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Trend in the prevalence of depression and correlates in Brazil: results from the National Health Surveys 2013 and 2019

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Abstract

This study aims to evaluate national variation in depression prevalence overall and in different socio-demographic groups, health behaviors and macro-regions of the country, between 2013-2019. Data were obtained from two nationwide Brazilian surveys – PNS 2013 and 2019. Participants aged 18 years and older included 60,202 individuals in 2013 and 88,531 in 2019. Depression was evaluated through the Patient Health Questionnaire-9 (PHQ-9). Calculations were carried out population-weighted. Analyses were conducted to account for demographic changes. The results showed that in the six-year period between the two surveys, the prevalence of depression in Brazil increased by 36.7%, going from 7.9% in 2013 to 10.8% in 2019, and this increase is more marked among young adults, 18 to 24 years old, who were not working, where there was a significant and almost three-fold absolute difference increase in the prevalence of depression (3.7 in 2013 and 10.3 in 2019), an increase of 178.4%. Those living in urban areas of the country had a greater increase in the prevalence of depression in the six-year period (39.8%) when compared to residents in rural areas (20.2%). There was an increase in the prevalence of depression between 2013-2019 for the worst categories of the three health behaviors under study, for both sexes: heavy drinking, smoking, and lack of physical activity. Our results show a significant increase in the prevalence of depression over the six-year period between the two surveys, mainly among the younger and unemployed men. The country's economic context of recession during this period may be an explanation for this finding.

Keywords: Trend study; Health Surveys; Depression; Mental Health

Introduction:

Depression is considered one of the main global public health issues. Data from the Global Burden of Disease Study show that depression is one of the three main causes for years lived with disability (YLD), especially among women ¹. Studies of trends in depression worldwide have produced mixed results. According to the World Health Organization (WHO), the total number of people with depression was estimated to exceed 300 million globally in 2015, an increase of 18.4% since 2005 ². However, a meta-analysis of 116 epidemiological studies showed that the prevalence of major depression was unchanged at 4.4% in 1990 (4.2–4.7%) and 2010 (4.1–4.7%); even though, 8 of the 11 GHQ studies found a significant increase in psychological distress over time ³. These studies have shown how inconsistent the empirical evidence can be for mental health outcomes, in particular depression, where cultural differences between countries and the definitions and assessments of depression can alter the prevalence of the disorder. More recently, a systematic review and meta-analysis of studies focused on the change over time in depression incidence and prevalence in the general population showed a predominant increasing trend in the prevalence of depression within populations over time, which seems not to be explainable by study design differences or publication bias alone ⁴.

There is now robust evidence that social, economic, and environmental inequalities, such as accelerated urbanization, impact the quality of life of populations, their health behaviors, access to health services, among others, influencing the development of chronic diseases, including mental disorders ^{5, 6, 7}. Some studies have shown that financial crises can have an important impact on the mental health of populations. Worldwide, periods of major economic crises, which lead to unemployment, financial difficulties, and poverty, have been associated with an increase in mental disorders in the population, with a greater impact on the levels of depression and suicide ^{8, 9, 10}. Two meta-analyses have shown that people experiencing unemployment are at greater risk for mental health problems than the general population ^{11, 12}.

During the first decade of the 21st century, Brazilian economy thrived and the country became the sixth economy in the world ¹³. However, since 2013, Brazil has been facing a scenario of deterioration and economic recession, with successive financial crises, increased unemployment, precarious work, and an increase in poverty. In addition, young people have faced enormous difficulties in entering the labor market.

These factors may have an impact in the Brazilian population's mental health, increasing the prevalence rates of depression in the general population, especially among those more vulnerable.

Data from the National Health Survey of 2013, a population-based survey conducted in the Brazilian population aged 18 or over, showed a prevalence of 4.1% for major depression, 7.9% for depression and 21.0% for depressed mood, assessed with the Patient Health Questionnaire (PHQ-9), being higher among women, individuals aged 40-59 years and 70 years old or more, those with lower educational level and those who lived in urban regions. Among those with depression, about 80% did not receive any treatment and 14% were treated only with medication^{14, 15}.

The second edition of the National Health Survey, held in 2019, represents an opportunity to evaluate temporal changes of several health problems in the general population, for the first time in Brazil. The present study aims to evaluate the variation in the overall prevalence of depression, and to examine how changes in prevalence of depression may have happened in different socioeconomic and demographic groups, health behaviors, and macro-regions of the country, between 2013 and 2019.

Methods:

Study design and population

We used two cross-sectional population-based datasets drawn from the National Health Survey (PNS) carried in Brazil in 2013 and 2019^{16, 17}. The PNS is a household-based nationwide survey conducted by the Ministry of Health, in partnership with the Brazilian Institute of Geography and Statistics (IBGE), in 2013 and 2019.

Both surveys are representative samples of the Brazilian population and allow estimates for urban and rural areas, for the country's five macro-regions, and for Federative Units, state capitals and metropolitan regions. The surveys were household-based with stratified sampling and a three-stage design: In the first stage, the primary sampling units (PSU) were randomly selected from the master sample, from which the major surveys conducted by IBGE are sampled. In the second stage, households were randomly selected within each PSU. In the third stage, an adult resident (18 years old or older in the 2013 edition and 15 years old or older in the 2019 edition) was selected with equal probability among all adult residents in the household. Weighting factors were calculated for each of the three sampling units, considering the probabilities of

selection and the non-response rate. For the selected resident, the weight was calculated considering the weight for the corresponding household, the probability of selection of the resident, the adjustment of non-response for sex, and calibration for the total population by sex and age groups estimated with the weight of all residents^{18,19}.

