Depression Screening in a population-based study: Brazilian National Health Survey 2019

Rastreamento de sintomas depressivos em um estudo de base populacional: Pesquisa Nacional de Saúde 2019

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Abstract *This study evaluated the prevalence of positive screening for depression in Brazil and its associated factors. We used data from National Health Survey 2019 (Pesquisa Nacional de Saúde - PNS), a population-based survey with 88,531 adults. The Patient Health Questionnaire (PHQ-9) was used with two scoring methods, the algorithm and the cutoff point≥10. The variables included sociodemographic characteristics. The prevalence ratios and 95% confidence intervals (95%CI) were estimated using Poisson regression. The positive screening for depression was 10.8% (95%CI: 10.4-11.0), at the cutoff point ≥10 and 5.7% (95%CI: 5.4-6.0) for algorithm. Significant differences were found in prevalence in some Brazilian states. Multivariable analyses showed that being female, black, under 70 years of age, having little education, being single, and living in an urban area were independently associated with a depressive symptoms. The highest association was found in the states of Sergipe, Goiás, Piauí, Espírito Santo, São Paulo, Alagoas and lowest in Pará, Mato Grosso and Maranhão. The prevalence of positive screening for depression in Brazil has increased in recent years. More investment in mental health resources is necessary and surveys such as the PNS should be continued.*

Key words *Depression, Mental health, PHQ-9, Cross-Sectional studies*

Resumo *Este estudo avaliou a prevalência de triagem positiva para depressão no Brasil e seus fatores associados. Utilizou-se dados da Pesquisa Nacional de Saúde 2019 (PNS), um inquérito de base populacional com 88.531 adultos. Para avaliar os sintomas depressivos utilizou-se o Patient Health Questionnaire (PHQ-9) com dois métodos de pontuação: o algoritmo e o ponto de corte ≥10. As variáveis incluíram características sociodemográficas. Utilizou-se a regressão de Poisson para obter razões de prevalência, com intervalo de confiança de 95% (IC95%). A triagem positiva para depressão foi de 10,8% (IC95%: 10,4-11,0), no ponto de corte ≥10 e 5,7% (IC95%: 5,4-6,0) para o algoritmo. Houve diferenças significativas na prevalência entre alguns estados brasileiros. Análises multivariadas mostraram que ser do sexo feminino, negro, ter menos de 70 anos, ter baixa escolaridade, ser solteiro e residir em área urbana estiveram independentemente associados a sintomas depressivos. A maior associação foi encontrada nos estados de Sergipe, Goiás, Piauí, Espírito Santo, São Paulo, Alagoas e a menor no Pará, Mato Grosso e Maranhão. A prevalência de triagem positiva para depressão no Brasil tem aumentado nos últimos anos. É necessário mais investimento em saúde mental e pesquisas como a PNS devem ser feitas continuamente.*

Palavras-chave *Depressão, Saúde mental, PHQ-9, Estudos transversais*

Introduction

Depression is one of three chronic non-communicable diseases (NCDs) that have prevailed as the top four leading causes of years lived with disability (YLDs) for almost three decades globally and contributed to 5.05% (95% uncertainty interval [UI]: 4.15-6.11) of the total YLD in the world in 2017. It was considered the 15th leading cause of disability-adjusted life years (DALY) in the Global Burden of Disease (GBD) study in 2017[1].

The study with GBD 2017 data from Brazil estimated the prevalence of depressive disorders in 3.3% (95%UI: 3.08-3.57%), with significant differences between the states, affecting nearly 7.2 million people. These disorders rank 4th and 13th as leading causes of YLD and DALY, respectively, in Brazil[2].

The studies by Ferrari *et al.*[3] and Silva *et al.*[4] was dedicated to carrying out systematic reviews and meta-analyses and provided a synthesis of the scientific production on depression, globally and in Brazil, respectively. High heterogeneity was found across the available estimates of depression due to methodological between-study variability. In Brazil, 11 different screening tools were used to assess depression morbidity in the 27 studies analyzed by Silva *et al.*[4], which resulted in a high variability of estimates: 14% (95%CI: 13-16) of depressive symptoms, 8% (95%CI: 7-10) of major depressive disorder (MDD) in the last year, and 17% (95%CI: 14-19) of lifetime MDD. The authors advocating the need for standardization of future research with a validated tool in a nationwide survey. In this sense, there are few representative population studies in Brazil based on prevalence data of depressive disorders. The main population-based study, representative of the Brazilian population conducted on depression, the National Health Survey (PNS) carried out in 2013, showed a positive screening for depression of 4.1% (95% confidence interval [CI]: 3.8-4.4%), using the algorithm from the Patient Health Questionnaire-9 (PHQ-9) as a method of analysis[5], and 7.9% (95%CI: 7.5-8.3%), using cut-off point of ≥10[6]. Study by Lopes *et al.*[6] from PNS 2013 indicate inequalities in treatment of depression with 78.8% of those individuals in Brazil did not receive any kind of treatment, and 14.1% received only pharmacotherapy.

Conducting a nationwide survey, with standardized methodology, is important for the monitoring of diseases and risk factors, including depressive disorders. The PNS was designed to be done periodically; therefore, in 2019 a second data collection was finalized (PNS-2019). Given the importance of this study, which is considered to be the most complete health survey performed in Brazil, it is required to update the scenario of depression throughout the Brazilian states. The present study aimed to evaluate the prevalence of positive screening for depression in Brazil and its 27 states, and the sociodemographic factors associated with it.

