




BMJ Open Prevalence of self-reported lifetime medical diagnosis of depression in Brazil: analysis of data from the 2019 Brazilian National Health Survey

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ABSTRACT

Objectives To assess the prevalence of and factors associated with the lifetime medical diagnosis of depression in Brazil.

Design Population-based, cross-sectional study.

Setting Analysis of data from the 2019 Brazilian National Health Survey.

Participants 90 846 individuals aged ≥15 years were included.

Outcome measure The self-reported medical diagnosis of depression at some point in one's life was the main outcome. Prevalence ratios (PRs) with 95% CIs were calculated by Poisson regression with robust variance. The independent variables included the geographical area of residence, sociodemographic characteristics, current smoking status, alcohol abuse, daily screen time, and the presence of physical disorders and mental health comorbidities.

Results The self-reported lifetime prevalence of medical diagnosis of depression was 9.9% (95% CI 9.5% to 10.2%). The probability of having received a medical diagnosis of depression was higher among urban residents (PR 1.23; 95% CI 1.12 to 1.35); females (2.75; 2.52 to 2.99); those aged 20–29 years (1.17; 0.91 to 1.51), 30–39 years (1.73; 1.36 to 2.19), 40–49 years (2.30; 1.81 to 2.91), 50–59 years (2.32; 1.84 to 2.93) and 60–69 years (2.27; 1.78 to 2.90) compared with those under 20 years; white-skinned people (0.69 (0.61 to 0.78) for black-skinned people and 0.74 (0.69 to 0.80) for indigenous, yellow and brown-skinned people compared with white-skinned people); those with fewer years of education (1.33(1.12 to 1.58) among those with 9–11 years, 1.14 (0.96 to 1.34) among those with 1–8 years and 1.29 (1.11 to 1.50) among those with 0 years compared with those with ≥12 years of education); those who were separated/divorced (1.43; 1.29 to 1.59), widowed (1.06; 0.95 to 1.19) and single (1.01; 0.93 to 1.10) compared with married people; smokers (1.26; 1.14 to 1.38); heavy screen users (1.31; 1.16 to 1.48) compared with those whose usage was <6 hours/day; those with a medical diagnosis of a physical disorder (1.80; 1.67 to 1.97); and individuals with

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ The nationwide representativeness and the robustness of the methodology are major strengths of this study.
- ⇒ Due to the cross-sectional study design, causality and direction of causality, between variables cannot be established.
- ⇒ Issues regarding the training of health professionals to identify depressive symptoms were not explored in this study, which may have had an impact on the prevalence of the outcome.
- ⇒ The restriction of the sample to domiciled individuals may underestimate the prevalence of the outcome, since populations in situations of extreme vulnerability, including the homeless, the institutionalised, those deprived of liberty and hospitalised people, are at greater risk of being affected by mental health disorders.

a medical diagnosis of a mental health comorbidity (5.05; 4.68 to 5.46).

Conclusion This nationwide population-based study of self-reported lifetime medical diagnosis of depression in Brazil showed that the prevalence was almost 10%. Considering the current Brazilian population, this prevalence corresponds to more than 2 million people who have been diagnosed with depression at some point in their lives.

INTRODUCTION

The lifetime prevalence and course of major depression differ across countries and regions. However, the high prevalence and persistence of depression globally reinforce the worldwide relevance of this condition. Depression is a heterogeneous condition with a variety of symptoms of presentation and is related to increased morbidity,

mortality and health costs. It is one of the main causes of years lived with disability (YLDs) worldwide and has an important impact on patients' and their families' quality of life.¹⁻⁴

Different estimates show that this disorder may affect more than 300 million individuals or 4.4% of the world's population, and recent evidence suggests that its prevalence has increased in recent years. However, depression prevalence differs according to sociodemographic and regional factors. Females, older individuals and those with a lower socioeconomic status are more likely to develop major depression compared with males, younger subjects and those with a high socioeconomic status.¹⁻⁴

Current data on the lifetime prevalence of depression diagnosis in the Brazilian population are scarce. However, results from the 2017 Global Burden of Disease Study, which included findings from 18 studies, showed that the prevalence of depressive disorders in Brazil was 3.30% (95% uncertainty interval (UI): 3.08% to 3.57%). Depressive disorders accounted for 1.239 million (95% UI: 878 911 to 1 689 498) YLDs in Brazil in 2017, with a rate of 543.96 per 100 000 people (95% UI: 386.79 to 740.75), accounting for 5% (95% UI: 4.04% to 6.09%) of all YLDs in the country.⁵

A nationwide population-based study of depression in Brazil, with data from the National Health Survey carried out in 2013 (PNS-2013), identified individuals at greater risk of depression through the use of the Patient Health Questionnaire-9. A total of 60 202 adults were evaluated and the prevalence of positive screening for depression was 4.1% (95% CI: 3.8% to 4.4%).⁶ The depression prevalence rate was higher among women, individuals with lower educational levels, older people, those living in urban areas, smokers, and among those with arterial hypertension, diabetes, or heart disorders.⁶ On the other hand, a nationwide study on the use of psychotropic drugs for the treatment of self-reported depression among the urban adult Brazilian population, conducted between 2013 and 2014, found a prevalence of self-reported depression of 6.1% (95% CI: 5.6% to 6.6%). The prevalence of depression increased with age and was greater among women and people with chronic multimorbidity (whereas as a single disease, the prevalence of depression was higher among young people).⁷

Recognising and identifying disease prevalence and key factors that determine health status are critical for effective national evidence-based policy.⁸ Hence, the objective of this study was to assess the prevalence of and factors associated with the self-reported lifetime medical diagnosis of depression using data from the 2019 Brazilian National Health Survey (PNS-2019).

