



BRIEF COMMUNICATION

Contextual risk factors of depression and suicidal thoughts in Brazilian adults: a multilevel analysis

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Objective: To evaluate the association between social and health contextual variables, and between major depressive episodes (MDE) and suicidal thoughts in Brazilian adults.

Methods: This population-based cross-sectional study used data from the 2013 National Health Survey (Pesquisa Nacional de Saúde). The Patient Health Questionnaire was used to evaluate the presence of MDE and suicidal thoughts. We used number of Family Health Strategy teams (FHS) per 20,000 state population, number of Psychosocial Care Centers (Centros de Atenção Psicossocial [CAPS]) per 1,000 state population, gross domestic product (GDP), and Gini index for each Brazilian state as contextual variables. Multilevel logistic regression models were used to calculate OR and the intraclass correlation coefficient (ICC).

Results: Prevalence of MDE and suicidal thoughts was 4.1% (95%CI 3.8-4.4) and 3.8% (95%CI 3.5-4.1), respectively. Multilevel regression models showed an ICC of 1.1% for MDE (95%CI 0.5-2.3) and 1.3% for suicidal thoughts (95%CI 0.6-2.6). Neither GDP, Gini, FHS, or CAPS showed evidence of association with the outcomes.

Conclusions: In general, contextual variables, within each Brazilian state, do not seem to affect the prevalence of MDE and suicidal thoughts.

Keywords: Depression; suicide; multilevel analysis; health service; economic index

Introduction

Depression is a major contributor to the overall burden of disease worldwide.^{1,2} Nine out of 10 suicides are associated with mental disorders, especially depression.³ Deaths by suicide were the third leading cause of death from known external causes in 2011⁴; Brazil is among the 10 countries with the highest suicide rates worldwide.⁵

Studies suggest that poor socioeconomic contextual variables, such as low gross domestic product (GDP), and/or high Gini index, are predictors of poor mental health and suicide.⁶⁻⁸ However, empirical evidence evaluating the effect of contextual factors on mental health is scarce in the Brazilian context.

Psychosocial Care Centers (Centros de Atenção Psicossocial [CAPS]) were implemented in Brazil to provide mental health care in communities and prevent hospitalization. It has been proposed that the differences in the prevalence of depression across Brazilian states is associated with the number of available services and specialized professionals within them.⁹ However, formal studies evaluating the impact of CAPS/health service availability on the burden of mental health are scarce.

Understanding the role of contextual factors in the occurrence of mental disorders at a population level may guide the development of public health policies and show possible gaps in the current health care system. The objective of this study was to evaluate the association of social and health contextual factors with major depressive episodes (MDE) and suicidal thoughts in Brazilian adults. Our hypothesis was that states with higher income, lower inequalities, and a better health service coverage (CAPS or Family Health Strategy [FHS]) would have a lower prevalence of mental disorders.

Methods

This population-based cross-sectional study used data from the 2013 Brazilian National Health Survey (Pesquisa Nacional de Saúde [PNS]) and includes a representative sample of the Brazilian population. The PNS used three-stage cluster sampling. Census tracts, households, and residents aged 18 years or more (one individual per household) were the primary, secondary, and tertiary sampling units respectively. Information on 64,348 households was obtained and a total of 60,202 individuals were

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interviewed. The loss rate was 20.8% for home interviews and 25.9% for individual interviews. Further details on survey methods can be found elsewhere.¹⁰

The outcomes evaluated were risk of MDE and suicidal thoughts. MDE was detected using the Patient Health Questionnaire (PHQ-9), which uses DSM-5 criteria¹¹ and has a sensitivity of 42.5% (27.0-59.1) and specificity of 95.3% (92.8-97.2) to identify MDE.¹² Data on suicidal thoughts were obtained through the following PHQ-9 question: "Over the last 2 weeks, how often have you been bothered by thoughts that you would be better off dead or of hurting yourself in some way?" Possible answers were: not at all, several days, more than half the days, and nearly every day. Individuals who provided any answer other than "not at all" were considered positive for suicidal thoughts.