Methodology

Type of study

This is a cross-sectional, population-based study using data from PNS-2019, which was conducted by the Brazilian Institute of Geography and Statistics (*Instituto Brasileiro de Geografia e Estatística* [IBGE]), in a partnership with the Ministry of Health. The objective of PNS-2019 was to afford the country with information on the health determinants and needs of the Brazilian population, to support the formulation of public policies and achieving greater health intervention effectiveness[7].

Data source

This study is based on a representative survey of Brazil and its population, resident in permanent private dwellings within the country. Data collection was carried out from August 2019 to March 2020[7].

The sample of the PNS was chosen randomly by conglomerates in three stages. In the first, the primary sampling units (PSU) were stratified by census sectors or groups of sectors. In the second stage, 10 to 14 households were selected for each PSU and in the third stage, a resident of 15 years of age or older was randomly chosen. The expected sample had 108,525 households, considering a 20% no-response rate. Finally, the PNS-2019 included 94,114 respondents to the individual questionnaire, with a 13,2% no-response rate. In the present study, the information from 88,531 individuals, age 18 and above, was analyzed. In calculating the sample size, the mean values, variances, and delineation effect were considered. The databases were weighted, including a correction factor for losses[7].

The interviews were conducted using mobile collection resources. There were three questionnaires, which evaluated: 1) the characteristics of

the households, 2) questionnaire for all residents in the household, and 3) information about the resident chosen to participate in the research. Overall, most of the questionnaire remained comparable with the 2013 edition, but some question groups were altered and others included in the 2019 version. Details of the sampling plan and other methodological aspects are available[7].

Study variables

Measurement of positive screening for depression

Depression was evaluated using the Brazilian version of the PHQ-9, a depression screening instrument consisting of nine items matching the internationally accepted diagnostic criteria of major depression, which evaluate the frequency of depression symptoms noticed by the patient in the previous two weeks. The positive screening for depression was measured using the following symptoms: depressed mood, anhedonia, trouble sleeping, tiredness or lack of energy, change of appetite or weight, feeling of guilt or uselessness, trouble concentrating, feeling slow or agitated, and having thoughts about being better off dead or of hurting yourself in some way[8].

For each item, possible answers and respective scores were: (0) "not at all", (1) "less than half of the days", (2) "more than half of the days", and (3) "almost every day". The PHQ-9 classified depression severity according to: none (1-4 points), mild (5-9), moderate (10-14), moderately severe (15-19), and severe (20-27)[8]. The scale, already validated in Brazil, allows for the identification of individuals likely to develop depression[9].

The analysis of the PHQ-9 results can be performed according to different scoring methods, which include the algorithm and a cutoff based on summed-item scores. In this study, the results of the algorithm and the scoring of summed-item for the cutoff point of ≥10 will be presented. These methods were the same chosen by studies which evaluated the data on positive screening for depression from the PNS-2013[5,6]. The algorithm considers the result of the test as positive if five or more symptoms are present, as long as at least one of them is a depressive mood or anhedonia, and each symptom lasts for a week or more, or almost every day, with the exception for the item ("thoughts that you would be better off dead or of hurting yourself in some way") that counts if present at all, regardless of duration[8]. The algorithm was the originally proposed scoring method to screen for major depression based

on Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) criteria. However, a cutoff score of 10 or above on the summed-item score has been recommended as a method of screening for major depression[10,11].

In Brazil, a population-based validation study conducted in a medium size town, demonstrated that the PHQ-9 showed a sensitivity of 42.5% (95%CI: 27.0-59.1) and a specificity of 95.3% (95%CI: 92.8-97.2) when the algorithm was used. For the cutoff point of ≥10, the sensitivity of the PHQ-9 was 72.5% (95%CI: 61.5-89.2) and the specificity was 88.9% (95%CI: 83.0 to 89.9)[8]. Comparatively, the cutoff point of ≥10 in the item-score method shows a greater sensitivity than the algorithm, which means that it is more capable of identifying individuals in the population who require health care and shows a better performance for treatment purposes[6,10,12].

Co-variables investigated

The co-variables included sociodemographic which evaluated: geographic area of residence (urban/rural); sex (male/female); age group [in years] (18-29; 30-39; 40-49; 50-59; 60-69; 70 years and older); race/skin color (white, black and others [yellow, brown and indigenous]); education (uneducated or incomplete primary school, complete primary school or incomplete high school, complete high school or incomplete college/university, complete college/university); marital status (living with a partner/no partner); occupational status (employed/unemployed); region of residence (North, Northeast, Southeast, South, Midwest); Brazilian state of residence.

Data analysis

Initially, the prevalence of positive screening for depression was described using the results of the algorithm and the cutoff point of ≥10, according to the selected variables using Rao-Scott Chi-Square test and their respective 95%CI. The level of significance was $p < 0.05$.

Crude and adjusted analyses of the associations between sociodemographic characteristics among individuals with depressive symptoms were performed, with the estimates of the cutoff point of ≥10 in the PHQ-9. A multivariable analysis was carried out using Poisson regression with robust variance, and prevalence ratios for depressive symptoms with 95%CI for the association between clinical and sociodemographic characteristics and geographic area of residence were estimated. The estimates were obtained, taking into consideration the PNS-2019 sam-

pling plan, including the expansion factors and the conglomerate effect. The analyses were performed using the module survey from the R software, version 4.0.2, for complex samples. Detailed information about PNS sample weights and sampling process was published elsewhere[7].