METHODS

This cross-sectional study followed the STrengthening the Reporting of OBservational studies in Epidemiology⁹ and Checklist for Reporting of Survey Studies statements.¹⁰

Study population

This population-based cross-sectional study used data from the PNS-2019 carried out by the Brazilian Institute of Geography and Statistics and the Ministry of Health.¹¹ Data from the PNS-2019 were collected between August 2019 and March 2020, throughout the national territory, in all five macro-regions of the country, using a probability sample of households. The research sample was obtained from a master sample, using cluster sampling, in three stages. In the first stage, the stratification of the set of census sectors or set of sectors (primary sampling units (PSUs)) was carried out, based on the Integrated System of Household Surveys. In the second stage, a fixed number of private households (secondary units) were selected from the National Register of Addresses for Statistical Purposes. In the third stage, from the list of residents compiled at the time of the survey, one resident aged ≥ 15 years was drawn from each permanent private household included in the survey to answer the specific questionnaire (tertiary units). Each of the stages was carried out by simple random sampling. Further details on the study design and methodology can be found in another publication.¹² The interviews were conducted by trained fieldworkers, with the help of mobile data collection devices, programmed to 'jump' questionnaire items and to check the consistency of the variables. The current study was conducted with data from individuals aged ≥ 15 years, of both sexes, who answered the specific questionnaire.

The sample size of the PNS-2019 was calculated based on selected indicators of the PNS-2013 data. Of a total of 15 096 PSUs, 108 525 households were selected. More in-depth details on the sampling plan, data collection and weighting process can be found in other publications.^{11 12} The total loss rate from non-response estimated at the planning phase of the study was 20% for common issues (general information given by a resident aged ≥ 18 years about all residents in the household in regard to level of schooling, occupation, household income, etc) and 27% for specific issues (block of questions aimed at one selected resident aged ≥ 15 years). However, losses from non-response in the study were lower than estimated. The total loss rate from non-response was 13.2% for common issues and 16.2% for specific issues.^{11 12}

Study outcome

The outcome of interest, the self-reported medical diagnosis of depression at some point in one's life, was defined by the answer to the question 'Has a doctor or mental health professional (such as a psychiatrist or psychologist) ever diagnosed you with depression?' The answer options were 'yes' and 'no'.

The independent variables included: macro-regions of the country (North, Northeast, South, Southeast or Central-West); geographical area of residence (urban or rural); sex (male or female); age group (15-19, 20-29, 30-39, 40-49, 50-59, 60-69, 70-79 or ≥ 80 years old); self-reported skin colour (white, black or others,



Figure 1 Map of Brazil representing its five macro-regions (dark green: North; blue: Northeast; yellow: Central-West; orange: Southeast and light green: South) and its five major cities (São Paulo, Rio de Janeiro, Brasília, Salvador and Fortaleza).

which included indigenous, yellow and brown); years of schooling (0, 1–8, 9–11 or ≥ 12); marital status (married, single, widowed or separated/divorced); current smoking status, obtained through the question ‘Do you currently smoke any tobacco products?’, with the answer options ‘yes, daily’, ‘yes, less than daily’ and ‘I do not currently smoke’ (those who answered ‘yes, daily’ were considered as smokers); abusive alcohol consumption, defined as drinking five or more doses on a single occasion, at least once a month, in response to the question ‘In general, on the day you drink, how many doses of alcohol do you consume?’ (one dose of alcoholic beverage is equivalent to a can of beer, a glass of wine, or a shot of *cachaça*, whiskey, or any other distilled alcoholic beverage); screen time, obtained through the question ‘In a day, how many hours of your free time (excluding work) do you usually use a computer, tablet or cell phone for leisure, such as using social media, reading news, watching videos, playing games, etc?’, with the answer options ‘less than 1 hour’, ‘from 1 hour to less than 2 hours’, ‘from 2 hours to less than 3 hours’, ‘from 3 hours to less than 6 hours’, ‘6 hours or more’ and ‘I don’t usually use a computer, tablet or cell phone during my free time’ (heavy screen users in their leisure time were defined as those who answered ‘6 hours or more’); self-reported medical diagnosis of at least one of the following physical disorders: arterial hypertension, diabetes mellitus, heart disease (heart attack, angina, heart failure or other), stroke, asthma (or asthmatic bronchitis), chronic pulmonary disease (emphysema, chronic bronchitis or chronic obstructive pulmonary

disease), arthritis (or rheumatism), work-related musculoskeletal disorder, cancer or chronic kidney failure; and self-reported medical diagnosis of at least one of the following mental health comorbidities: anxiety disorder, panic disorder, schizophrenia, bipolar disorder, psychosis or obsessive compulsive disorder. These variables were selected based on evidence on factors associated with depression.^{4–6 13}

Statistical analysis

The data analysis was carried out using the Stata software, V.12.1 (Stata Corp, College Station, Texas, USA). All analyses were stratified according to the macro-region of the country and carried out using the `svyset` command, which takes into consideration sample weights.¹² Sample weights were defined for the PSUs, households and all residents, as well as for the selected resident. A descriptive analysis was initially carried out, calculating frequencies and their respective 95% CI for the entire country, followed by stratification for the Brazilian macro-regions. The adjusted analysis was performed using Poisson regression,¹⁴ based on a hierarchical model composed of three levels.¹⁵ Variables that presented a p value of 0.20 or less in each level were maintained in the adjusted model. Level one was composed of the geographical area of residence (urban or rural), demographic variables (sex, age, skin colour and marital status) and educational level. Level two included behavioural variables (current smoking status, alcohol use and screen time), and level three comprised the presence of any chronic physical or mental morbidity. The Wald test for heterogeneity and the linear trend test were used to assess associations. P values lower than 0.05 were considered statistically significant.

Patient and public involvement

None.