Despite the change in the age group of the household selected resident in PNS 2019, which now includes the population aged 15 years old or over, in order to provide valid data for monitoring the indicators established by the Sustainable Development Goals (SDGs)²⁰, the indicators that have been used in the publications of IBGE and the Ministry of Health, are related to the population of 18 years or older¹⁷. Thus, following this guideline and to allow comparisons between the two editions of the PNS, the present study uses data referring only to the population aged 18 or over.

In the PNS 2013, a total of 69,954 occupied households were visited and 60,202 individuals were interviewed, resulting in a response rate of 86.1%. In the PNS 2019, of a total of 108,525 households visited, interviews were conducted in 94,114 households, with a loss rate of 13.2%. The sample of households with a person aged 18 or over (selected resident), reached 88,531 individuals.

The PNS 2013 and PNS 2019 surveys were approved by the National Commission of Ethics in Research (CONEP) of the National Health Council – CNS, in June 2013, Regulation N^o. 328.159, and in August 2019, N^o. 3.529.376, respectively. In both editions all participants signed an informed consent agreement.

Assessment of depression

Depression was assessed, in both editions of PNS, through the Patient Health Questionnaire PHQ-9, which evaluates the frequency of depressive symptoms over the two weeks prior to data collection²¹. The instrument had previously been validated in Brazil²², with good validity in diagnosing major depression at the cut-offs of ≥ 9 and ≥ 10 . Depression was described using the PHQ-9 score as recommended by Kroenke et al.²¹, which classifies depression severity according to the following thresholds: none (1–4 points), mild (5–9), moderate (10–14), moderately severe (15–19) and severe (20–27 points). In the present study, depression was defined by a PHQ-9 score of 10 or higher, which is considered the best cutoff point to detect the presence of clinically relevant depressive symptoms^{23,24}.

Other measures

In both surveys, socio-demographic variables were assessed, including sex (male and female); age group (18-24, 25-29, 30-39, 40-49, 50-59, 60-69, 70 years or over), race/skin color (white, black and others: yellow, brown and indigenous); level of 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 (married or in cohabit with a partner vs. single) and work status (working / not working). Geographical areas were defined as macro-region of residence (North, Northeast, Midwest, Southeast, and South), and living in urban vs. rural areas.

Health behaviors selected for analysis were: current smoker of any type of tobacco (yes, no); excessive alcohol consumption (heavy drinking) being defined as the weekly consumption of 15 or more alcoholic drinks for men and 8 or more for women²⁵, a dose being considered equivalent to a can of beer, a glass of wine, or a dose of distilled drink; and leisure physical activity, assessed through the number of days per week that the person practiced physical exercise or sport in the last 3 months, in which those who practiced any activity for at least once a week were considered active.

Data analysis

Prevalence of depression was described according to socio-demographic characteristics and geographical area. Estimates were computed for both PNS 2013 and PNS 2019, with their respective 95% confidence intervals using the *t* distribution, given the large number of primary sampling units (PSU). The prevalence change between the surveys was expressed as the relative difference, as percentage, between the 2013 and 2019, computed by Gaussian generalized linear models, with the prevalence in each group in 2013 as the baseline, i.e., without the intercept. The coefficients and standard errors of the interaction term, between the group variable and the survey indicator to the 2019 survey, estimated the absolute differences, used to compute the relative changes, and the confidence intervals, respectively. The datasets from both surveys were stacked and an indicator variable was created to flag their respective survey iteration, then post-stratification was carried out in order to adjust the weights.

All statistical analyses were performed using survey-specific weighting factors adjusting the study samples to the demographic-geographic distribution of the

population in Brazil. To estimate the prevalence of depression according to the correlates in each year, their variations between surveys, and confidence intervals we used R version 4.0.5²⁶ with the *survey* package version 4.0²⁷.

Results:

Demographic features of PNS 2013 and PNS 2019 samples are shown in Table 1. Overall, the sample characteristics of PNS 2013 and PNS 2019 showed little change in the underlying population regarding the included variables, except for age distribution (shift towards older age) and increase in higher levels of education.

Table 2 shows the prevalence of depression according to socio-demographic characteristics and health behaviors of the general population in 2013 and 2019. Overall, there was a 36.7% increase in the prevalence of depression between 2013 (7.9%) and 2019 (10.8%), and this increase was greater among the youngest (from 18-24 years old), the women, those living in urban areas, and those living in the Southeast region of the country. There was a significant sex difference in the prevalence of depression, with women having a higher prevalence in both periods of time; with an increase in prevalence between 2013 (10.7%) and 2019 (15.0%) greater than that observed among men (4.7% vs. 6.1%). Prevalence among women was significantly higher than among men in all age groups and at both time points.

Although there was an increase in the prevalence of depression for all age groups, this increase was more marked among the younger age groups, especially among those aged 18 to 24 years old, where the prevalence of depression almost doubled, being 5.6% in 2013 and 11.1% in 2019. This pattern was repeated for women (8.3% vs. 15.6%) and men (2.9% vs. 6.6%) in this age group. In contrast, for those aged 70 years or more, the prevalence remained almost constant in the whole population, changing from 10.2% to 11.1%, having an increase among women, but not among men.