Ethical issues

This study used secondary and public data; therefore, it did not require approval from the Research Ethics Committee. However, the PNS-2019 project was sent to the National Commission on Research Ethics (CONEP)/National Health Council (CNS), and was approved and logged under Legal Opinion number 3,529,376, on August 23rd, 2019. All individuals were consulted, duly informed, and agreed to participate in the study. The right to identity privacy was guaranteed as was the privacy of personal data for the participants, residents, and interviewees.

Results

Characteristics of the participants

The study analyzed data from 88,531 individuals, aged 18 years and older. Most of the participants were females (53.2%), lived with a partner (63.7%), had some kind of occupation (92.1%), and lived in an urban area (86.2%); 43.1% were 18 to 39 years of age. About a third of the population in the study was illiterate or had incomplete primary school (34.8%), while 34.9% had complete high school or incomplete college education. Concerning the self-definition of race/skin color, 44.5% were in the category which includes brown, yellow, and indigenous, and 43.9% defined themselves as white (Table 1).

The frequency data about the interviewees for each region and state of Brazil is presented in Table 2. The biggest proportion resided in the Southeast region (43.4%) and the smallest in the Midwest region (7.6%).

Prevalence of positive screening for depression

Prevalence of positive screening for depression, evaluated by the PHQ-9, conducted with a score ≥10 points, was 10.8% (95%CI: 10.4-11.0). The prevalence using the algorithm as an analysis method of the PHQ-9 indicated a positive screening for depression of 5.7% (95% CI 5.4 - 6.0) (Table 1).

Positive screening for depression, evaluated by the PHQ-9, conducted with a score ≥10 points, indicated a higher prevalence among women (15.0%; 95%CI 14.4-15.6), residents in urban areas (11.3%; 95%CI: 10.9-11.8), single or that had no partner (12.9%; 95%CI: 12.2-13.6), and unemployed (15.2%; 95%CI: 13.4-17.3). In terms of education, the prevalence was higher for people with no education or incomplete primary education (12.4%; 95%CI: 11.8-13.0) and complete primary school or incomplete high school (11.5%; 95%CI: 10.4-12.6). There were no differences in positive screening for depression between skin color group (Table 1).

Concerning the screening for depression for the Brazilian regions and states, the North region presented a prevalence of symptoms of depression that was statistically lower than the other regions (8.3%; 95%CI: 7.6-9.0). The highest prevalence was found in the Southeast region (11.5%; 95%CI: 10.8-12.3) and in the states of Sergipe (14.6%; 95%CI: 12.9-16.4), Goiás (13.9%; 95%CI: 12.1-15.9), Piauí (12.8%; 95%CI: 10.6-15.5), and Espírito Santo (12.4%; 95%CI: 10.9-14.2), while the lowest prevalence was found in Pará (7.3%; 95%CI: 6.2-8.5), Mato Grosso (7.8%; 95%CI: 6.1-9.8), Maranhão (7.8%; 95%CI: 6.8-8.9), and Amazonas (8.5%; 95%CI: 7.0-10.3) (Table 2).

Factors associated with symptoms of depression

Table 3 shows the crude and adjusted prevalence ratios for cutoff values ≥10 in the PHQ-9. The analysis, adjusted by all variables of the model, indicated that the adjusted prevalence ratio (RPaj) for women was twice as high as for men (RPaj=2.42; 95%CI: 2.36-2.48). Under 70 years of age had a high prevalence of depression as compared to the reference group (70 years or more). In terms of education, the lower the education level, the higher the prevalence and the RPaj for symptoms of depression. For marital status, we verified that the individuals who were single or had no partner had a higher prevalence (RPaj=1.22; 95%CI: 1.20-1.25) of symptoms of depression than those who lived with a partner. As far as race or skin color, those who defined themselves as black had a higher RPaj (1.08; 95%CI: 1.05-1.11) than did the others. The symptoms of depression were also higher, at 47% (RPaj=1.47; 95%CI: 1.44-1.49) for those who lived in urban areas, as compared to individuals who lived in rural areas. In the comparison between Brazilian states, a highest association with depressive symptoms was found in Sergipe (RPaj=1.93;

Table 1. Sociodemographic characteristics by the prevalence of positive screening for depression in the Brazilian adult population (PHQ-9), according to the algorithm and the cutoff point≥10, PNS 2019.