The present study analyzed individual and contextual variables for adults (18 years old or more). The following individual data were used: sex, age, self-reported skin color, marital status, schooling, assets index (quintiles), place of residence (urban or rural), and number of residents per household. For the construction of the variable assets index, individuals were asked about household characteristics and belongings, like: type of construction, number of rooms, having a domestic worker, and number and type of home appliances. This variable was stratified into quintiles, ranging from the poorest quintile (1st) to the richest quintile (5th). Contextual variables were collected for each of the 26 Brazilian states and the Federal District, including the number of FHS teams implemented in each state, number of CAPS, GDP, and Gini index. All these

data were obtained from the Brazilian Institute of Geography and Statistics (IBGE) databases and from the Brazilian Ministry of Health. Two variables were created: number of CAPS units in each state per 20,000 inhabitants in 2009; and number of FHS in each state per 1,000 inhabitants in 2012.

Data analysis was carried out using the Stata software, version 14.1. We performed an ecological analysis, with calculation of the Pearson coefficient of correlation between contextual variables. The percentage of each outcome per state was calculated using the svy command. Additionally, we carried out multilevel logistic regressions, calculating odds ratios (OR) with 95% confidence intervals (95%CI). For each outcome, three different multivariate models were set up; an empty model (without covariates), a model with only contextual variables (model 1), and a model with both contextual and individual variables (model 2). The intraclass correlation coefficient (ICC) was calculated for each model.

The PNS project was approved by the National Research Ethics Committee (CONEP; protocol 10853812.7.0000.0008).

Results

The prevalence of MDE and suicidal thoughts in Brazil was 4.1% (95%CI 3.8-4.4) and 3.8% (95%CI 3.5-4.1) respectively (n=60,202). MDE prevalence was lowest in the state of Pará (2.1%), and more than twice as high in Santa Catarina (5.9%). The prevalence of suicidal thoughts ranged from 2.2% in Rondônia to 5.8% in Goiás (Table 1).

Table 1 Distribution of major depressive episodes, suicidal thoughts, and contextual variables according to Brazilian federative unit

	%MDE	%ST	Gini	GDP	FHS/1,000	CAPS/20,000
Rondônia	4.0	2.2	0.57	184665	0.18	1.99
Acre	4.2	3.8	0.64	1269032	0.23	0.58
Amazonas	3.0	3.9	0.67	1785578	0.15	0.35
Roraima	5.3	4.2	0.64	1557713	0.19	0.95
Pará	2.1	2.3	0.63	1167896	0.13	1.13
Amapá	3.6	3.7	0.62	1491484	0.18	1.28
Tocantins	3.9	3.8	0.61	1377567	0.28	1.08
Maranhão	3.6	3.3	0.63	876034	0.26	2.07
Piauí	2.8	2.4	0.62	813751	0.35	2.16
Ceará	3.1	3.9	0.62	1047312	0.22	0.91
Rio Grande do Norte	4.6	5.1	0.61	1224946	0.27	1.59
Paraíba	3.7	3.7	0.61	1015188	0.33	3.61
Pernambuco	5.4	4.3	0.64	1313848	0.21	1.14
Alagoas	4.8	5.2	0.63	933343	0.24	2.91
Sergipe	3.7	5.0	0.63	1318093	0.27	2.97
Bahia	3.6	3.1	0.63	1183233	0.20	2.31
Minas Gerais	4.1	3.0	0.56	2032458	0.23	1.57
Espírito Santo	4.2	2.8	0.57	299963	0.17	1.26
Rio de Janeiro	4.7	3.9	0.61	3106463	0.13	1.59
São Paulo	4.2	3.6	0.58	3362441	0.09	1.28
Paraná	4.1	5.2	0.54	2419479	0.18	1.68
Santa Catarina	5.9	4.2	0.49	2777185	0.22	2.22
Rio Grande do Sul	4.8	4.4	0.55	2577921	0.13	2.64
Mato Grosso do Sul	3.9	3.1	0.57	2174432	0.20	1.86
Mato Grosso	3.9	3.1	0.57	2594587	0.18	2.27
Goiás	4.2	0.6	0.56	2013426	0.20	0.91
Distrito Federal	3.9	3.2	0.64	64653	0.05	0.31

CAPS = Psychosocial Care Centers; GDP = gross domestic product per capita; FHS = Family Health Strategy; MDE = major depressive episodes; ST = suicidal thoughts.