RESULTS

A total of 90 846 individuals were analysed. **Figure 1** contains a map of Brazil with its five macro-regions and the five most populous cities in the country. **Table 1** presents the sample distribution in Brazil and the macro-regions. In the country, the majority (85.9%) lived in urban areas, were female (52.9%), were between 20 and 59 years old (70.4%) and 42.9% self-declared as being of white skin colour. About one in five participants (19.8%) had ≥ 12 years of schooling and 5.8% had not received any formal education. The proportion of widowed and separated/divorced participants was 13.2%; 12.2% were current smokers; 4.4% presented abusive consumption of alcoholic beverages; and about 1 in 10 (9.9%) were heavy screen users (≥ 6 hours/day). More than one-third (38.1%) and 6.6% of the respondents reported having a medical diagnosis of at least one physical disorder and of at least one mental health comorbidity, respectively.

As for the distribution of the sample in the macro-regions, the proportion of residents in urban areas was

**Table 1** Sample description of the Brazilian National Health Survey, 2019 (nationally and by region)

Independent variables	Regions of Brazil											
	Brazil		North		Northeast		Southeast		South		Central-West	
	N	%	N	%	N	%	N	%	N	%	N	%
Geographical area												
Rural	20 973	14.1	4840	22.4	9887	25.8	2641	6.3	2149	13.5	1456	9.2
Urban	69 873	85.9	12 762	77.6	21 657	74.2	17 189	93.7	9323	86.5	8942	90.8
Sex												
Male	42 799	47.1	8627	48.3	14 552	46.8	9235	46.7	5537	47.6	4848	47.4
Female	48 047	52.9	8975	51.7	16 992	53.2	10 595	53.3	5935	52.4	5550	52.6
Age (years)												
15–19	4336	9.2	1196	12.2	1581	10.2	740	8.4	388	8.0	431	9.6
20–29	13 373	17.2	3183	20.9	4712	18.0	2434	16.1	1408	15.7	1636	19.2
30–39	18 150	19.8	3833	21.4	6432	20.2	3636	19.3	2185	20.0	2064	19.6
40–49	16 602	17.2	3275	17.5	5757	17.0	3558	17.0	2011	17.0	2001	18.5
50–59	15 657	16.2	2628	12.5	5326	15.1	3637	17.2	2173	17.3	1893	16.0
60–69	12 555	11.5	2032	8.9	4104	10.5	3166	12.5	1850	12.7	1403	10.2
70–79	7157	6.2	1045	4.7	2530	5.9	1845	6.6	1036	6.8	701	5.0
≥80	3016	2.8	410	2.0	1102	3.1	814	2.9	421	2.6	269	1.9
Skin colour												
White	33 133	42.9	3338	18.5	8014	24.5	9296	50.3	8 670	72.3	3815	35.5
Black	10 345	11.4	1869	10.1	4136	14.5	2615	11.9	604	5.6	1121	10.3
Others*	47 358	45.7	12 394	71.5	19 390	61.0	7916	37.9	2197	22.1	5461	54.3
Education (years of schooling)												
0	7658	5.8	1651	7.3	4230	11.5	800	3.2	401	2.9	576	5.2
1–8	35 785	37.3	6643	38.7	13 266	40.5	7398	34.4	4727	40.3	3751	35.0
9–11	29 824	37.1	6225	38.5	9792	34.3	6816	39.1	3558	35.5	3433	37.0
≥12	17 579	19.8	3083	15.5	4256	13.6	4816	23.4	2786	21.3	2638	22.9
Marital status												
Married	35 144	41.5	5998	34.7	11 498	36.0	8650	45.5	5006	44.9	3992	39.0
Single	40 560	45.3	9456	56.8	15 254	52.7	7108	39.7	4172	40.8	4570	47.7
Widowed	7628	6.5	1062	4.4	2673	6.3	1985	6.9	1128	7.1	780	5.9
Separated/divorced	7514	6.7	1086	4.1	2119	5.0	2087	7.9	1166	7.2	1056	7.5
Currently smoking												
No	79 460	87.8	15 535	90.1	27 957	89.7	17 192	87.1	9766	85.6	9010	87.4
Yes	11 386	12.2	2067	9.9	3587	10.3	2638	12.9	1706	14.4	1388	12.6
Alcohol abuse												
No	86 801	95.6	16 864	95.6	30 133	95.5	19 088	96.0	10916	95.3	9800	94.6
Yes	4045	4.4	738	4.4	1411	4.5	742	4.0	556	4.7	598	5.4
Screen time (hours)												
<6	83 679	90.1	16 110	90.4	29 089	90.0	18 099	89.8	10795	91.8	9586	88.9
≥6	7167	9.9	1492	9.6	2455	10.0	1731	10.2	677	8.2	812	11.1
Physical disorder												
No	54 660	61.9	11 769	70.4	19 394	65.4	10 855	58.8	6 295	58.6	6 347	64.6
Yes	36 186	38.1	5 833	29.6	12 150	34.6	8 975	41.2	5 177	41.1	4 051	35.4
Mental health comorbidity												
No	85 941	93.6	17 139	97.6	29 960	94.7	18 420	92.7	10 664	92.4	9 758	93.5
Yes	4 905	6.4	463	2.4	1 584	5.3	1 410	7.3	808	7.6	640	6.5

*Others (indigenous, yellow and brown).

lowest in the North (77.6%) and Northeast (74.2%), and highest in the Southeast (93.7%). In all macro-regions, most individuals were female. In the North region, the proportion of individuals under 40 years of age was higher (54.5%) than in the country overall. In the Southeast and South regions, the proportion of individuals who self-declared as white (50.3% and 72.3%, respectively) and with ≥ 12 years of schooling (23.4% and 21.3%, respectively) was higher than in the country overall. The absence of formal education was higher in the North (7.3%) and Northeast regions (11.5%) than in the remaining regions. The percentages of widowed (4.4%) and separated/divorced (4.1%) individuals were lower in the North region.