Those living in urban areas of the country presented a higher increase (of 39.8%) in the prevalence of depression (from 8.1% in 2013 to 11.3% in 2019), when compared to those living in rural areas (from 6.4% to 7.7% in the same period), a relative increase of 20.2%. When considering the country's macro-regions, the absolute differences between the prevalence of depression in 2013 and 2019 followed the 2-3 percentage points found for the whole country (Table 2). When stratified by sex, among women,

the differences of 4-5 percentage points in the prevalence of depression between 2013 and 2019 remained for all regions, except for the Southern region of the country, where it was less than one point percentage (13.4% in 2013 and 14.3% in 2019). In 2013, the prevalence of depression among women in the Southern region was higher than in the rest of the country, and remained stable after six years (Table 3).

For other socioeconomic and demographic characteristics, no significant variations were found in the prevalence of depression between 2013 and 2019 in the categories under study, with the changes generally accompanying the difference of about 3 percentage points between 2013 and 2019 for the overall population, and of about 4-5 percentage points for women and 1.5 percentage points for men (Tables 2 and 3).

There was a significant and almost three-fold absolute difference increase in the prevalence of depression in the group of men aged 18 to 24, who were not working (3.7% in 2013 and 10.3% in 2019), an increase of 178.4%, when compared to those who were working (2.6% vs. 4.9%), a relative increase of 90.5% (Table 4 and Figure 1).

Regarding health behaviors, as can be seen in Table 2, in the general population, there was an increase in the prevalence of depression in all three categories, following the increase of about three percentage points in the general prevalence. Both in 2013 and 2019, people who reported heavy drinking, who did not practice any physical activity and who smoked, had a higher prevalence of depression than those without such health risk behaviors. The variation in the prevalence of depression among smokers went from 10.8% in 2013 to 14.7% in 2019, a relative difference of 35.9%. A relative increase of 40.5% was found among those that were not engaged in physical activities at least once a week, higher than differences observed in the other categories of health risk behaviors.

When stratifying by sex (Table 3), among women who reported heavy drinking, there was a greater variation in the prevalence of depression from 2013 to 2019 than among those who did not report this pattern of alcohol consumption in those years. Women who reported smoking in 2013 showed a higher prevalence of depression in 2013 (17.7% among smokers vs. 9.9% among nonsmokers) and in 2019 (23.1% among smokers and 14.1% among nonsmokers); with a relative increase of 30.4% among smokers from 2013 to 2019. Among men, smoking showed a higher prevalence of depression in 2013 and 2019, with a relative increase of 41.9%, considerably higher

than the variation among men in general. Regarding the practice of physical activity, women who did not practice physical activity in 2019 showed a higher prevalence of depression than those who practiced physical activity, as observed in 2013, with a relative increase of 46.5%. Conversely, among men, those who did not practice physical activity had a relative increase of 25.2% in the prevalence of depression as compared to those who practiced physical activity, moving from 5.9% in 2013 to 7,3% in 2019 (Table 3).

Discussion:

This is the first study to compare the prevalence of depression in the Brazilian population in two distinct periods in time. The study shows an increase in the prevalence of depression from 2013 to 2019, from 7.9% to 10.8%, mainly among women and the youngest. The change in the prevalence of depression was not homogeneous in all age groups, with a greater increase among those aged 18 to 24 years old. This increase among the youngest was even greater among those who did not work, and especially among young men.

Overall, the current results differ from those in the initially presented meta-analysis and from the findings of the Global Burden of Disease Study, which found no differences in the prevalence of depression over time ^{1, 3}. A study in Chile, which compared the prevalence of major depression in 2003 and 2010, also found no significant variation (20.5% vs. 18.4%, respectively) ²⁸. However, studies that assessed the impact of periods of financial crisis and economic recession on the prevalence of depression in adult populations from different countries, found results similar to ours. In Spain, a study conducted to assess the impact of the economic crisis that began in 2007 on different health outcomes showed that, compared with the pre-crisis period of 2006, the 2010 survey revealed that the greatest percentage point rise in frequency was for mood disorders, major depression (19.4 percentage point increase) and dysthymia (10.8) ²⁹. In Greece, the prevalence of major depression increased from 3.3% in 2008 to 8.2% in 2011, and this increase was attributed to the economic crisis experienced by the country in 2008 ³⁰. A study conducted among representative samples of the working age (25–64 years) general population in England between 1991 and 2010, to assess short-term differences in population mental health before and after the 2008 recession, showed an increase of common mental disorders, from 13.7% in 2008 to 16.4% in 2009

and 15.5% in 2010³¹. Some of these studies also found that financial crises and periods of recession and unemployment have higher impact in specific subgroups, especially among the youngest and among men³². These groups are more likely to be affected by economic hardship, losing jobs or not being able to get one, which leads to a situation of disillusion and hopelessness. On the other hand, women, who have already a higher risk of depression, are also very affected by periods of economic crisis. However, none of these studies found differences in the increase in the prevalence of depression as large as those observed in the present study. Our findings, showing a 178% increase in the prevalence of depression among men aged 18 to 24 years who were not working, and 89.8% among women in the same age group and work situation, is unparalleled in the literature. Brazil had a period of good economic growth since the beginning of the 21st century until 2014, which was followed by a period of deep economic crisis, with a significant increase in unemployment, which led to a dramatic drop in the population's standard of living, affecting mainly those who were at the age of entry into the labor market. As Brazil did not have effective governmental mechanisms for social protection in such crisis periods, it is possible that those more vulnerable groups suffered the consequences of economic hardship more intensively.