Variables	n	%	≥10 Points (95%CI)	Algorithm (95%CI)
Total	88,531	100	10.8 (10.4-11.0)	5.7 (5.4-6.0)
Gender			p-value* (0.00)	p-value* (0.00)
Male	41,662	46.8 (46.2-47.4)	6.1 (5.7-6.5)	3.1 (2.8-3.4)
Female	46,869	53.2 (52.6-53.8)	15.0 (14.4-15.6)	7.9 (7.4-8.4)
Age			p-value* (0.01)	p-value* (0.00)
18-29	15,394	22.1 (21.5-22.7)	10.2 (9.3-11.1)	4.6 (4.0-5.2)
30-39	18,150	21.0 (20.5-21.5)	10.0 (9.2-10.8)	5.2 (4.7-5.9)
40-49	16,602	18.2 (17.7-18.6)	11.7 (10.9-12.5)	6.4 (5.8-7.0)
50-59	15,657	17.1 (16.7-17.5)	11.9 (11.0-12.9)	6.5 (5.8-7.2)
60-69	12,555	12.2 (11.8-12.5)	10.5 (9.5-11.5)	5.8 (5.1-6.6)
70+	10,173	9.4 (9.1-9.8)	11.1 (10.0-12.2)	6.1 (5.3-7)
Education			p-value* (0.00)	p-value* (0.00)
None or incomplete primary school	35,572	34.8 (34.1-35.4)	12.4 (11.8-13.0)	6.9 (6.5-7.5)
Complete primary school or incomplete high school	12,005	14.5 (14.1-14.9)	11.5 (10.4-12.6)	6.4 (5.6-7.4)
Complete high school or incomplete college/university	27,337	34.9 (34.3-35.6)	9.8 (9.2-10.5)	4.7 (4.3-5.1)
Complete college/university	13,617	15.8 (15.2-16.5)	9.0 (8.1-10.0)	4.3 (3.6-5.2)
Occupational Status			p-value* (0.00)	p-value* (0.00)
Employed	52,475	92.1 (91.6-92.5)	8.8 (8.4-9.2)	4.7 (4.3-5.1)
Unemployed	3,737	7.9 (7.5-8.4)	15.2 (13.4-17.3)	4.3 (3.6-5.2)
Race/Skin color			p-value* (0.16)	p-value* (0.14)
White	32,409	43.3 (42.5-44)	10.6 (10.0-11.2)	5.6 (5.2-6.1)
Black	10,132	11.5 (11.1-11.9)	11.8 (10.8-12.8)	6.4 (5.6-7.3)
Others	45,891	45.3 (44.6-45.9)	10.9 (10.3-11.4)	5.5 (5.2-5.9)
Marital status			p-value*(0.00)	p-value* (0.00)
Single or no partner	35,254	36.3 (35.6-36.9)	12.9 (12.2-13.6)	6.9 (6.3-7.4)
Married or living with a partner	53,277	63.7 (63.1-64.4)	9.7 (9.2-10.1)	5.0 (4.7-5.3)
Geographical area			p-value* (0.00)	p-value* (0.00)
Rural	20,311	13.8 (13.4-14.2)	7.7 (7.0-8.4)	3.7 (3.3-4.1)
Urban	68,220	86.2 (85.8-86.6)	11.3 (10.9-11.8)	6.0 (5.7-6.3)

*p-values estimated using Rao-Scott Chi-Square Test.

Source: Authors.

95%CI: 1.89-1.96), Goiás (RPaj=1.83; 95%CI: 1.77-1.88), Piauí (RPaj=1.78; 95%CI: 1.73-1.82), Espírito Santo (RPaj=1.68; 95%CI: 1.65-1.72), São Paulo (RPaj=1.66; 95%CI: 1.57-1.76), Alagoas (RPaj=1.60; 95%CI: 1.57-1.63) and lowest in Pará (RPaj=1.00), Mato Grosso (RPaj=1.06; 95%CI: 1.03-1.09) and Maranhão (RPaj=1.06; 95%CI: 1.04-1.09) (Table 3 and Figure 1).

Discussion

The present study used the PHQ-9 depression scale and identified that the prevalence of positive screening for depression in the Brazilian population, according to the algorithm and to the cutoff point of ≥10 was 5.7% (5.4-6.0) and 10.8% (10.4-11.0), respectively. The adjusted prevalence ratios of the positive screening according to cutoff point of ≥10 was higher for women, for blacks, under 70 years of age, who were less educated, single or with no partners, in the previous 12 months. The residents of urban areas and from regions other than the North region, and from the states of Sergipe, Goiás, Piauí, Espírito Santo, São Paulo, Alagoas had the highest the adjusted prevalence ratio of depressive symptoms.

The prevalence of positive screening for depression in Brazil verified by PNS-2019 (10.8%; 95%CI: 10.4-11.0) is higher than the prevalence

Table 2. Prevalence of positive screening for depression by PHQ-9 in the Brazilian adult population by region and Brazilian states, PNS 2019.