The proportion of current smokers was highest in the South (14.4%). The Central-West region had the largest proportion of individuals with abusive alcohol consumption (5.4%) and heavy screen users (11.1%). The lowest proportion of individuals who reported having a medical diagnosis of a physical disorder was in the North region (29.6%) and the highest proportions were in the Southeast (41.2%) and South regions (41.1%). The South region also had the highest proportion of individuals with a medical diagnosis of a mental health comorbidity (7.8%).

Crude prevalence of self-reported medical diagnosis of depression

Table 2 contains the crude prevalence of self-reported medical diagnosis of depression, according to the independent variables, in Brazil and the macro-regions. In the country, the prevalence was 9.9% and the highest prevalence was found among individuals living in urban areas (10.3%); females (14.3%); those aged 40–49 (12.6%), 50–59 (12.9%) and 60–69 (13.0%) years old; self-declared white (12.1%); those with ≥ 12 years of schooling (12.0%); separated/divorced individuals (17.9%); current smokers (11.4%); those who did not engage in abusive alcohol consumption (10.6%); those who were not heavy screen users (9.9%); individuals with a medical diagnosis of a physical disorder (15.7%); and individuals with a medical diagnosis of any mental health comorbidity (48.6%).

The prevalence ranged from 4.8% in the North region to 14.8% in the South region. In the South region, the prevalence was higher among females, those aged ≥ 30 years old, widowed or separated/divorced individuals, those who did not engage in abusive alcohol consumption, and in individuals who reported a medical diagnosis of any physical disorder or any mental health comorbidity. On the contrary, the North and Northeast regions reported the lowest prevalence, regardless of the characteristics analysed.

The association of self-reported lifelong medical diagnosis of depression with sex (female), separated/divorced individuals, no abusive alcohol consumption and self-reported medical diagnosis of a mental health comorbidity was consistently higher in all regions of the country.

Adjusted prevalence ratios for self-reported medical diagnosis of depression, nationally and by region

The results of the adjusted analyses are shown in table 3. In the country overall, the probability of having received a medical diagnosis of depression was higher among urban residents (23% higher than among rural residents), females (175% higher than in males), those aged between 40 and 69 years old (about 2.3 times higher than among those under 20 years), white-skinned individuals (about 30% higher than in black, indigenous, yellow and brown people), those with less education (33%, 14% and 29% higher, respectively, among those with 9–11, 1–8 and 0 years of schooling, compared with those with ≥ 12 years of schooling), separated/divorced individuals (43% more prevalent than among married people), current smokers (26% higher than in non-smokers), heavy screen users (31% more than among those whose usage was < 6 hours/day), in individuals who reported any medical diagnosis of physical disorders (80% higher than among those without physical disorders), and five times higher in participants who reported any mental health comorbidity than in those without a mental health comorbidity (prevalence ratio (PR)=5.05; 95% CI: 4.68 to 5.46).

In comparison with those living in rural areas, the probability of urban residents having received a medical diagnosis of depression was 33% higher in the Central-West region, followed by 32% higher in the North and 27% higher in the Northeast region. In the Southeast region, black, indigenous, yellow and brown skin-coloured individuals, and black individuals in the Central-West region, had a lower probability of receiving a medical diagnosis of depression than white-coloured individuals. In the Southeast, South and Central-West regions, the probability of separated/divorced individuals having received a medical diagnosis of depression was, respectively, 46%, 37% and 68% higher than for married individuals. In comparison with non-smokers, the smokers living in the Northeast, South and Central-West regions were more likely to have received a medical diagnosis of depression. Except in the Southeast, in all other regions, heavy screen users had a higher probability of having received a medical diagnosis of depression than their counterparts.

The characteristics most strongly associated with the outcome were a self-reported medical diagnosis of any mental health comorbidity, which had an adjusted PR about four times higher than in those without a mental health comorbidity, in all macro-regions (in the North region, the association was even stronger); followed by being female (two or more times higher than in men), a self-reported medical diagnosis of any physical disorder (1.67–2.46 times higher in all macro-regions) and age (more than twice as high in individuals aged 40–69 years old compared with the youngest).

DISCUSSION

To the best of our knowledge, this is one of the largest studies focused on describing the lifetime prevalence



Table 2 Crude prevalence of self-reported medical diagnosis of depression, with 95% CI, according to independent variables, nationally and by region

