RESEARCH

Open Access

Mental disorders in adults from Ribeirão Preto, Brazil: a cross-sectional analysis of two birth cohorts

Luis Felipe Scarabelot[1*], Jesem Douglas Yamall Orellana[2], Viviane Cunha Cardoso[3], Marco Antonio Barbieri[3], Ricardo Carvalho Cavalli[4], Heloisa Bettiol[3], Bernardo Lessa Horta[5] and Cristina Marta Del-Ben[1]

Abstract

Background In Brazil, the prevalence of mental disorders is heterogeneous, with most studies conducted in large cities with high population density. This study aimed to assess the prevalence of mental disorders and psychiatric comorbidities among young adults (22–23 years old) and adults (37–38 years old) from Ribeirão Preto, a city located in the Northeast of the São Paulo state, with approximately 700,000 inhabitants, and to explore associations with sociodemographic variables, suicide risk, and health service usage. Second, we aimed to evaluate the performance of the Self-Report Questionnaire (SRQ-20) as a screening tool for mental disorders to be applied to the local population.

Methods Participants from the 1978/1979 and 1994 Ribeirão Preto birth cohorts were evaluated using the Mini International Neuropsychiatric Interview (MINI) and the SRQ-20 at mean ages of 22–23, and 37–38 years, respectively.

Results Our sample comprised 1,769 individuals from the 1978/1979 cohort and 1,037 from the 1994 cohort. The prevalence of mental disorders ranged from 28.6% (1978/79) to 31% (1994), with frequent comorbid diagnoses (42.7% and 43.3%, respectively). Men and women had a similar prevalence of mental disorders in the younger cohort, while women had a higher prevalence in the older cohort. Low educational attainment was associated with higher rates of diagnosis. In both cohorts, alcohol and other psychoactive substance use was higher among those with a psychiatric diagnosis. Although those with a psychiatric diagnosis were less satisfied with their own health, only one-fifth had seen a mental health professional in the previous year. A psychiatric diagnosis increased the suicide risk by 5.6 to 9.1 times. Regarding the SRQ-20, the best cutoff points were 5/6 for men and 7/8 for women, with satisfactory performance.

Conclusions The prevalence and comorbidity of mental disorders were high in both cohorts and comparable to those in larger Brazilian cities. However, few individuals with a diagnosis had sought specialized care. These data suggest that the mental health gap is still significant in Brazil.

Keywords Mood disorders, Anxiety disorders, Substance-related disorders, Diagnostic techniques and procedures, Patient Outcome Assessment

*Correspondence:
Luis Felipe Scarabelot
luisfs@hcrp.usp.br
Full list of author information is available at the end of the article

Background

According to estimates from the Global Burden of Disease, 16% of the world population had a psychiatric diagnosis in 2016, resulting in the loss of 162.5 million disability-adjusted life years. Depression, anxiety, and substance use disorders accounted for approximately two-thirds of these lost years [1].

In Brazil, early epidemiological studies on mental disorders reported high prevalence rates, yet they had significant methodological issues, such as the use on non-standardized diagnostic tools [2]. The first Brazilian large-scale, multicenter epidemiological study was conducted in three large cities (Brasília, São Paulo, Porto Alegre) in 1992. The authors reported that 19.0–34.1% of individuals potentially needed treatment for psychiatric disorders [3]. In the 2000s, the São Paulo Megacity Survey, carried out in the country's largest metropolitan area, reported a prevalence of mental disorders of 29.6%, with a psychiatric comorbidity rate of 39.5% [4]. A more recent analysis reported a prevalence rate of 26.8% for common mental disorders, associated with female sex at birth, black or brown (mixed) skin color, younger age, and lower education [5]. Hence, the overall estimated prevalence of mental disorders was consistent across various studies conducted in large cities.

However, in Ribeirão Preto, a medium-sized city (approximately 700,000 inhabitants) located in the Northeast of the state of São Paulo, representative samples of household residents from three neighborhoods exhibited a prevalence of mental disorders of 40.5% [6], surpassing the prevalence rates observed in prior studies from larger cities [3–5]. Furthermore, the prevalence rates varied from 35.1 to 48.3% across the neighborhoods [6]. It remains unclear whether other factors such as different urbanization rates and socioeconomic backgrounds influence the prevalence rates in Ribeirão Preto.

In a previous study [7], employing the Mini International Neuropsychiatric Interview (MINI) on birth cohort samples, we compared the prevalence of three diagnostic categories (depressive episodes, generalized anxiety disorder, social phobia) and suicide risk in adolescents (18–19 y/o), youth (21–23 y/o) and adults (30–39 y/o) from Ribeirão Preto with two other Brazilian cities (Pelotas, RS; and São Luís, MA). The prevalence rates of the mental disorders varied across the centers. For instance, current depressive episode was more prevalent among adolescents from São Luís [15.8% (14.8–16.8)], a region with less favorable socioeconomic indicators, than in adolescents from Pelotas [6.8% (6.1–7.5)]. In Ribeirão Preto, the prevalence of current depressive episode was 10.2% (9.4–11.0) among adults and 12.9% (12.0–13.9) among youth [7].