The present study also found that residents in urban areas of the country had a higher prevalence of depression in both 2013 and 2019, and a greater increase in the prevalence of depression in the six year period (39.8%), when compared to residents in rural areas (20.2 %), and this pattern was similar for men and women. We did not find any other study that investigated living in urban vs. rural areas and the mental health trend in Brazil, but previous studies on the prevalence of common mental disorders / depression in urban and rural areas have shown inconclusive results, some showing an association and others not^{33, 34, 35}. Studies conducted in other countries, however, corroborate our findings and show that living in urban regions with high demographic density is associated with a greater risk of depression^{36, 37}. Among the studies that have investigated the trend of depression over time, some have observed a tendency towards an increase in the prevalence of depression in urban vs. rural regions, following accelerated urbanization processes^{38, 39}. Other studies, however, did not observe such a trend^{28, 40}. A recent study, conducted in Peru, to assess trends in the prevalence of depression between 2014 and 2018, found no significant differences in the prevalence of depression in the period, for urban and rural regions⁴¹.

Regarding health behaviors, the present study found an increase in the prevalence of depression between 2013 and 2019 for the worst categories of the three health behaviors under study, for both sexes: heavy drinking, smoking and lack of physical activity, following the pattern observed for the general population. However, when stratified by sex, the differences in the prevalence of depression are greater for women who reported excessive alcohol consumption than for men who also reported such behavior. The relationship between health risk behaviors and depressive symptoms is already well established in the literature^{42, 43, 44, 45}. Few studies, however, have evaluated the role of health risk behaviors on changes in the prevalence of depression over time. Overall, the current results are in line with those presented by a study based on the annually cross-sectional U.S. National Health Interview Surveys (NHIS) of 1997-2016, among individuals aged 18 years and older⁴⁶. They found that psychological distress became more strongly associated with smoking and physical inactivity, but less strongly associated with heavy alcohol consumption. Another study, also in the American population, examined changes in the prevalence of major depression in the U.S. between 1991-1992 and 2001-2002, and sought to determine whether these changes were associated with changes in substance abuse (including alcohol). They found that increases in the prevalence of depression associated with substance use disorders were consistent only for black men between 18-29 years of age⁴⁷. The results of the present study are also in line with longitudinal studies which showed that women who were in a high-risk drinking group at baseline are under higher risk of developing depression disorder at follow-up^{45, 48}.

Strengths and limitations of this study

One of the strengths of the present study is the fact that it is the first that assessed the trend in the prevalence of depression based in two nationally representative surveys, which allowed the assessment of changes in the prevalence of depression according to sociodemographic characteristics, region of residence and health behaviors. In addition, both surveys used the same standardized questionnaire (PHQ-9), widely used in national and international studies, for the assessment of depression according to internationally accepted criteria, allowing the comparison of results of the present study with those of other international studies.

There are also some limitations that need to be considered. First, presence of depression was assessed with the PHQ-9 with the cut-off 10 to assess depression, and

pooled estimates for such cut-off are 0.77 for sensitivity and 0.85 for specificity, implying that some degree of random misclassification must have occurred. This may have weakened the observed associations. Secondly, more severe cases of depression may have been underestimated due to selection bias (non-response), information bias and exclusion of institutionalized individuals in both surveys. A third limitation is that the primary sample units (PSU) identification use different code scheme across surveys, since it is likely to occur overlapping of PSU in both samples there may some variability not accounted for. Thus, the confidence intervals for the differences in the prevalence in 2013 and 2019 may be slightly underestimated, increasing the probability of type I error. So, confidence limits close to the null hypothesis should be interpreted with caution.

In conclusion, our findings show evidence of a significant increase in the prevalence of depression over the six-year period between the two surveys. The finding that the group of younger and unemployed men showed the greatest variation in the prevalence of depression, draws attention and encourages us to seek explanations based on the literature and the country's socioeconomic context during this period. It is quite likely that such a subgroup is today one of the most vulnerable and that such a condition will have an impact on their mental health. Although economic crises tend to lead to reduced resources for health care, resources for mental health care must be maintained or even increased to allow faster and better results, both in terms of economic recovery, and mental health of the population.

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Contribution of all authors: CSL and PRM conceived the study, interpreted the results and wrote the manuscript, NLG and WLJ analyzed the data and participated in the writing of the manuscript.

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Table 1: Population distribution of socio-demographic characteristics of 18 years and older. National Health Surveys, Brazil, 2013 and 2019.