Variables	n	%	≥10 Points (95%CI)	Algorithm (95%CI)
Region			p-value* (0.00)	p-value* (0.00)
North	16,937	19.1 (18.8-19.5)	8.3 (7.6-9.0)	4.2 (3.7-4.8)
Northeast	30,702	26.5 (25.9-27)	10.7 (10.1-11.2)	5.3 (4.9-5.7)
Southeast	19,435	43.4 (42.6-44.2)	11.5 (10.8-12.3)	6.1 (5.5-6.7)
South	11,276	14.7 (14.3-15.1)	10.2 (9.3-11.2)	5.6 (5.1-6.2)
Midwest	10,181	7.6 (7.3-7.9)	11.4 (10.4-12.4)	6.3 (5.5-7.1)
State			p-value* (0.00)	p-value* (0.00)
Rondônia (RO)	2,108	0.8 (0.7-0.8)	10.5 (9.0-12.2)	5.8 (4.6-7.3)
Acre (AC)	2,283	0.4 (0.4-0.4)	9.9 (8.3-11.7)	5.7 (4.6-7.0)
Amazonas (AM)	3,37	1.7 (1.6-1.8)	8.5 (7.0-10.3)	4.4 (3.3-5.8)
Roraima (RR)	2,135	0.2 (0.2-0.2)	10.1 (8.4-12.1)	4.6 (3.7-5.8)
Pará (PA)	3,696	0.2 (0.2-0.2)	7.3 (6.2-8.5)	3.6 (2.9-4.5)
Amapá (AP)	1,473	0.4 (0.3-0.4)	9.2 (7.4-11.4)	3.9 (2.9-5.3)
Tocantins (TO)	1,872	0.7 (0.7-0.8)	8.7 (7.2-10.4)	4.4 (3.3-5.7)
Maranhão (MA)	4,889	3.0 (2.9-3.2)	7.8 (6.8-8.9)	3.9 (3.3-4.7)
Piauí (PI)	2,674	1.5 (1.4-1.6)	12.8 (10.6-15.5)	5.8 (4.4-7.8)
Ceará (CE)	4,141	4.3 (4.1-4.5)	11.0 (9.8-12.2)	4.6 (3.9-5.4)
Rio Grande do Norte (RN)	2,877	1.6 (1.5-1.8)	9.6 (8.1-11.2)	5.1 (4.2-6.3)
Paraíba (PB)	3,068	1.9 (1.8-2)	9.9 (8.6-11.4)	5.5 (4.4-6.8)
Pernambuco (PE)	3,992	4.5 (4.2-4.7)	10.5 (9.2-12.0)	5.8 (4.9-6.9)
Alagoas (AL)	2,898	1.5 (1.4-1.6)	12.2 (10.6-13.9)	5.4 (4.4-6.5)
Sergipe (SE)	2,563	1.1 (1-1.1)	14.6 (12.9-16.4)	7.0 (5.9-8.3)
Bahia (BA)	3,36	7 (6.7-7.4)	11.0 (9.6-12.5)	5.5 (4.5-6.7)
Minas Gerais (MG)	5,128	10.4 (10-10.9)	10.6 (9.4-12.0)	5.4 (4.5-6.4)
Espírito Santo (ES)	3,463	1.9 (1.8-2.0)	12.4 (10.9-14.2)	6.7 (5.3-8.5)
Rio de Janeiro (RJ)	4,849	8.6 (8.3-9.0)	10.4 (9.3-11.6)	5.7 (4.9-6.6)
São Paulo (SP)	5,995	22.5 (21.6-23.4)	12.2 (11.0-13.5)	6.5 (5.6-7.6)
Paraná (PR)	3,893	5.5 (5.2-5.8)	10.7 (9.2-12.4)	6.5 (5.5-7.7)
Santa Catarina (SC)	3,676	3.5 (3.4-3.7)	8.7 (7.4-10.2)	5.2 (4.3-6.3)
Rio Grande do Sul (RS)	3,707	5.6 (5.4-5.9)	10.8 (9.3-12.4)	4.9 (4.1-5.9)
Mato Grosso do Sul (MS)	2,805	1.2 1.2-1.3)	11.2 (9.6-12.9)	5.8 (4.8-6.9)
Mato Grosso (MG)	2,423	1.6 (1.5-1.7)	7.8 (6.1-9.8)	4.1 (3.0-5.6)
Goiás (GO)	2,648	3.3 (3.1-3.5)	13.9 (12.1-15.9)	7.9 (6.6-9.6)
Distrito Federal (DF)	2,305	1.5 (1.3-1.6)	9.7 (8.1-11.5)	5.1 (4.1-6.4)

*p-values estimated using Rao-Scott Chi-Square test.

Source: Authors.

found in PNS-2013 (7.9%; 95%CI: 7.5-8.3)[6], considering the cutoff point of ≥10 in PHQ-9, as well as by using the algorithm from PHQ-9, PNS-2019 (5.7%; 95%CI: 5.4-6.0) and PNS-2013 (4.1%; 95%CI: 3.8-4.4)[5], pointing to an increase in the prevalence of positive screening for depression in recent years in Brazil. Comparatively, in the USA, there was no difference in the prevalence of depression measured by the PHQ-9 (≥10), in a period of 10 years (2007-2008 to 2015-2016)[13]. However, over these six years, Brazil has been going through a period of intense economic crisis, with an increase in the number of unemployed and economic recession. Accelerated and unplanned urbanization led to increased social vulnerability and exposure to violence[14]. In addition, studies from PNS 2019 indicated the aging of the Brazilian population between 2013 and 2019 and the increased prevalence and burden of chronic non-communicable diseases[15,16].

Table 3. Crude and adjusted ratios of the prevalence of depressive symptom and confidence interval according to sociodemographic characteristics in the Brazilian adult population with the cutoff point≥10, by PHQ-9, PNS 2019.