Independent variables	Regions of Brazil																	
	Brazil		North			Northeast			Southeast			South			Central-West			
	N	%	95% CI	N	%	95% CI	N	%	95% CI	N	%	95% CI	N	%	95% CI	N	%	95% CI
Self-reported depression	8332	9.9	9.5 to 10.2	936	4.8	4.2 to 5.3	2301	6.7	6.3 to 7.1	2288	11.1	10.4 to 11.8	1732	14.8	13.9 to 15.7	1075	10.3	9.4 to 11.2
Geographical area																		
Rural	1386	7.2	6.6 to 7.8	201	3.3	2.7 to 3.9	513	5	4.3 to 5.7	257	9.5	7.9 to 11.1	303	15.4	13.2 to 17.7	112	6.9	5.3 to 8.4
Urban	6946	10.3	9.9 to 10.7	735	5.2	4.5 to 5.9	1788	7.3	6.8 to 7.7	2031	11.2	10.5 to 11.9	1429	14.7	13.7 to 15.7	963	10.7	9.7 to 11.6
Sex																		
Male	1954	4.9	4.6 to 5.3	222	2.7	2.1 to 3.2	488	2.9	2.6 to 3.3	560	5.8	5.1 to 6.5	442	7.3	6.4 to 8.2	242	5.3	4.3 to 6.2
Female	6378	14.3	13.7 to 14.9	714	6.8	5.9 to 7.6	1813	10	9.4 to 10.6	1728	15.8	14.6 to 16.9	1290	21.6	20.1 to 23.1	833	14.9	13.5 to 16.2
Age (years)																		
15–19	174	4.8	3.8 to 5.9	28	2	1.0 to 3.0	55	3.1	2.1 to 4.1	39	5.3	3.0 to 7.6	29	6.8	3.9 to 9.7	23	9.5	5.7 to 13.3
20–29	752	5.8	5.1 to 6.6	120	3.5	2.7 to 4.4	185	3.5	2.8 to 4.2	193	7.2	5.5 to 8.9	149	8.9	7.1 to 10.6	105	5	3.6 to 6.3
30–39	1371	9	8.2 to 9.7	177	4.6	3.4 to 5.8	406	6	5.1 to 6.8	324	9.7	8.3 to 11.2	281	14.2	12.1 to 16.3	183	10.3	8.3 to 12.3
40–49	1747	12.6	11.6 to 13.6	203	6.7	5.1 to 8.3	502	8.5	7.5 to 9.5	493	14.7	12.6 to 16.7	326	17.4	15.1 to 19.8	223	12.5	10.4 to 14.6
50–59	1922	12.9	11.9 to 13.8	188	5.9	4.8 to 7.1	532	9.8	8.7 to 11.0	548	13.8	12.1 to 15.6	382	17.3	15.3 to 19.3	272	13.7	11.4 to 16.0
60–69	1417	13	12.0 to 14.1	139	6.1	4.6 to 7.7	381	9.6	8.1 to 11.1	404	13.7	11.8 to 15.6	332	19.7	17.3 to 22.1	161	11.4	8.6 to 14.1
70–79	705	10.7	9.5 to 11.9	63	6.1	3.7 to 8.5	176	7.1	5.8 to 8.4	212	11.2	9.0 to 13.4	168	16.6	13.6 to 19.5	86	10.8	7.9 to 13.7
≥80	244	9.3	7.5 to 11.0	18	4	1.6 to 6.4	64	5.5	3.6 to 7.3	75	9.9	6.6 to 13.1	65	16.8	11.3 to 22.2	22	11.3	5.8 to 16.7
Skin colour																		
White	3833	12.1	11.5 to 12.7	225	5.8	4.7 to 6.9	661	7.6	6.7 to 8.4	1160	12.5	11.4 to 13.6	1352	15.2	14.2 to 16.3	435	11.4	10.0 to 12.9
Black	773	7.9	7.0 to 8.8	78	5.6	2.9 to 8.3	276	6.1	5.0 to 7.2	238	8.5	7.0 to 10.1	89	15.5	11.3 to 19.7	92	7.2	5.0 to 9.4
Others*	3726	8.3	7.8 to 8.7	633	4.4	3.9 to 4.9	1364	6.5	6.0 to 7.0	890	10	9.0 to 11.1	291	13.2	11.3 to 15.0	548	10.2	9.0 to 11.4
Education (years of schooling)																		
0	525	8	6.9 to 9.1	81	5.1	3.3 to 6.9	245	6.2	5.1 to 7.3	79	10.4	6.9 to 13.8	59	13.9	9.7 to 18.1	61	12.2	8.1 to 16.3
1–8	3377	10.5	10.0 to 11.1	335	4.3	3.7 to 4.9	1006	6.8	6.2 to 7.5	883	12	10.8 to 13.2	774	17.1	15.5 to 18.7	379	9.9	8.5 to 11.4