Variables		Population in 2013		Population in 2019	
		N	%	N	%
Region	Brazil	145,572,210	100.0	159,171,311	100.0
	North	10,873,762	7.5	12,494,635	7.8
	Northeast	38,515,102	26.5	42,106,815	26.5
	Southeast	63,924,452	43.9	69,148,495	43.4
	South	21,474,791	14.8	23,373,724	14.7
	Midwest	10,784,103	7.4	12,047,642	7.6
Area	Urban	125,446,098	86.2	137,171,226	86.2
	Rural	20,126,112	13.8	22,000,085	13.8
Sex	Male	68,568,527	47.1	74,552,698	46.8
	Female	77,003,683	52.9	84,618,613	53.2
Age (years)	18 to 24	23,186,777	15.9	22,072,088	13.9
	25 to 29	14,823,285	10.2	13,107,254	8.2
	30 to 39	31,430,214	21.6	33,411,675	21.0
	40 to 49	26,360,041	18.1	28,930,814	18.2
	40 to 59	23,487,729	16.1	27,250,627	17.1
	60 to 69	14,866,884	10.2	19,367,899	12.2
	70+	11,417,281	7.8	15,030,954	9.4
Work status	Working	89,494,928	61.5	97,520,408	61.3
	Not working	56,077,282	38.5	61,650,903	38.7
Income (minimal wage)	0 to 1	72,397,085	49.7	81,499,740	51.2
	more than 1 to 3	55,514,046	38.1	59,294,591	37.3
	more than 3 to 5	9,341,881	6.4	10,117,149	6.4
	5 or more	8,295,540	5.7	8,209,612	5.2
Education	Less than primary	56,741,611	39.0	55,320,373	34.8
	Primary	22,589,072	15.5	23,048,597	14.5
	Secondary	47,729,621	32.8	55,612,506	34.9
	University	18,511,905	12.7	25,189,835	15.8
Marital status	Single	53,371,566	36.7	58,478,288	36.7
	Married or cohabit	92,200,644	63.3	100,693,023	63.3

Table 2. Prevalence of depression by socio-demographic factors and health behaviors among adults (≥ 18 years of age), and relative change, National Health Surveys, Brazil, 2013 and 2019.

Variables		Prevalence of depression in 2013		Prevalence of depression in 2019			Relative change		
		%	CI 95%	%	CI 95%		Diff. %	CI 95%	
Region	Brazil	7.9	7.5; 8.3	10.8	10.4; 11.2		37.6	30.4; 44.7	
	North	6.1	5.3; 6.8	8.3	7.6; 9.0		36.7	19.9; 53.4	
	Northeast	8.0	7.3; 8.7	10.7	10.1; 11.2		33.7	22.8; 44.6	
	Southeast	7.7	7.0; 8.4	11.5	10.7; 12.3		50.0	36.5; 63.5	
	South	9.1	8.0; 10.1	10.2	9.3; 11.1		12.9	-2.6; 28.5	
	Midwest	8.2	7.3; 9.1	11.4	10.3; 12.4		38.7	22.0; 55.5	
Area	Urban	8.1	7.7; 8.6	11.3	10.9; 11.8		39.8	32.0; 47.6	
	Rural	6.4	5.6; 7.2	7.7	7.0; 8.4		20.2	4.1; 36.3	
Age (years)	18 to 24	5.6	4.8; 6.4	11.1	9.8; 12.4		97.4	69.9; 125.0	
	25 to 29	5.6	4.8; 6.5	8.7	7.6; 9.8		54.4	30.0; 78.9	
	30 to 39	7.3	6.6; 8.0	10.0	9.2; 10.8		36.8	21.8; 51.9	
	40 to 49	8.7	7.8; 9.7	11.7	10.8; 12.5		33.7	19.5; 47.8	
	40 to 59	9.8	8.7; 10.8	11.9	11.0; 12.9		22.5	7.9; 37.0	
	60 to 69	8.6	7.4; 9.9	10.5	9.5; 11.5		21.4	2.7; 40.1	
	70+	10.2	8.8; 11.5	11.1	10.0; 12.1		8.9	-8.2; 25.9	
Skin color	White	7.5	6.9; 8.0	10.6	9.9; 11.2		41.4	30.3; 52.5	
	Black	8.6	7.4; 9.7	11.8	10.7; 12.8		37.0	18.9; 55.2	
	Others	8.2	7.6; 8.7	10.8	10.3; 11.4		32.9	23.3; 42.5	
Work status	Working	6.1	5.6; 6.5	8.8	8.3; 9.2		44.8	34.6; 55.0	
	Not working	10.7	10.0; 11.5	14.1	13.4; 14.7		30.8	21.8; 39.8	
Income (minimal wage)	0 to 1	9.2	8.6; 9.8	12.2	11.7; 12.7		32.9	24.3; 41.6	
	more than 1 to 3	7.1	6.5; 7.7	9.9	9.3; 10.6		39.3	26.5; 52.1	
	more than 3 to 5	5.1	4.0; 6.2	7.6	6.3; 8.8		47.8	15.0; 80.5	
	5 or more	4.5	3.4; 5.6	7.8	6.5; 9.0		73.0	35.8; 110.1	
Education	Less than primary	10.2	9.5; 10.9	12.4	11.8; 13.0		21.3	12.1; 30.4	
	Primary	7.7	6.8; 8.6	11.5	10.4; 12.5		48.3	29.7; 66.8	
	Secondary	6.0	5.4; 6.5	9.8	9.2; 10.5		64.5	50.4; 78.7	
	University	5.7	4.8; 6.6	9.0	8.0; 10.0		57.3	33.9; 80.7	
Marital status	Single	8.0	7.4; 8.6	12.7	12.0; 13.4		58.6	47.2; 70.0	
	Married or cohabit	7.8	7.3; 8.3	9.8	9.3; 10.2		25.1	16.4; 33.7	
Heavy drinking	Yes	8.9	7.5; 10.4	12.0	10.5; 13.6		34.7	10.5; 58.8	
	No	7.8	7.4; 8.2	10.7	10.3; 11.1		37.6	30.1; 45.0	
Physical activity	Yes	5.1	4.6; 5.7	8.0	7.5; 8.6		56.0	40.8; 71.2	
	No	9.1	8.6; 9.6	12.7	12.2; 13.3		40.5	32.4; 48.6	
Smoking	Yes	10.8	9.7; 11.9	14.7	13.5; 15.9		35.9	21.0; 50.9	
	No	7.4	7.0; 7.8	10.3	9.9; 10.7		39.4	31.5; 47.3	

Table 3. Prevalence of depression by sex, socio-demographic factors and health behaviors among adults (≥ 18 years of age), and relative change. National Health Surveys, Brazil, 2013 and 2019.