	Crude prevalence ratio (CI95%)	Adjusted prevalence ratio (CI95%)
Gender		
Male	-	-
Female	2.47 (2.4-2.52)	2.42 (2.36-2.48)
Age (years)		
18-29	0.92 (0.89-0.96)	1.20 (1.15-1.25)
30-39	0.90 (0.88-0.93)	1.24 (1.19-1.28)
40-49	1.05 (1.03-1.08)	1.32 (1.29-1.36)
50-59	1.08 (1.05-1.11)	1.31 (1.28-1.34)
60-69	0.95 (0.92-0.97)	1.05 (1.03-1.08)
70+	-	-
Education		
None or incomplete primary school	1.38 (1.33-1.42)	1.62 (1.57-1.67)
Complete primary school or incomplete high school	1.27 (1.22-1.33)	1.44 (1.38-1.5)
Complete high school or incomplete college/university	1.09 (1.05-1.14)	1.15 (1.1-1.19)
Complete college/university	-	-
Skin color/Race		
White	-	-
Black	1.11 (1.08-1.14)	1.08 (1.05-1.11)
Other	1.02 (1.00-1.05)	1.03 (1.00-1.05)
Marital Status		
Single or no partner	1.34 (1.31-1.36)	1.22 (1.20-1.25)
Married or living with a partner	-	-
Geographical area		
Rural	-	-
Urban	1.48 (1.45-1.50)	1.47 (1.44-1.49)
Brazilian State		
Acre (AC)	1.35 (1.33-1.38)	1.38 (1.36-1.41)
Alagoas (AL)	1.67 (1.63-1.70)	1.60 (1.57-1.63)
Amazonas (AM)	1.17 (1.14-1.20)	1.17 (1.14-1.20)
Amapá (AP)	1.26 (1.24-1.29)	1.23 (1.21-1.26)
Bahia (BA)	1.50 (1.45-1.56)	1.48 (1.43-1.54)
Ceará (CE)	1.50 (1.47-1.54)	1.48 (1.44-1.51)
Distrito Federal (DF)	1.33 (1.30-1.36)	1.35 (1.32-1.39)
Espírito Santo (ES)	1.71 (1.67-1.74)	1.68 (1.65-1.72)
Goiás (GO)	1.90 (1.84-1.96)	1.83 (1.77-1.88)
Maranhão (MA)	1.07 (1.05-1.09)	1.06 (1.04-1.09)
Minas Gerais (MG)	1.46 (1.39-1.53)	1.41 (1.34-1.48)
Mato Grosso do Sul (MS)	1.53 (1.50-1.56)	1.49 (1.46-1.52)
Mato Grosso (MG)	1.07 (1.04-1.10)	1.06 (1.03-1.09)
Pará (PA)	-	-
Paraíba (PB)	1.36 (1.33-1.38)	1.32 (1.29-1.35)
Pernambuco (PE)	1.44 (1.40-1.48)	1.37 (1.34-1.41)
Piauí (PI)	1.76 (1.71-1.81)	1.78 (1.73-1.82)
Paraná (PR)	1.46 (1.41-1.52)	1.48 (1.43-1.54)
Rio de Janeiro (RJ)	1.43 (1.39-1.47)	1.38 (1.33-1.42)
Rio Grande do Norte (RN)	1.31 (1.28-1.34)	1.28 (1.25-1.31)
Rondônia (RO)	1.44 (1.41-1.47)	1.45 (1.42-1.48)
Roraima (RR)	1.38 (1.36-1.41)	1.43 (1.41-1.46)
Rio Grande do Sul (RS)	1.47 (1.42-1.53)	1.49 (1.43-1.55)
Santa Catarina (SC)	1.19 (1.16-1.23)	1.24 (1.20-1.28)
Sergipe (SE)	2.00 (1.96-2.04)	1.93 (1.89-1.96)
São Paulo (SP)	1.68 (1.58-1.78)	1.66 (1.57-1.76)
Tocantins (TO)	1.19 (1.16-1.21)	1.19 (1.17-1.22)

Source: Authors.
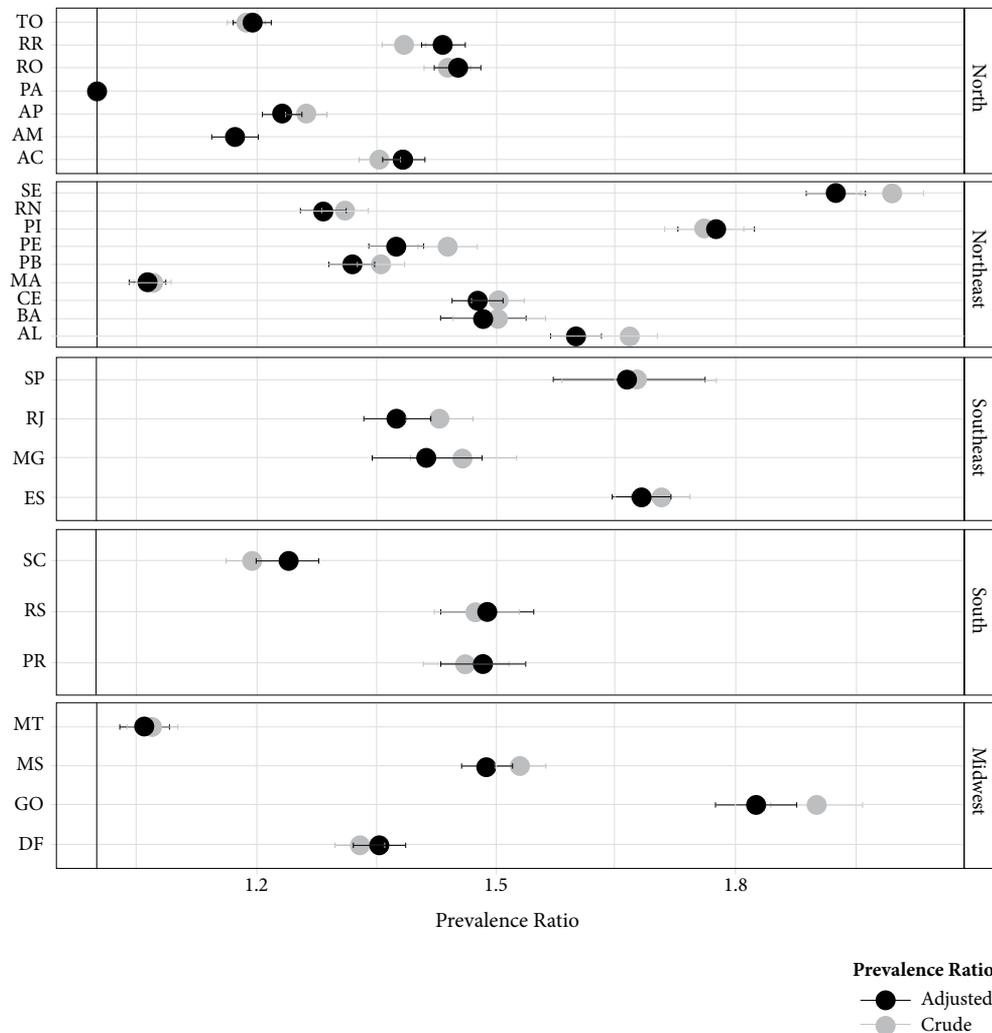
Figure 1. Crude and adjusted ratios of the prevalence of depressive symptoms and confidence interval according to states in the Brazilian adult population with the cutoff point≥10, by PHQ-9, PNS 2019.