Continued

Table 2 Continued

Independent variables	Regions of Brazil																	
	Brazil		North			Northeast			Southeast			South			Central-West			
	N	%	95%CI	N	%	95%CI	N	%	95%CI	N	%	95%CI	N	%	95%CI	N	%	95%CI
9-11	2417	8.4	7.9 to 9.0	277	4.5	3.4 to 5.7	651	5.9	5.3 to 6.5	690	9	8.0 to 10.1	464	12.4	10.9 to 13.9	335	9.9	8.4 to 11.4
≥12	2013	12	11.1 to 12.9	243	6.4	5.2 to 7.7	399	8.6	7.5 to 9.7	636	13.3	11.8 to 14.8	435	14.5	12.7 to 16.2	300	11.1	9.4 to 12.8
Marital status																		
Married	3119	10.1	9.6 to 10.7	332	5.4	4.4 to 6.4	807	7	6.4 to 7.7	913	10.8	9.7 to 11.8	687	15	13.5 to 16.4	380	9.7	8.5 to 10.9
Single	3051	7.9	7.4 to 8.4	413	3.8	3.2 to 4.4	973	5.7	5.2 to 6.3	707	9.1	8.0 to 10.2	567	12	10.8 to 13.3	391	8.6	7.4 to 9.9
Widowed	1011	14.2	12.9 to 15.4	86	8.5	5.6 to 11.4	269	9.2	7.7 to 10.6	301	15.5	13.3 to 17.7	225	19.3	16.3 to 22.4	130	17.2	13.2 to 21.2
Separated/divorced	1151	17.9	16.3 to 19.5	105	9.1	6.3 to 11.8	252	11.3	9.4 to 13.2	367	19.1	16.3 to 21.9	253	24.7	21.0 to 28.4	174	18.8	15.3 to 22.3
Currently smoking																		
No	7092	9.7	9.3 to 10.1	827	4.8	4.2 to 5.4	2003	6.5	6.1 to 6.9	1933	11	10.2 to 11.7	1436	14.5	13.5 to 15.5	893	10.1	9.1 to 11.0
Yes	1240	11.4	10.4 to 12.4	109	4.4	3.2 to 5.6	298	8.1	6.6 to 9.6	355	11.9	10.0 to 13.7	296	16.6	14.4 to 18.9	182	12.1	9.8 to 14.4
Alcohol abuse																		
No	7418	10.6	10.2 to 11.0	836	5.1	4.5 to 5.8	2097	7.4	6.9 to 7.8	2006	11.8	11.0 to 12.6	1549	15.5	14.4 to 16.5	930	11.3	10.3 to 12.4
Yes	914	6.4	5.7 to 7.0	100	2.9	2.1 to 3.6	204	3.2	2.6 to 3.9	282	7.7	6.4 to 9.0	183	10.8	8.7 to 12.9	145	6	4.8 to 7.3
Screen time (hours)																		
<6	7625	9.9	9.6 to 10.3	832	4.5	4.1 to 5.0	2119	6.8	6.4 to 7.2	2081	11.2	10.5 to 12.0	1621	14.9	13.9 to 15.8	972	9.7	8.9 to 10.6
≥6	707	9.4	8.4 to 10.5	104	7	4.2 to 9.9	182	5.8	4.7 to 6.9	207	9.8	7.9 to 11.7	111	14	10.7 to 17.3	103	14.8	11.2 to 18.5
Physical disorders																		
No	3124	6.3	5.9 to 6.7	376	2.8	2.4 to 3.3	870	4.3	3.9 to 4.7	840	7.2	6.4 to 8.0	628	9.8	8.8 to 10.7	410	6.7	5.8 to 7.6
Yes	5208	15.7	15.0 to 16.4	560	9.4	8.1 to 10.7	1431	11.2	10.4 to 12.0	1448	16.7	15.4 to 17.9	1104	21.9	20.3 to 23.5	665	16.9	15.1 to 18.7
Mental health comorbidity																		
No	6053	7.3	6.9 to 7.6	740	3.8	3.4 to 4.3	1664	4.9	4.6 to 5.2	1593	7.8	7.2 to 8.4	1290	11.7	10.9 to 12.6	766	7.9	7.1 to 8.7
Yes	2279	48.6	46.3 to 50.9	196	42.2	34.0 to 50.5	637	38.4	35.0 to 41.9	695	53.1	49.1 to 57.0	442	51.9	47.0 to 56.8	309	44.9	39.3 to 50.5

*Others (indigenous, yellow and brown).

Table 3 Adjusted prevalence ratios (PRs), with 95% CI, for medical diagnosis of self-reported depression, according to independent variables, nationally and by region

	Brazil			North			Northeast			Southeast			South			Central-West			
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	
Level 1																			
Geographical area	p<0.001		p=0.020		p=0.003		p=0.583		p=0.449		p=0.020								
Rural	1		1		1		1		1		1		1		1		1		1
Urban	1.23*	1.12 to 1.35	1.32*	1.04 to 1.67	1.27*	1.08 to 1.49	1.05	0.88 to 1.27	0.94	0.80 to 1.10	1.33*	1.05 to 1.69	p<0.001		p<0.001		p<0.001		
Sex	p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		
Male	1		1		1		1		1		1		1		1		1		
Female	2.75*	2.52 to 2.99	2.39*	1.94 to 2.94	3.26*	2.84 to 3.73	2.59*	2.23 to 3.00	2.94*	2.56 to 3.37	2.63*	2.16 to 3.21	p<0.001		p<0.001		p<0.001		
Age (years)	p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		
15–19	1		1		1		1		1		1		1		1		1		
20–29	1.17	0.91 to 1.51	1.57	0.88 to 2.79	1.09	0.74 to 1.62	1.33	0.82 to 2.15	1.31	0.81 to 2.10	0.51	0.31 to 0.85							
30–39	1.73*	1.36 to 2.19	1.96*	1.09 to 3.52	1.81*	1.25 to 2.62	1.73*	1.09 to 2.75	2.06*	1.29 to 3.29	1.05	0.67 to 1.65							
40–49	2.30*	1.81 to 2.91	2.77*	1.56 to 4.93	2.59*	1.81 to 3.71	2.46*	1.56 to 3.90	2.37*	1.51 to 3.70	1.18	0.73 to 1.90							
50–59	2.32*	1.84 to 2.93	2.42*	1.39 to 4.22	2.99*	2.07 to 4.32	2.36*	1.51 to 3.67	2.36*	1.50 to 3.71	1.31	0.82 to 2.09							
60–69	2.27*	1.78 to 2.90	2.37*	1.33 to 4.23	2.99*	2.01 to 4.44	2.19*	1.38 to 3.48	2.62*	1.64 to 4.18	0.98	0.58 to 1.66							
70–79	1.87*	1.44 to 2.42	2.14*	1.11 to 4.11	2.36*	1.57 to 3.56	1.74*	1.06 to 2.83	2.30*	1.40 to 3.80	0.91	0.52 to 1.59							
≥80	1.61*	1.18 to 2.18	1.32	0.57 to 3.04	1.74*	1.05 to 2.89	1.53	0.88 to 2.67	2.35*	1.35 to 4.09	0.84	0.40 to 1.75							
Skin colour	p<0.001		p=0.097		p=0.252		p=0.002		p=0.349		p=0.048								
White	1		1		1		1		1		1		1		1		1		
Black	0.69*	0.61 to 0.78*	1.05	0.65 to 1.72	0.87	0.70 to 1.07	0.70*	0.57 to 0.86*	0.98	0.77 to 1.25	0.68*	0.49 to 0.92*							
Other†	0.74*	0.69 to 0.80*	0.81	0.65 to 1.01	0.90	0.78 to 1.03	0.87*	0.76 to 0.99*	0.89	0.77 to 1.04	0.93	0.78 to 1.10							
Education (years of schooling)	p<0.001		p=0.608		p=0.058		p=0.035		p=0.037		p=0.574								
0	1.29*	1.11 to 1.50	0.99	0.6 to 1.46	1.21	0.97 to 1.49	1.16	0.80 to 1.67	1.28	0.95 to 1.72	0.82	0.57 to 1.17							
1–8	1.14	0.96 to 1.34	1.05	0.66 to 1.67	1.15	0.9 to 1.44	1.00	0.67 to 1.48	1.04	0.77 to 1.41	0.85	0.57 to 1.28							
9–11	1.33*	1.12 to 1.58	1.18	0.76 to 1.84	1.37*	1.07 to 1.74	1.26	0.85 to 1.86	1.09	0.79 to 1.50	0.90	0.60 to 1.36							
≥12	1		1		1		1		1		1		1		1		1		
Marital status	p<0.001		p=0.009		p=0.106		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		
Married	1		1		1		1		1		1		1		1		1		
Single	1.01	0.93 to 1.10	0.85	0.69 to 1.04	1.07	0.92 to 1.24	1.08	0.92 to 1.26	1.05	0.90 to 1.22	1.03	0.84 to 1.26							
Widowed	1.06	0.95 to 1.19	1.34	0.89 to 1.99	0.95	0.77 to 1.16	1.17	0.97 to 1.41	0.85	0.70 to 1.04	1.36*	1.01 to 1.83							
Separated/divorced	1.43*	1.29 to 1.59	1.35	0.95 to 1.93	1.24*	1.03 to 1.50	1.46*	1.23 to 1.74	1.37*	1.15 to 1.62	1.68*	1.35 to 2.08							
Level 2																			
Currently smoking	p<0.001		p=0.480		p=0.001		p=0.135		p=0.030		p=0.006								
No	1		1		1		1		1		1		1		1		1		
Yes	1.26*	1.14 to 1.38	1.11	0.83 to 1.50	1.38*	1.14 to 1.67	1.13	0.96 to 1.34	1.18*	1.02 to 1.37	1.34*	1.09 to 1.65							