Sex	Variables	Prevalence of depression in 2013		Prevalence of depression in 2019		Relative change		
		%	IC 95%	%	IC 95%	Diff. %	CI 95%	
Male	Region	Brazil	4,7	4,2 ; 5,1	6,1	5,7 ; 6,5	30,8	17,4 ; 44,1
		North	3,4	2,7 ; 4,2	4,3	3,7 ; 4,9	26,1	-2,4 ; 54,6
		Northeast	5,0	4,2 ; 5,7	5,8	5,2 ; 6,4	17,2	-1,8 ; 36,1
		Southeast	4,9	4,0 ; 5,7	6,7	5,9 ; 7,6	39,1	14,3 ; 63,9
		South	4,2	3,3 ; 5,1	5,7	4,8 ; 6,5	35,2	4,8 ; 65,6
		Midwest	4,6	3,5 ; 5,7	5,9	4,9 ; 7,0	29,2	-3,2 ; 61,5
	Area	Urban	4,8	4,3 ; 5,3	6,5	6,0 ; 7,0	35,0	20,1 ; 49,9
		Rural	3,8	3,0 ; 4,6	4,0	3,4 ; 4,5	3,8	22,0 ; 29,7
	Age (years)	18 to 24	2,9	2,0 ; 3,8	6,6	5,0 ; 8,2	127,1	64,1 ; 190,1
		25 to 29	2,7	1,8 ; 3,5	5,0	3,8 ; 6,2	87,3	32,9 ; 141,8
		30 to 39	4,1	3,3 ; 4,9	4,7	3,9 ; 5,5	14,5	12,8 ; 41,8
		40 to 49	4,8	3,7 ; 5,9	6,4	5,4 ; 7,3	31,7	2,6 ; 60,8
		40 to 59	6,2	4,9 ; 7,5	7,0	5,9 ; 8,0	12,3	15,0 ; 39,6
		60 to 69	6,0	4,4 ; 7,6	6,7	5,5 ; 7,9	11,9	22,2 ; 46,0
		70+	7,4	5,6 ; 9,3	6,4	5,3 ; 7,5	-14,5	43,2 ; 14,3
	Skin color	White	4,8	4,1 ; 5,6	6,2	5,6 ; 6,9	28,2	8,3 ; 48,2
		Black	4,7	3,4 ; 6,0	6,3	5,2 ; 7,3	32,7	-3,0 ; 68,4
		Others	4,4	3,8 ; 5,0	5,9	5,2 ; 6,6	33,5	13,1 ; 54,0
	Work status	Working	3,6	3,1 ; 4,1	4,8	4,3 ; 5,2	34,0	15,7 ; 52,2
		Not working	7,8	6,7 ; 8,9	9,5	8,5 ; 10,5	22,0	2,9 ; 41,1
	Income (minimal wage)	0 to 1	5,4	4,8 ; 6,1	6,6	6,0 ; 7,3	21,9	4,8 ; 39,0
		more than 1 to 3	4,3	3,6 ; 5,0	5,8	5,1 ; 6,5	35,2	12,4 ; 58,0
		more than 3 to 5	2,4	1,4 ; 3,4	4,6	3,0 ; 6,1	90,4	13,4 ; 167,3
5 or more		3,3	1,7 ; 4,9	4,9	3,4 ; 6,3	48,2	- ; 113,7	

