI: 95% confidence interval.
Source: Data provided by the Department of Information Technology of the Unified Health System (DATASUS—www.datasus.gov.br). Ministry of Health, Brazil.

The age-standardized mortality rate varied negatively in all regions, however only the Northeast, Southeast and South regions showed a significant decline (β = -0.131, p=0.003; β = -0.115, p=0.013; (β = -0.128, p=0.038, respectively). And when analyzing Brazil, it was observed that a reduction was obtained (β = -0.112, p= 0.004) (table 2).

Analyzing mortality due to mental and behavioral disorders between sexes, it was noted that only males showed a reduction in the rate in all Brazilian regions, however, only the Northeast region (β = -0.27, p = 0.001), Southeast region (β = -0.20, p = 0.003) and South region (β = -0.19, p = 0.023) showed significant reductions. When performing a direct comparison at the national level, both sexes showed a reduction, but only males had a significant decline (male: β = -0.20, p = 0.001; female: β = -0.03, p = 0.146) (Table 3).

Males showed an increase in mortality among single individuals in the South (β = 10.98, p=0.034) and Central-West (β = 7.21, p=0.028) regions. For married men, there was a reduction in the Northeast (β = -22.55, p<0.001) and South (β = -13.87, p=0.009) regions. Widowed individuals had an increase in mortality in the Northeast (β = 5.72, p=0.009), Southeast (β = 6.03, p=0.036) and Central-West (β = 2.27, p=0.007) regions (table 4).

Among single women, the Northeast (β = 6.21, p=0.024), Southeast (β = 12.27, p=0.016), and Central-West (β = 3.53, p=0.006) regions had an increase in mortality. Among widowed women, there was an increase in mortality in the North (β = 1.93, p=0.010), Northeast (β = 18.05, p<0.001), and Central-West (β = 4.00, p=0.001) regions (table 4).

Table 2: Standardized mortality rate from Mental and Behavioral Disorders per 100,000 inhabitants (95% confidence interval) and linear regression estimate between 2009 and 2019 according to the country's regions

Brazil/ Regions	Mortality standardized put age* put Disorders mental and behavioral (x100,000 inhabitants)												
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	β	p
North	0.003	0.003	0.003	0.003	0.003	0.003	0.004	0.003	0.004	0.003	0.003	-0.003	0.916
North East	7.702	7.796	8.266	7.402	8.142	7.329	7.568	6.915	6.807	6.626	6.949	-0.131	**0.003**
Southeast	6.661	7.067	7.388	6.825	6.471	6.106	5.827	6.001	5.753	6.020	6.409	-0.115	**0.013**
South	6.618	6.843	7.174	5.736	5.898	5.392	5.220	5.317	5.276	6.096	5.845	-0.128	**0.038**
Midwest	5.921	6.864	7.401	6.860	6.717	6.710	6.007	5.903	6.692	7.057	6.408	-0.014	0.779
Brazil	6.705	7.015	7.376	6.595	6.645	6.190	6.059	5.959	5.873	6.077	6.260	-0.112	**0.004**

* Age-standardized according to the World Health Organization (WHO) global population. Deaths: International Classification of Diseases, 10th Revision, Codes F00–F99. Regression Linear: β: inclination from the regression; r 2 : capacity predictive; IC 95%: interval of trust of 95%
Source: System of Information on Mortality (YES). Data made available for the Department of Computing of System Single of Health (DATASUS— www.datasus.gov.br). Ministry of Health, Brazil.

Table 3: Rate of standardized mortality by Disorders Mental and Behavioral put 100,000 inhabitants (interval of trust of 95%) by sex, and estimate of regression linear between 2009 and 2019 of agreement with to the regions of country