Continued

Table 3 Continued

	Brazil		North		Northeast		Southeast		South		Central-West	
	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI	PR	95% CI
Alcohol abuse	p=0.911		p=0.470		p=0.337		p=0.464		p=0.916		p=0.167	
No	1		1		1		1		1		1	
Yes	1.01	0.81 to 1.27	0.80	0.43 to 1.47	0.83	0.56 to 1.22	1.15	0.79 to 1.67	1.02	0.73 to 1.41	0.77	0.53 to 1.12
Screen time (hours)	p<0.001		p=0.001		p=0.034		p=0.130		p=0.015		p<0.001	
<6	1		1		1		1		1		1	
≥6	1.31*	1.16 to 1.48	1.91*	1.31 to 2.77	1.25*	1.02 to 1.54	1.18	0.95 to 1.46	1.34*	1.06 to 1.70	1.90*	1.49 to 2.42
Level 3												
Physical disorder (any)	p<0.001		p<0.001		p<0.001		p<0.001		p<0.001		p<0.001	
No	1		1		1		1		1		1	
Yes	1.80*	1.67 to 1.97	2.46*	1.98 to 3.06	1.77*	1.55 to 2.01	1.72*	1.48 to 2.00	1.67*	1.49 to 1.88	2.01*	1.68 to 2.40
Mental health comorbidity (any)	p<0.001		p<0.001		p>0.001		p>0.001		p<0.001		p<0.001	
1	1		1		1		1		1		1	
5.05*	4.68 to 5.46	7.13*	5.80 to 8.77	6.11*	5.41 to 6.91	5.38*	4.72 to 6.12	3.63*	3.20 to 4.11	4.31*	3.63 to 5.13	

*Intervals that did not cross 1.

†Others (indigenous, yellow and brown).



of self-reported medical diagnosis of depression using primary representative Brazilian national data. The lifetime prevalence of self-reported diagnosis of depression in Brazil was 9.9%, and it was more prevalent in the South region and less so in the North and Northeast regions. The prevalence was higher in residents of urban areas of the country, females, those aged ≥ 30 years, those self-declared as white, separated/divorced individuals, those with higher education, smokers, heavy screen users, and in individuals with a self-reported medical diagnosis of a mental health comorbidity or any chronic physical disease. In the adjusted analysis, the association with educational level was reversed and less educated individuals presented a higher PR for a self-reported lifetime diagnosis of depression than those with 12 years or more of schooling. The strongest and most consistent associations were with a mental health comorbidity, sex, age and the presence of any chronic physical disease.

These prevalence estimates suggest that the prevalence of depression in Brazil is higher than in the world's population (4.4%). However, most studies explore current depression diagnosis or depression diagnosis in the past 12 months in the adult population,¹⁶ whereas our study evaluated self-reported diagnosis throughout the lifetime of individuals aged ≥ 15 years old. In a meta-analysis with data from 30 countries, the aggregated lifetime prevalence of depression was 10.8% (7.8% to 14.8%), but the heterogeneity was high.¹⁷ Compared with the 17% lifetime prevalence described in a meta-analysis combining findings from 27 Brazilian studies published up to 2014, which measured the prevalence of depressive symptoms or major depressive disorder in 464 734 adults,¹⁸ our numbers are smaller. However, the aggregated lifetime prevalence of major depressive disorder calculation was based on only four studies conducted with participants from Rio de Janeiro and São Paulo (two metropolitan cities located in the Southeast region), employing different diagnostic criteria, and whose results were very heterogeneous.¹⁸

The diagnosis of depression depends on the provision of and access to health professionals. The Brazilian Unified Health System is a nationwide public health system that includes mental health assistance.¹⁹ However, this service still cannot attend to the entire population. The macro-regions with the greatest coverage of health facilities are the Southeast and South, while the Northeast and North regions have the lowest.¹⁷ The macro-regions with greater coverage of health facilities had a higher prevalence of self-reported lifelong medical diagnosis of depression.