								17,4	
Female	Education	Less than primary	6,3	5,5 ; 7,1	7,0	6,2 ; 7,7	10,7	-6,2 ; 27,6	
		Primary	4,1	3,0 ; 5,1	5,9	4,8 ; 7,0	45,8	9,0 ; 82,5	
		Secondary	3,3	2,7 ; 3,9	5,7	5,0 ; 6,4	73,1	43,4 ; 102,8	
		University	3,6	2,3 ; 4,9	5,0	4,0 ; 6,0	38,4	-7,0 ; 83,8	
	Marital status	Single	4,8	4,1 ; 5,6	7,9	6,9 ; 8,8	63,0	38,3 ; 87,6	
		Married or cohabit	4,6	4,0 ; 5,1	5,3	4,8 ; 5,7	16,1	0,2 ; 32,0	
	Heavy drinking	Yes	6,8	5,2 ; 8,5	7,4	5,7 ; 9,1	8,8	- ; 43,7	
		No	4,4	4,0 ; 4,9	5,9	5,5 ; 6,4	33,7	19,2 ; 48,3	
	Physical activity	Yes	2,4	2,0 ; 2,9	4,5	3,9 ; 5,1	85,1	53,6 ; 116,6	
		No	5,9	5,2 ; 6,5	7,3	6,7 ; 8,0	25,2	10,0 ; 40,3	
	Smoking	Yes	6,3	5,2 ; 7,4	9,0	7,7 ; 10,2	41,9	15,6 ; 68,3	
		No	4,3	3,8 ; 4,7	5,5	5,1 ; 6,0	29,8	14,5 ; 45,0	
Region	Brazil	10,7	10,1 ; 11,3	15,0	14,4 ; 15,6	39,8	31,8 ; 47,8		
	North	8,6	7,3 ; 9,8	12,0	10,8 ; 13,2	39,9	19,7 ; 60,1		
	Northeast	10,7	9,7 ; 11,6	14,9	14,0 ; 15,8	39,8	27,6 ; 51,9		
	Southeast	10,1	9,1 ; 11,1	15,6	14,4 ; 16,8	54,3	38,9 ; 69,7		
	South	13,4	11,7 ; 15,1	14,3	12,9 ; 15,8	6,5	10,1 ; 23,2		
	Midwest	11,5	10,1 ; 12,8	16,2	14,7 ; 17,8	41,7	23,6 ; 59,7		
Area	Urban	11,0	10,3 ; 11,6	15,4	14,7 ; 16,1	40,6	31,9 ; 49,2		
	Rural	9,1	7,8 ; 10,4	11,9	10,8 ; 13,1	31,3	12,1 ; 50,4		
Age (years)	18 to 24	8,3	6,9 ; 9,6	15,6	13,5 ; 17,7	89,1	59,4 ; 118,7		
	25 to 29	8,6	7,1 ; 10,0	12,1	10,4 ; 13,8	41,1	14,9 ; 67,3		
	30 to 39	10,2	9,0 ; 11,3	14,9	13,5 ; 16,3	46,3	28,8 ; 63,8		
	40 to 49	12,0	10,5 ; 13,5	16,0	14,7 ; 17,4	33,8	17,4 ; 50,3		
	40 to 59	13,0	11,4 ; 14,6	16,5	15,1 ; 17,9	26,8	10,6 ; 42,9		
	60 to 69	10,6	9,0 ; 12,3	13,4	12,0 ; 14,9	26,1	5,4 ; 46,9		
	70+	12,2	10,3 ; 14,2	14,5	12,9 ; 16,1	18,2	-2,4 ; 38,8		
Skin color	White	9,8	9,0 ; 10,6	14,3	13,3 ; 15,3	46,3	33,5 ; 59,2		
	Black	12,0	10,2 ; 13,8	16,7	15,0 ; 18,3	38,9	18,4 ; 59,4		

	Others	11,6	10,7 ; 12,4	15,3	14,5 ; 16,1	32,3	21,9 ; 42,7
Work status	Working	9,4	8,7 ; 10,1	13,8	12,9 ; 14,6	46,8	34,9 ; 58,8
	Not working	12,1	11,2 ; 13,0	16,3	15,5 ; 17,1	34,9	24,9 ; 44,9
Income (minimal wage)	0 to 1	12,2	11,3 ; 13,0	16,7	15,9 ; 17,5	37,5	27,9 ; 47,1
	more than 1 to 3	9,9	9,0 ; 10,9	13,8	12,6 ; 15,0	39,0	23,9 ; 54,2
	more than 3 to 5	7,7	5,8 ; 9,5	10,5	8,5 ; 12,6	37,7	1,0 ; 74,3
	5 or more	5,8	4,2 ; 7,3	10,8	8,7 ; 12,8	87,0	42,3 ; 131,8
Education	Less than primary	13,9	12,8 ; 14,9	17,4	16,3 ; 18,4	25,2	14,5 ; 36,0
	Primary	11,4	9,9 ; 12,9	17,2	15,4 ; 18,9	50,4	30,3 ; 70,4
	Secondary	8,3	7,5 ; 9,1	13,4	12,4 ; 14,4	61,8	46,4 ; 77,1
	University	7,3	6,0 ; 8,6	11,9	10,5 ; 13,3	63,9	37,4 ; 90,4
Marital status	Single	10,5	9,6 ; 11,3	15,8	14,8 ; 16,7	50,5	38,6 ; 62,5
	Married or cohabit	10,9	10,2 ; 11,7	14,5	13,6 ; 15,3	32,6	22,4 ; 42,8
Heavy drinking	Yes	13,6	10,6 ; 16,5	19,6	16,8 ; 22,4	44,4	14,4 ; 74,5
	No	10,6	10,0 ; 11,2	14,8	14,1 ; 15,4	38,8	30,6 ; 47,0
Physical activity	Yes	8,4	7,4 ; 9,5	11,7	10,8 ; 12,6	39,5	23,0 ; 56,0
	No	11,6	10,9 ; 12,2	16,9	16,1 ; 17,7	46,5	37,4 ; 55,5
Smoking	Yes	17,7	15,6 ; 19,9	23,1	20,8 ; 25,4	30,4	12,7 ; 48,1
	No	9,9	9,3 ; 10,5	14,1	13,5 ; 14,8	43,2	34,4 ; 52,0

Table 4: Prevalence of depression, by sex, work status, and age among adults (≥ 18 years of age), and relative change. National Health Surveys, Brazil, 2013 and 2019.