Brazil/ Regions	Mortality male standardized put age* put Disorders mental and behavioral (x100,000 inhabitants)												
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	β	p
North	5.15	4.97	5.36	4.69	5.10	5.09	5.38	4.97	5.22	4.52	4.72	-0.03	0.242
North East	12.89	13.06	13.61	12.40	13.56	12.10	12.31	11.27	11.17	10.63	10.99	-0.27	**0.001**
Southeast	9.73	9.99	10.61	9.74	9.28	8.69	8.44	8.33	7.99	8.55	8.79	-0.20	**0.003**
South	10.57	11.04	11.47	9.65	9.76	9.26	8.73	8.91	8.56	9.77	9.66	-0.19	**0.023**
Midwest	9.48	10.65	11.66	11.09	10.88	10.14	9.58	9.15	10.31	11.11	10.12	-0.03	0.635
Brazil	10.37	10.68	11.25	10.16	10.26	9.50	9.33	8.99	8.85	9.18	9.29	-0.20	**0.001**
Brazil/ Regions	**Mortality feminine standardized put age* put Disorders mental and behavioral (x100.000 inhabitants)**												
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	β	p
North	1.33	1.46	1.40	1.41	1.49	1.79	1.86	1.69	1.80	1.37	1.71	0.03	0.072
North East	3.10	3.14	3.54	2.99	3.38	3.14	3.44	3.09	2.99	3.14	3.44	0.002	0.885
Southeast	3.86	4.34	4.41	4.13	3.90	3.74	3.44	3.84	3.65	3.71	4.19	-0.04	0.203
South	3.04	3.01	3.28	2.19	2.36	1.87	2.02	2.05	2.27	2.73	2.35	-0.07	0.097
Midwest	2.51	3.24	3.36	2.89	2.81	3.48	2.67	2.88	3.33	3.30	2.98	0.03	0.504
Brazil	3.36	3.65	3.83	3.34	3.35	3.18	3.10	3.19	3.14	3.26	3.49	-0.03	0.146

* Standardized to age of agreement with the population worldwide from the Organization World from the Health. Deaths: Classification International of illnesses, 10th revision, Codes F 00 - F 99. Regression Linear: β: inclination from the regression; r 2 : capacity predictive; IC 95%: interval of trust of 95%.
Source: System of Information on Mortality (YES). Data made available for the Department of Computing of System Single of Health (DATASUS— www.datasus.gov.br). Ministry of Health, Brazil.

Table 4: Deaths put Disorders Mental and Behavioral stratified put state civil, I estimated of regression linear between 2009 and 2019 according to the regions of the country

	Deaths male put state civil							
Brazil/Regions	**Single**		**Married**		**Widower**		**Legally separated**	
	β	p	β	p	β	p	β	p
North	2.07	0.058	-0.20	0.797	0.58	0.303	0.86	**0.031**
North East	10.19	0.067	-22.55	<0.001	5.72	0.009	6.49	**<0.001**
Southeast	14.16	0.121	-7.94	0.313	6.03	0.036	6.92	**0.010**
South	10.98	0.034	-13.87	0.009	-0.66	0.731	5.16	**0.017**
Midwest	7.21	0.028	2.50	0.047	2.27	0.007	3.46	**0.005**
Brazil	44.62	0.020	-42.06	0.011	13.95	0.009	22.91	**<0.001**
	Deaths feminine put state civil							
Brazil/Regions	**Single**		**Married**		**Widower**		**Legally separated**	
	β	p	β	p	β	p	β	p
North	0.56	0.309	0.56	0.137	1.93	**0.010**	0.14	0.345
North East	6.21	**0.024**	2.12	0.089	18.05	**<0.001**	1.71	**0.003**
Southeast	12.27	**0.016**	4.20	0.064	16.44	0.093	8.12	**<0.001**
South	0.61	0.632	-0.61	0.632	-4.20	0.331	1.91	**0.026**
Midwest	3.53	**0.006**	0.86	0.128	4.00	**0.001**	0.93	**<0.001**
Brazil	23.05	**0.007**	7.15	0.115	36.23	**0.024**	12.82	**<0.001**

Deaths: Classification International of illnesses, 10th revision, Codes F 00 - F 99. Regression Linear: β: inclination from the regression; r 2 : capacity predictive; IC 95%: interval of trust of 95%.
Source: System of Information on Mortality (YES). Data made available for the Department of Computing of System Single of Health (DATASUS— www.datasus.gov.br). Ministry of Health, Brazil.

DISCUSSION

The results obtained from statistical analyses conducted between 2009 and 2019 provide a comprehensive overview of mortality rates from Mental and Behavioral Disorders (MBDs) in Brazil. Overall, a reduction in mortality rates from MBDs was observed, particularly among younger age groups and among males, especially in the Northeast, Southeast, and South regions. These findings corroborate data from previous studies, such as those by Pereira *et al.*[11], which also indicated a downward trend in hospitalization rates for MBDs in Brazil, especially in Rio de Janeiro.

From this perspective, mental disorders are seen as a factor that impacts morbidity levels, as well as impairments in the individual's functional capacity and a reduction in the quality of life of those affected. Around 90% of mental health problems manifest as depression, anxiety, insomnia, fatigue, irritability, and memory and concentration dysfunction[12].