The evidence is also consistent in describing a higher prevalence of self-reported lifelong medical diagnosis of depression in individuals living in urban areas, compared with rural areas.⁶ One of the defining trends of population movement in the last half of the 20th century has been global urbanisation. Urbanisation can lead to depression through several different mechanisms, including overcrowding, social stress, inequality, pollution and lack of greenspace.²⁰

Our study also showed that lifetime depression is about 30% higher among white-skinned individuals than in black, indigenous, yellow and brown people. A systematic review on mental disorders, depression, anxiety and race in Brazil identified a greater risk of mental disorders in non-white people when compared with white people.²¹ Nonetheless, the same study highlighted the difficulty of associating mental disorders and race, in view of the variability of instruments used for diagnosis and in the way of categorising skin colour.²¹ It also suggested that white-skinned people have more or better access to health professionals. The current evidence is that implicit racial/ethnic bias is present in healthcare, thus affecting healthcare outcomes.²² Additionally, black, indigenous, yellow and brown people have fewer years of education in Brazil,¹⁹ and other studies have found that low levels of education are associated with higher lifetime depression.²³

Our results were consistent with population-based studies that have shown that major depression is two times higher in females than males.^{4 6 24} The reasons for this sex difference are associated with both biological and social factors. Substantial cross-national research, for example, has been based on speculation that larger sex disparities in depression occur in societies with higher levels of gender inequality.²⁵ The PNS-2013 found more than twice as high a probability of positive screening for depression in females than in males (PR=2.29; 95% CI: 1.99 to 2.65), and a recent meta-analysis reported that women are 25 times more likely to be diagnosed with depression than men.¹⁷

The prevalence was higher in individuals aged ≥ 30 years old (particularly in those 40–69 years old). PRs vary by age and the literature has suggested that the peak occurs in older adulthood.^{2 16} In the PNS-2013, the greatest PRs for depression were observed among groups aged more than 40 years old, compared with the younger group (18–29 years old).⁶ The nationwide study on the use of psychotropic drugs for the treatment of self-reported depression in Brazil found that the prevalence increased significantly with age, from 3.5% in the under-40s age group to 9.5% in the 60 years or older group.⁷

In terms of marital status, a recent meta-analysis, using data from 26 population-based surveys, reported that compared with married people, the OR for depression among divorced individuals reached 8.2 in India and 19.3 in Lebanon, although the study's wide 95% CI (5.0 to 74.4) means that the real effect size is uncertain.⁴

The association between depression and smoking is consistently reported. A systematic review of longitudinal studies on the association of different aspects of smoking behaviour with depression and anxiety described that the results varied considerably, with evidence for smoking being associated with subsequent depression and vice versa.²⁶

Our study found no association with alcohol abuse. Cohort studies on the association between alcohol consumption and subsequent depressive symptoms have

produced inconsistent results,²⁷ which can be explained by the different methodologies used to assess depressive symptoms, alcohol consumption and variables used in the adjusted analyses.²⁷ Nonetheless, a recent meta-analysis with 338 426 participants found that heavy drinking does not significantly predict the occurrence of depressive symptoms after adjusting for potential confounders.²⁷

With advances in technology, screen time, including watching television, using a computer and playing video games, is becoming a dominant element of daily lives.^{28 29} The results of a recent meta-analysis showed that most of the subjects who engaged in more than 2 hours/day of screen time were more likely to have depression.²⁸ In our results, individuals classified as heavy screen users (≥ 6 hours of screen time in addition to work and study time) were 31% more likely to have had a medical diagnosis of depression than those whose usage was < 6 hours/day.

Individuals with a mental health comorbidity and physical disorders are more likely to have depressive symptoms; however, the common underlying biological mechanisms are still unclear.^{2 30 31} Depression can be associated with hormonal and physiological changes in the body systems that increase the chance of the appearance of one or more physical or mental health comorbidities. In this sense, for biological reasons, populations with less experience of depressive events have a lower incidence of chronic diseases.^{30–32} In our study, the association with mental health comorbidities was strong (PR=5.05; 95% CI: 4.68 to 5.46 compared with those with no mental health comorbidity). The presence of psychopathology is strongly predictive of the onset of other mental disorders.³² The findings of the PNS-2013 showed a strong association with other diseases; however, in that study, only three types of physical diseases were included.

This study has strengths and limitations. Among the limitations, characteristics of respondents and non-respondents in the sample could not be compared because data about non-respondents were not available. Due to the cross-sectional study design, causality and the direction of causality, between variables cannot be established. In the present study, this could be seen in the inability to ascertain the direction of the associations between the outcome, behavioural variables, and physical and mental health conditions. Also, household income data were not available in the dataset and the educational level was used as a proxy for this variable. In addition, aspects regarding the training of Brazilian health professionals to identify depressive symptoms (that may affect the prevalence of the outcome) were not available and could not be explored in our study. The restriction of the sample to domiciled individuals underestimates the prevalence of the outcome, since populations in situations of extreme vulnerability (the homeless, the institutionalised, those deprived of liberty and hospitalised people) are at greater risk of being affected by mental disorders. On the other hand, the nationwide representativeness

and the methodological robustness are major strengths of the study.

CONCLUSION

This nationwide population-based study with more than 90 000 individuals showed that the lifetime prevalence of self-reported medical diagnosis of depression in Brazil was almost 10%. Considering the current Brazilian population, this percentage indicates that more than 2 million people have been diagnosed with depression at some point in their lives. In light of that, depression is ranked among the largest contributors to non-fatal health loss in the country. These results show the importance of a national public health plan for the prevention of mental illness and care of mental health in Brazil.

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