Sex	Work status	Age	Prevalence of depression in 2013		Prevalence of depression in 2019		Relative change	
			%	CI 95%	%	CI 95%	Diff. %	CI 95%
Both	Working	18 to 24	5.2	4.2 ; 6.3	9.9	8.2 ; 11.6	89.4	51.3 ; 127.6
		25 to 29	4.4	3.6 ; 5.2	8.2	6.9 ; 9.5	86.8	51.7 ; 121.8
		30 to 39	6.3	5.6 ; 7.1	8.1	7.3 ; 9.0	28.8	10.8 ; 46.8
		40 to 49	6.7	5.7 ; 7.6	9.5	8.7 ; 10.3	42.2	23.2 ; 61.2
		40 to 59	6.9	5.7 ; 8.0	9.2	8.1 ; 10.2	33.6	10.8 ; 56.3
		60 to 69	6.5	4.5 ; 8.5	7.7	6.1 ; 9.2	18.6	-20.8 ; 57.9
		70+	5.0	1.4 ; 8.5	4.2	2.6 ; 5.8	-16.3	-93.9 ; 61.4
	Not working	18 to 24	6.2	4.9 ; 7.5	12.8	10.7 ; 14.9	106.5	66.9 ; 146.2
		25 to 29	9.3	7.0 ; 11.5	9.9	8.0 ; 11.7	6.3	-25.4 ; 38.0
		30 to 39	10.7	8.8 ; 12.6	16.8	14.8 ; 18.8	57.7	31.9 ; 83.6
		40 to 49	14.7	12.3 ; 17.0	18.9	16.6 ; 21.1	28.8	6.6 ; 50.9
		40 to 59	14.3	12.4 ; 16.3	17.1	15.4 ; 18.8	19.4	1.2 ; 37.6
		60 to 69	9.6	8.2 ; 11.0	12.0	10.7 ; 13.3	25.1	5.1 ; 45.2
		70+	10.8	9.3 ; 12.2	11.9	10.7 ; 13.1	10.5	-6.9 ; 27.9
Male	Working	18 to 24	2.6	1.7 ; 3.5	4.9	3.4 ; 6.5	90.5	20.4 ; 160.5
		25 to 29	2.4	1.5 ; 3.2	4.6	3.4 ; 5.9	96.2	32.3 ; 160.2
		30 to 39	3.7	2.9 ; 4.5	4.3	3.5 ; 5.2	17.3	-13.8 ; 48.4
		40 to 49	3.4	2.4 ; 4.3	5.3	4.4 ; 6.1	55.9	17.1 ; 94.8
		40 to 59	4.9	3.5 ; 6.3	5.2	4.1 ; 6.4	7.4	-28.9 ; 43.8
		60 to 69	5.6	2.8 ; 8.4	4.4	2.9 ; 5.9	-21.6	-77.9 ; 34.6
		70+	3.6	-0.4 ; 7.5	3.5	1.6 ; 5.4	-2.7	-125.3 ; 120.0
	Not working	18 to 24	3.7	1.7 ; 5.6	10.3	6.6 ; 14.0	178.4	65.6 ; 291.2
		25 to 29	5.2	2.0 ; 8.5	6.9	3.5 ; 10.3	31.1	-59.4 ; 121.6
		30 to 39	8.3	4.4 ; 12.2	8.4	5.8 ; 11.0	1.6	-54.9 ; 58.1
		40 to 49	15.1	9.8 ; 20.5	14.9	11.2 ; 18.6	-1.6	-44.6 ; 41.3
		40 to 59	10.6	7.2 ; 14.0	13.2	10.5 ; 15.9	24.2	-16.8 ; 65.2
		60 to 69	6.3	4.4 ; 8.2	8.8	6.9 ; 10.7	39.0	-3.3 ; 81.4
		70+	8.3	6.3 ; 10.4	7.0	5.7 ; 8.2	-16.2	-45.4 ; 12.9
Female	Working	18 to 24	8.8	6.7 ; 10.9	16.7	13.4 ; 20.0	89.8	45.7 ; 133.9
		25 to 29	7.4	5.8 ; 9.0	12.7	10.3 ; 15.1	71.6	32.5 ; 110.6
		30 to 39	9.6	8.3 ; 10.8	12.8	11.1 ; 14.5	33.6	11.7 ; 55.5
		40 to 49	10.5	8.8 ; 12.3	14.1	12.7 ; 15.6	34.2	12.5 ; 55.8
		40 to 59	9.8	7.8 ; 11.8	14.4	12.6 ; 16.3	47.0	19.5 ; 74.4
		60 to 69	7.9	4.8 ; 10.9	12.3	9.2 ; 15.3	56.1	1.9 ; 110.4
		70+	9.4	1.4 ; 17.3	5.5	2.7 ; 8.4	-40.8	-131.3 ; 49.7
	Not working	18 to 24	7.7	6.0 ; 9.3	14.5	11.9 ; 17.0	88.4	48.6 ; 128.3
		25 to 29	10.4	7.7 ; 13.2	11.2	8.9 ; 13.4	6.8	-27.2 ; 40.9
		30 to 39	11.3	9.2 ; 13.4	19.4	16.9 ; 21.9	71.7	42.5 ; 100.8
		40 to 49	14.5	12.0 ; 17.1	20.0	17.4 ; 22.7	37.9	12.3 ; 63.4
		40 to 59	15.8	13.4 ; 18.2	18.8	16.7 ; 20.8	18.7	-1.3 ; 38.6
		60 to 69	11.4	9.5 ; 13.4	13.9	12.3 ; 15.4	21.2	-0.7 ; 43.0
		70+	12.4	10.4 ; 14.4	15.1	13.4 ; 16.8	21.8	0.7 ; 42.9

Figure 1: Relative change in prevalence of depression 2013-2019 by age, work status, and sex. (*) indicates statistically significant trend, National Health Surveys, Brazil, 2013 and 2019.