Hiany *et al.*,[12] claim that 12% of global illnesses are related to mental disorders, and only 1% of deaths are caused by them. Unfortunately, 40% of countries still lack effective mental health policies, and there is a lack of programs targeting this population group.

Among the Brazilian population, 3% of them suffer from severe and persistent mental disorders and another portion, 6%, from severe psychiatric disorders due to the use of alcohol or other drugs[12].

Brazil is increasingly using information systems to research morbidities and costs recorded in hospital admission authorizations (AIHs). However, there are few studies on hospitalizations due to Mental and Behavioral Disorders (MBDs). However, it is known that these disorders cause high financial costs for public health[11].

Data from the World Health Organization (WHO) indicate a 10% prevalence of mental disorders worldwide. They occur with high frequency, leading the ranking of diseases listed as the main causes of years lived with disability[11].

Studies have shown a decline in mortality from Mental and Behavioral Disorders over the 10-year period evaluated, falling from a rate of 6,705 in 2009 to 6,260 in 2019.

Presenting greater significance in the Northeast, Southeast and South regions. Corroborating this, Pereira and collaborators[11] in research in the state of Rio de Janeiro in the period from 1999 to 2010, identified a reduction in the number of hospitalizations due to Mental and Behavioral Disorders, with a decline of 70% between the values of 1999 and 2010.

Mental disorders are considered a factor in global morbidity rates, and even at low levels, they have long-term repercussions. By causing disabilities in those with the clinical condition, they negatively affect the individual's mobility and quality of life. Furthermore, treatment is difficult, as there is low demand for health services and a lack of technical and scientific knowledge among professionals regarding mental health, delaying the process of identification, diagnosis, intervention, and treatment[12].

Regarding mortality by age group, there was an increase in individuals over 79 years of age in the Central-West region, with a rate of 51.0. In general, the rates showed negative variation between Brazilian regions, with a broad reduction across the country.

That said, population aging was considered a result of increased life expectancy and birth control in society, thus triggering a greater prevalence of chronic-degenerative diseases, including mental and behavioral disorders, such as dementia syndrome[13].

In contrast, data from 2015 indicate that 20.0% of individuals aged 60 or over suffer from some mental or neurological illness, the most frequent being dementia and depression[13]. A study carried out in São Paulo in 2013 found a prevalence of 29.7% in mental disorders, more pronounced in women; elderly people aged 80 or over; low income; sedentary people and those with chronic diseases[14].

There was little divergence between the age range identified through the data analysis and the other studies analyzed. This shows how the elderly population constitutes a risk group for developing and dying from CMD in Brazil.

Another study, conducted in 2011 in São Paulo, found that mental and behavioral disorders accounted for 40.3% of hospitalizations[15]. Santos and collaborators[13] infer the vulnerability of elderly citizens to developing mental disorders, as they experience events such as bereavement; decline in their work activities; loss of autonomy; and retirement. The combination of these and many other factors can lead to isolation, resulting in loneliness and psychological changes.

In Brazil, from 2008 to 2014, 139,941 hospitalizations of elderly people due to mental and behavioral disorders were recorded, and during this period there was a decline in hospitalization rates. A reduction in annual hospitalization rates was also observed in almost all regions, especially in the North, Northeast, and Central-West regions. The exception was the South region, where the trend was stable and had the highest hospitalization rate in 2014[13].

While a significant decline in mortality from CMD was only observed in Brazil, in the 10-year period considered, in the Northeast, Southeast and South regions.

Regarding the reduction in deaths by sex, there is a greater reduction among male individuals throughout Brazil (rate from 10.37 to 9.29), although the data are more significant in the Northeast, Southeast and South regions.

In addition to these data, regarding the profile of hospitalized patients, throughout the studied period, there was a higher coefficient of males, with an age range of 60 to 69 years. Furthermore, in both sexes and all age groups, there was a decrease in the period from 2008 to 2014. Among the hospital mortality of elderly people hospitalized for CMD, the main related diagnosis was dementia (32.3%)[13].

It can be noted that the male population is more affected among the values of deaths due to CMD, while the research showed a greater reduction in rates in the young population (0.017).

In contrast, Hiany and collaborators[12], analyzing studies by other authors, found that the majority of the Brazilian population affected by mental disorders is female. For both sexes, diagnoses include mood disorders; neurotic disorders; followed by psychotic disorders. Epidemiological studies have shown that mood disorders are more common in females, and psychotic disorders and substance use are more common in males.