Given the heterogeneity of mental disorder prevalence data in different Brazilian cities, our primary goal was to fully describe the prevalence of mental disorders and psychiatric comorbidities in young adults and adults from Ribeirão Preto. Additionally, we aimed to examine associations between sociodemographic variables, mental health service use, and suicide risk with psychiatric diagnoses. We expanded the previous analysis [7] to encompass the entire version of the MINI in two Ribeirão Preto birth cohorts. Also, we sought to assess the performance of a screening instrument, the Self-Reporting Questionnaire (SRQ-20) within our sample. We hypothesized that the prevalence of mental disorders and comorbidity rates in our sample would be high and comparable to those previously reported for other populations. Furthermore, we anticipated that individuals with a psychiatric diagnosis would exhibit increased social vulnerability correlates and an elevated risk of suicide.

Methods

We conducted a cross-sectional analysis with data from two birth cohorts from Ribeirão Preto, Brazil. These cohorts are part of the RPS cohort consort, which also includes two other Brazilian birth cohorts from Pelotas, RS, and São Luís, MA [8]. The first Ribeirão Preto cohort commenced in 1978/1979 and stands as the oldest Brazilian birth cohort, while the second cohort initiated in 1994. We used data from the follow-up visits that occurred in 2016 and 2017.

Ribeirão Preto is a medium-sized city, with around 700,000 inhabitants (2022) located in the state of São Paulo, 320 km from São Paulo city, the capital of São Paulo State. The economy is based on agribusiness and service provision, with a GDP per capita of R$55,484.91 (2021) and HDI=0.800 (2010) (https://cidades.ibge.gov.br/).

The Ethics Committee of the Ribeirão Preto Medical School, University of São Paulo, granted approval for this study (process number: 49992521.3.0000.5440). Written informed consent was obtained from all participants in this study. This study followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (Supplementary Table S1).

Ribeirão Preto Birth cohorts

In 1978/1979, a comprehensive evaluation was conducted on all births in Ribeirao Preto over the course of one year. Newborns whose mother did not reside in Ribeirão Preto or refused to participate were excluded. 98% of the newborns (9,607 individuals) underwent assessment, and after exclusions, the initial sample comprised 6,827 individuals (51.4% male, 48.6% female) [9]. Recruitment for the 1994 cohort covered 4 months, motivated by the absence of seasonality in birth characteristics within the city, and 3,663 newborns were assessed. The same exclusion criteria were applied and after exclusions, 2,846

(50.7% male, 49.2% female) composed the 1994 baseline sample [10].

At birth, the address of the mother was registered. At subsequent follow-up assessments, patients were tracked from previously registered addresses and phone numbers and from different databases to maximize recruitment: local electronic medical record system, list of school children, list of military recruits. At each assessment, contact and address information were updated to minimize losses to follow-up [8, 11]. Further details on the cohort methodology have been described elsewhere [8].

Assessment

In 2016–2017, participants from both cohorts were invited for a new wave of assessments using their most recent addresses and phone numbers, supplemented by invitations through local media advertisements and searches in electronic medical records and list of military recruits. The assessment procedures were conducted at the University Hospital of Ribeirão Preto Medical School. Participants from the 1978/1979 cohort were aged 37–38 years and those from the 1994 cohort were aged 22–23 years.

All recruited individuals completed a set of questionnaires encompassing sociodemographic, economic, lifestyle, and general health aspects, along with clinical evaluations, including physical measurements and laboratory analyses [9].

Sociodemographic features were examined through dedicated questionnaires, focusing on variables such as sex at birth, self-reported skin color, marital status, educational level, and financial dependence, all of which have been associated with the prevalence of common mental disorders [12, 13]. We categorized self-reported skin color as "white" or "non-white" (black, mixed). We considered "married" those who cohabited with a partner and "single" the remaining individuals. Educational level was stratified into three categories representing the Brazilian educational system (<9 years: primary and lower secondary school; 9–12 years: upper secondary school; >12 years: college and above).

Psychiatric diagnoses

All participants were evaluated by trained psychologists using the Mini International Neuropsychiatric Interview Brazilian Version 5.0.0 (MINI). The MINI is a structured interview designed for clinical settings and research that provides a comprehensive diagnostic approach based on DSM-IV criteria [14]. It has been translated and validated for use in Brazil [15, 16].

The MINI comprises nineteen modules: eighteen provide diagnoses from the DSM-IV, and one provides additional information about suicidality. We adapted diagnostic categories to enhance clinical relevance: current and recurrent major depressive disorder (without a history of manic/hypomanic episodes) were classified as "major depressive disorder"; current or past manic or hypomanic episodes as "bipolar disorder"; lifetime and current panic disorder and current agoraphobia as "panic disorder"; alcohol abuse and dependence as "alcohol-related problems"; substance abuse and dependence as "substance-related problems"; psychotic syndrome not occurring exclusively during mood episodes as "non-affective psychotic disorder"; anorexia nervosa and bulimia nervosa as "eating disorder". Dysthymia, social anxiety disorder, obsessive-compulsive disorder, post-traumatic stress disorder, generalized anxiety disorder and antisocial personality disorder remained as described in the MINI. The suicidality module was analyzed separately and excluded from the psychiatric diagnosis prevalence calculations. Detailed information on the adapted diagnostic variables is provided in the Supplementary Table S2.