Source: 2013 National Health Survey (Pesquisa Nacional de Saúde [PNS]).¹⁰

There was no correlation between the percentage of MDE in each state and GDP ($r = 0,01$), Gini ($r = -0,01$), CAPS/20,000 inhabitants ($r = 0,01$), or FHS/1,000 inhabitants ($r < -0,01$). Likewise, we found no correlation between these contextual variables and the suicidal thoughts outcome ($r \sim 0,01$ for all variables).

Contextual variables were not associated with MDE and suicidal thoughts in any model. Only FHS showed a protective effect of 40% against MDE and 32% against suicidal thoughts. However, the confidence intervals included the reference (Table 2). As shown in Table 2, older individuals and women had a higher chance of MDE and

suicidal thoughts, while those with a partner, complete higher education, in the richest quintile, and living in rural areas had a lower chance of presenting MDE.

In the empty models, ICC was 1.1% for MDE (95%CI 0.5-2.3%) and 1.3% for suicidal thoughts (95%CI 0.6-2.6%). In the models with only contextual variables, the ICCs for depression and suicidal thoughts decreased to 1.0% (95% CI 0.5-2.1) and 1.2% (95%CI 0.6-2.5) respectively. When we included individual-level variables, ICCs reached 1.2% (95%CI 0.6-2.4%) and 1.6% (95%CI 0.8-3.2) (Table 2). However, the models were not significantly different when compared using a likelihood ratio test ($p > 0.05$).

Table 2 Association between risk of major depressive episodes, suicidal thoughts, and social determinants of health

	Risk of MDE		Suicidal thoughts	
	Model 1 ICC 0.010	Model 2 ICC 0.012	Model 1 ICC 0.012	Model 2 ICC 0.016
GDP (in reais)	1.00 (0.99-1.01)	1.00 (0.99-1.02)	1.00 (0.98-1.01)	1.00 (0.99-1.01)
Gini index	1.00 (0.98-1.01)	0.99 (0.98-1.01)	1.00 (0.99-1.01)	0.99 (0.98-1.01)
CAPS/20,000 population	1.03 (0.91-1.17)	1.03 (0.90-1.17)	1.03 (0.90-1.73)	1.04 (0.89-1.20)
FHS/1,000 population	0.85 (0.19-3.85)	0.60 (0.12-3.00)	1.64 (0.33-8.26)	0.68 (0.11-4.20)
Age (years)				
18-24		1.00		1.00
25-34		1.43 (1.21-1.68)		1.04 (0.89-1.20)
35-44		1.77 (1.50-2.08)		1.18 (1.02-1.37)
45-54		1.86 (1.57-2.20)		1.16 (0.99-1.36)
55-64		1.63 (1.36-1.95)		1.00 (0.84-1.19)
65 or more		1.25 (1.03-1.51)		0.71 (0.59-0.86)
Sex				
Male		1.00		1.00
Female		2.36 (2.15-2.59)		2.10 (1.91-2.30)
Skin color				
White		1.00		1.00
Black/brown		0.96 (0.87-1.05)		1.05 (0.96-1.16)
Others		1.01 (0.74-1.39)		1.17 (0.85-1.60)
Marital status				
Without a partner		1.00		1.00
With a partner		0.76 (0.70-0.83)		0.72 (0.66-0.79)
Schooling				
No education/incomplete primary education		1.00		1.00
Complete primary education/incomplete secondary education		0.77 (0.69-0.87)		0.82 (0.73-0.92)
Complete secondary education/incomplete higher education		0.58 (0.51-0.66)		0.52 (0.46-0.59)
Complete higher education		0.47 (0.40-0.56)		0.39 (0.32-0.48)
Assets index (quintiles)				
1 (poorer)		1.00		1.00
2		0.95 (0.85-1.07)		0.90 (0.80-1.00)
3		0.90 (0.79-1.02)		0.73 (0.64-0.84)
4		0.72 (0.63-0.84)		0.59 (0.51-0.69)
5 (richer)		0.66 (0.56-0.78)		0.46 (0.38-0.55)
Place of residence				
Urban		1.00		1.00
Rural		0.63 (0.56-0.72)		0.75 (0.67-0.85)
Number of residents per household		1.03 (1.01-1.06)		1.03 (1.01-1.06)