Note: AC - Acre; AL - Alagoas; AP - Amapá; AM - Amazonas; BA - Bahia; CE - Ceará; DF - Distrito Federal; ES - Espírito Santo; GO - Goiás; MA - Maranhão; MT - Mato Grosso; MS - Mato Grosso do Sul; MG - Minas Gerais; PA - Pará; PB - Paraíba; PR - Paraná; PE - Pernambuco; PI - Piauí; RR - Roraima; RO -Rondônia; RJ - Rio de Janeiro; RN - Rio Grande do Norte; RS - Rio Grande do Sul; SC - Santa Catarina; SP - São Paulo; SE - Sergipe; TO - Tocantins.

Source: Authors.

Other few population-based survey studies were also conducted in Brazil using the PHQ-9. However, not all of them used the same scoring method used in the present study (cutoff point of ≥10), makes it difficult to compare results. One study conducted in Manaus and its metropolitan region, in the state of Amazonas, found a prevalence of symptoms of depression of 7.0% (95%CI: 6.0-8.0) with a cutoff point of ≥9[17], close to the PNS-2019 estimates, which were 8.5% (95%CI:

7.0-10.3) and which evaluated the same region of that state. Another study conducted with residents of the urban area of Pelotas, Rio Grande do Sul (RS), using a cutoff point of ≥9, found a prevalence of symptoms of depression of 20.4% (95%CI: 18.9-21.8)[18]. The municipality studied is not part of the metropolitan region of Rio Grande do Sul, where the sampling for the PNS-2019 came from, which found a prevalence of 10.8% (95%CI: 9.3-12.4). These results should be

interpreted with caution, considering the PHQ-9 cutoff point of ≥9 in these studies.

On the other hand, it was possible to compare the results to other countries using the positive screening for depression, evaluated by the PHQ-9, conducted with a score ≥10 points in population-based survey studies. In Russia, 5,077 people were interviewed, between 35 and 69 years of age, from two cities and the age-standardized prevalence of depression was 10.6% and 6.3%, respectively[19]. Meanwhile, in Germany, the prevalence was 5.6%, among 5,018 individuals of 14 years of age and older[20]. In Korea, the prevalence was 6.7% among 4,949 adults of 19 years of age and above[21]. In the USA, data from the National Health and Nutrition Examination Survey (NHANES), from 2013 to 2016, identified a prevalence of 8.1% among adults of 20 years of age and older[13]. We have already mentioned that all these countries used the PHQ-9 (with cutoff ≥10), however, these studies investigated populations with social and cultural characteristics that are different from those of the Brazilian population. Moreover, they used samples with specific characteristics, which may explain the differences in prevalence.

The increase in the prevalence of positive screening for depression comparing PNS 2013 to PNS-2019 is even more worrisome, considering the measures taken by the current federal government, which has prompted changes in the policies for mental health in Brazil[22,23]. Among these changes is the reduction in registering at the community mental health services (*Centro de Atenção Psicossocial* [CAPS])[23]. Moreover, PNS 2019 indicated that among the individuals who sought treatment for depression, 47.4% were treated by private doctors or clinics[14], which indicates limited access to treatment, considering that 75.9% of the Brazilian population relies on public health services[24]. Other studies have also called attention to the low and inadequate access to depression treatment[6,19,25], especially in low medium income countries (LMICs)[26].

For the Brazilian States, we noticed a different distribution pattern of self-referred depression prevalence in comparison to PNS-2013. In PNS-2019, higher prevalence of depressive symptoms was found in Sergipe, Goiás, Piauí, and Espírito Santo. In PNS-2013, the self-referred depression prevalence was higher in the states of Rio Grande do Sul, Santa Catarina, Paraná, and Minas Gerais[2,27,28]. This might be explained by a better access to treatment in the states with higher self-referred depression prevalence, such as the southern region, which includes three states among the six with the highest gross domestic product (GDP) in Brazil[29]. This result reveals a need for better availability of access to services of mental health in those states, which showed a higher prevalence of depressive symptoms in the PNS-2019 indicating inequalities and unmet health needs among residents of the less developed regions. Gonçalves *et al.*[30], verified that 53.0% of the individuals who had scores ≥10 in PHQ-9, did not refer to themselves as having such a disorder when questioned directly about morbidity, most likely indicating a lost opportunity of being diagnosed and treated adequately.