However, when analyzing the period from 1999 to 2010, in Rio de Janeiro, hospitalizations for CMD, there was a predominance of hospitalizations for mental disorders in male patients. They were higher in individuals aged 30 to 39 and 40 to 49 years for both sexes. The largest portion of diagnoses were schizophrenia and other schizotypal and delusional disorders (50 to 60%), with about 60% being men. Hospitalizations for schizophrenia were more frequent in male patients aged 20 to 30 years, and among female patients, there was a predominance in the 30 to 39 age group[11].

Furthermore, data reveal that the second most common diagnosis in hospitalizations for mental disorders in men is alcohol abuse and dependence, while in women it is mood disorders. Hospitalizations due to substance use were predominant in the young population, aged 20 to 29, while those hospitalized for alcohol use disorders were on average 30 to 49 years old[11].

Mood disorders showed a slight increase, accounting for almost a quarter of psychiatric hospitalizations in women between 2008 and 2010. The age range of these women is between 20 and 49 years old and 50 and 59 years old. It is worth noting that among mood disorders, the main cause of hospitalization in both sexes was bipolar disorders, followed by depressive disorders and manic episodes[11].

With the data analyzed, higher mortality was evidenced among single male individuals (0.020), favoring this finding, in studies on mortality from mental and behavioral disorders due to the use of psychoactive substances in Brazil, between the years 2012 to 2016, data indicated that a large part of the deaths were due to alcohol consumption, in addition, 85.97% were male and 46.31% single[16].

CONCLUSION

Mortality from mental and behavioral disorders reached its highest rates in 2011, with a rate of 7,376, with the highest proportion of deaths observed among males (11.25%), especially among single men, in all regions of Brazil. During the study period, an increase in mortality among women was observed, with a higher prevalence observed in the Northeast region and among those who were widowed.

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Conflicts of Interest

The authors declare no conflicts of interest regarding the authorship and publication of this article.

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Resumo

Introdução: existem muitos transtornos mentais distintos, com apresentações diferentes. Geralmente são caracterizados por uma combinação de pensamentos, percepções, emoções, comportamento e relacionamentos anormais com outras pessoas. Os transtornos mentais incluem: depressão, transtorno bipolar, esquizofrenia, alcoolismo, distúrbios por abuso de drogas, psicoses em geral, demência e transtornos do desenvolvimento, incluindo autismo. Mesmo assim, é uma das áreas que menos recebe atenção e verba da saúde pública. Em torno de 1 bilhão de pessoas vivem com transtorno mental, 3 milhões de pessoas perdem a vida todos os anos por conta do uso nocivo do álcool e uma pessoa morre a cada 40 segundos por suicídio.

Objetivo: analisar a mortalidade por transtorno mental e comportamental no Brasil no período de 2009 a 2019.

Método: estudo epidemiológico ecológico observacional com temporalidade transversal com dados oficiais do Sistema de Informação sobre Mortalidade, Sistema de Informação Hospitalar. Os dados foram coletados por local de ocorrência e de residência entre pacientes no período de 2009 a 2019, no Brasil, foi incluída a Autorização de Internação Hospitalar e as Fichas de Notificação de Internação. A fonte dos dados foi a Declaração de Óbitos.

Resultados: analisando a mortalidade por transtorno mental e comportamental entre os sexos, notou-se que apenas os paciente do sexo masculino apresentou redução na taxa em todas as regiões brasileiras,destacando as regiões Nordeste (β = -0,27, p=0,001), região Sudeste (β = -0,20, p=0,003) e região Sul (β = -0,19, p=0,023), apresentaram reduções significantes. Ao realizar uma comparação na série estudada, ambos os sexos apresentaram redução, mas, apenas o sexo masculino teve declínio significativo (masculino: β = -0,20, p=0,001; feminino: β = -0,03, p=0,146).

Conclusão: a mortalidade por transtornos mentais e comportamentais, revelou maiores taxas no ano de 2011 (7,376), correspondendo maior parcela do sexo masculino (11,25), especialmente solteiro, em todas as regiões da unidade da federação brasileira. Quanto a análise total dos óbitos na série do estudo, houve aumento da mortalidade no sexo feminino, com prevalência na Região Nordeste e em estado civil viúva

Palavras-chave: mortalidade, incidência, transtornos mentais, comportamentais.