Data presented as odds ratio (95% confidence interval).

CAPS = Psychosocial Care Centers; FHS = Family Health Strategy; GDP = gross domestic product per capita; ICC = intraclass coefficient; MDE = major depressive episodes.

Source: 2013 National Health Survey (Pesquisa Nacional de Saúde [PNS]).¹⁰

Discussion

Our ecological analysis showed no correlation between our state-specific contextual variables and the outcomes, as also observed in our multilevel regression models. In addition, the ICC shows that residents of any one state were not more similar among themselves than as compared to residents from other states in terms of MDE and suicidal thoughts. State contextual variables only explain 1-1.3% of the variability, suggesting that individual variables are more important for the occurrence of these outcomes. However, other intermediate contextual variables, like the ones from municipalities or neighborhoods, which were not explored in this study, might still be important, as shown in other studies.^{6-8,13} However, this hypothesis could not be tested in the present study.

The present findings do not support the discussion raised in a previous study,⁹ which links the variability in the prevalence of depression in different Brazilian regions with the number of available CAPS and specialized professionals across regions. According to Mateus et al.,¹⁴ the rates of psychiatrists and psychologists per 10,000 inhabitants are 0.3 and 1.0, respectively, but are unevenly distributed across the Brazilian territory. However, according to our results, this does not seem to explain the differences in the prevalence of these mental disorders.

It has been shown that living in large cities increases the risk of mental illnesses, due to different stress factors and adverse circumstances.¹⁵ Perhaps environmental variables such as green areas or urbanization could better explain the variability in depression and suicidal thoughts than health care service availability, suggesting that a contextual variable related to prevention rather than treatment might be more relevant in this scenario.

We should also acknowledge some limitations. The 26 Brazilian states plus the Federal District (Brasília) were the analysis unit in the highest level of our multilevel models; therefore, we may have lacked power to find statistical difference from contextual variables. This may be especially true for FHS coverage, which showed a clear protective effect but had wide confidence intervals. In addition, the use of a screening instrument to measure MDE with only one question to obtain data on suicidal thoughts might not be the ideal choice, and measurement error is more likely to occur compared to a psychological evaluation. However, it is important to note the complexity of performing mental health assessments in epidemiology research, especially in a country-based sample, for which a psychological interview would be logistically unfeasible. The PNS uses poststratification and postestimation weights to correct for the survey design. However, multilevel analysis commands do not support these kinds of survey corrections. Nonetheless, we used states as our highest level of analysis – a level of analysis which is not part of the sampling strategy – and thus the survey design is not likely to have affected this level's estimates and standard errors. Since we found no correlation in the ecological analysis, it is more plausible to think that negative results in the multilevel analysis are not due to the non-use of the svy command.

Finally, even when we found no effect of state contextual variables, we did not have information about

territorial regions within states or municipalities. In this sense, there might still be an effect of these variables at this intermediate level. In addition, we were not able to evaluate other types of variables and other health service characteristics. Therefore, further studies should evaluate other contextual socioeconomic variables at different levels. Perhaps depression and suicidal thoughts are neither related to FHS coverage nor to number of CAPS, but to the quality of these services and the equity of their distribution.

Disclosure

The authors report no conflicts of interest.

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