The PNS-2019 results confirmed references frequently found in literature about depression prevalence. Among those, it is important to mention the higher prevalence of depression among women, which is related to biological and social factors[3-5,13,28,31,32]. Except for Germany, where the prevalence of depression was higher among men[20], other international studies showed a higher prevalence for women[33-35].

The data on the adjusted prevalence ration indicates that, under 70 years of age had a high prevalence of depression as compared to the reference group (70 years or more). However, the literature about the association between age and depression is divergent. In PNS-2013 the prevalence was higher in the age group between 40 and 59 years or 80 years or over[5]. Other national studies[36], as well as international studies, have shown a higher depression among the elderly[20,33,35]. Similar to this study, Wittayanukorn *et al.*[37], in a study done with 13,320 adults, using the PHQ-9 in the USA, identified an increased prevalence with age and a decline in the oldest group. A Korean study identified that people in the age group of 40 to 50 years had an increased risk of developing depression[34].

In addition, we verified that the proportion of adults with depression increased with decreasing level of education. We should also mention a lower level of education[5,18,20,34,35,38] and unemployment or lack of occupation[6,38], as two factors which indicate worse living conditions. Although this study did not evaluate the income of the interviewees, it is a known fact that education is a good marker of socioeconomic level and low socioeconomic levels are associated with higher psychiatric morbidity[20,38] and lower access to health services[38].

In Brazil, there are few studies about the relationship between race/skin color and mental health. Smolen and Araújo[39] did a systematic

literature review in Brazil and concluded that mental disorders are more common among white people. The authors reminded that there is a need for more studies to better determine the evidence, arguing that almost half of the Brazilian articles on the theme was written based on homogenous sampling in terms of race and skin color. Although the sampling of the PNS is heterogeneous, representative of the Brazilian territory and with a higher statistical power to evaluate association, that result should be interpreted with caution, since data from the PNS was not adjusted by the income of the participants, which may have altered the estimates. Since there is not a biological relationship between race/skin color and mental health, the comparison of Brazilian results to international results thus becomes unfeasible, considering the differences of social, cultural, and historical contexts[39].

Concerning marital status, the literature corroborates the PNS-2019 results, in that there is a higher association of having depression symptoms and being single or having no partner[18,40-42]. As in the present study, the results of a study conducted in Germany showed that those who did not cohabitate had an average PHQ-9 score of higher than those who cohabitated[20].

Another recurring finding refers to living in urban areas[5,17,43-45]. There are some national[5,17,45] and international studies[34,43,44] which demonstrate that residing in urban areas make people more prone to develop mental disorders, especially depression, because of issues related to the stress caused by the intense lifestyle, traffic, violence, and social isolation. In terms of living in rural areas, a study done in rural communities in India found a 14.6% prevalence of depression; however, only 4.3% of those individuals sought some kind of treatment for depression, most likely because of the unavailability of health services and worse socioeconomic conditions, among other problems[33].

Strengths and limitations of this study

This study has an advantage: the evaluation of positive screening for depression in the general population of Brazil though an instrument used in several countries, which makes it easier to compare results. Moreover, this is the second time that this evaluation has been conducted in Brazil, allowing for the evaluation of the temporal evolution of the results. However, the prevalence of depression is based on scores from the PHQ-9, a symptom-screening questionnaire that allows for a criteria-based diagnosis of depressive disorders. The definite diagnosis for depression can only be confirmed through interviews done by mental health professionals. Another limitation is related to the methods of analysis adopted by the PHQ-9, which show limited sensitivity and specificity (cutoff $\geq$10 are 0.77 and 0.85, respectively), implying some degree of random classification error. The prevalence measure by PHQ-9 could be underestimate by self-report bias. Moreover, since this is a cross-sectional study, it is not possible to determine a causation relationship between the variables. We must also consider that the socioeconomic level of the participants, a variable which is capable of influencing the results, was not evaluated in this study.

Conclusion

The new data collection by the PNS-2019 allowed us to verify that there has been an increase in the number of people with positive screening for depression in the country since the previous study. Considering that many of the factors associated with these disorders, such as education, occupation, and living conditions in big cities are potentially modifiable, policies aimed at improving these factors must be strengthened and specific actions to improve the mental health care network need to be taken as well.

It should be highlighted that the collection of data for PNS-2019 was conducted before the beginning of the COVID-19 pandemic, which has caused the worst economic, health, and sanitation crisis ever in the country. Meta-analysis indicates that populations affected by pandemics have significantly higher prevalence of depression, compared to general populations under normal circumstances[46]. Therefore, it is imperative that new data collections by the PNS continue to take place using the PHQ-9, as it will be also useful to evaluate the impact of the COVID-19 pandemic on the mental health of the Brazilian population.

Collaborations

APS Melo and CSC Bonadiman drafted the first version of the article. FM Andrade participated in the literature review. DC Malta participated in the planning and design of the study. PC Pinheiro participated in the data analysis and design of the study. All authors interpreted the results and collaborated with the interpretation/writing of the findings. All authors contributed to and have approved the final manuscript.

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