Screening instrument

The Self-Reporting Questionnaire (SRQ-20) screens psychiatric morbidity in primary care settings [17]. In Brazil, the SRQ-20 has been recognized as a practical screening instrument in primary health care and an effective indicator of morbidity [18, 19]. The questionnaire comprises 24 questions divided into two sections: 20 initial items that screen for non-psychotic disorders and the latter four screen for psychotic disorders [17]. The main disorders screened by the first 20 items are traditionally known as "common mental disorders", such as depression, anxiety-related disorders, and somatoform disorders [20]. In Brazil, only the 20-item version has been validated for use; therefore, we administered this version. The recommended cutoff points are >5 for men and >7 for women [18]. For more trustworthy results, we excluded individuals with psychotic disorders and those diagnosed exclusively with alcohol or substance-related problems according to the MINI from the SRQ-20 analysis.

Patient-related outcomes

Satisfaction with health as a patient-related outcome was measured by a single question ("How satisfied are you with your own health?") graded as very dissatisfied, dissatisfied, regular, satisfied, or very satisfied. We dichotomized the answers as "dissatisfied" (very dissatisfied, dissatisfied, regular) or "satisfied" (satisfied, very satisfied). All participants were questioned if they had seen a health professional in the previous 12 months and if they did, they were explicitly asked if they had seen a psychologist or a psychiatrist.

Scarabelot *et al. BMC Public Health*   (2024) 24:2465

Page 4 of 12

Statistics

We described the raw missing data in tables. Missing data were not considered for frequency analyses or statistics.

The data were analyzed with IBM SPSS Statistics for Windows, version 26. Pearson's chi-square test and Fisher's exact test were used for categorical variables. Confidence intervals for prevalence rates were estimated using a bootstrapping method with one thousand replications. We employed binary logistic regression to estimate the odds ratio for each sociodemographic variable, service use variable, and the suicidality item. Values of $p < 0.05$ were considered significant.

Receiver operating characteristics (ROC) curve was plotted to compare the SRQ-20 with the MINI (considered the "gold standard" in our analysis), and ROC curve coordinates were calculated. We analyzed the ROC curves visually and through the provided coordinates to determine the best cutoff point for our sample, considering the use of the SRQ-20 as a screening tool for common mental disorders. The misclassification rates were calculated after choosing a cutoff point for our sample.

Results

Sociodemographic features

The sample assessed in 2016/2017 consisted of 1,769 individuals from the 1978/1979 cohort (25.9% of the baseline sample) and 1,037 from the 1994 cohort (36.4% of the baseline sample). A comparison of baseline characteristics between our sample and the individuals not assessed in 2016/2017 revealed significant differences in sex at birth and maternal education, while gestational age and birth weight showed similar patterns (Supplementary Table S3).

Table 1 shows that most individuals were women and self-reported skin color as white. Participants from the 1978/1979 cohort were more often married and financially independent. Although younger, individuals from the 1994 cohort had higher education levels. The older cohort sought medical consultations more frequently in the previous year than did the younger cohort, especially with psychiatrists, whose frequency was twice as high.

Prevalence of mental disorders according to the MINI

The prevalence of any mental disorder was 28.6% (95% CI 26.3–30.8%; $n = 506$) in the 1978/1979 cohort and 31.0% (95% CI 28.0–34.2%; $n = 321$) in the 1994 cohort. Table 2 shows that the prevalence of each diagnosis was similar in both cohorts, except for substance-related problems (twice as frequent in the 1994 cohort) and panic disorder (twice as frequent in the 1978/1979 cohort). Major depressive disorder and generalized anxiety disorder were the most frequent diagnoses in both cohorts.

Overall diagnoses, as described in Table 2, exceeded the total number of individuals with any mental disorder due to psychiatric comorbidity. Among those with at least one diagnosis, 42.7% (95% CI 38.6–47.1%) and 43.3% (95% CI 38.2–48.4%) had two or more psychiatric diagnoses in the older and younger cohorts, respectively. Supplementary Table S4 provides a detailed account of the observed comorbidities.

Figure 1 illustrates the comparison among each pair of diagnoses. Upon visual inspection, major depressive disorder and generalized anxiety disorder co-occurred more frequently than any other possible pair. Major depressive disorder also overlapped with alcohol and substance-related problems. Additionally, bipolar disorder was associated with generalized anxiety disorder.

The comorbidity of other psychiatric diagnoses with alcohol and other substance use was also relevant. Among those individuals with alcohol-related problems, 73.7% (95% CI 63.2–84.1%) and 68.6% (95% CI 54.8–80.8%) had another psychiatric diagnosis in the older and younger cohorts, respectively. These proportions were significantly different from the sole diagnosis of alcohol-related problems ($p < 0.001$).

Among those with substance-related problems, 54.4% (95% CI 42.3–66.1%) and 50.0% (95% CI 41.0–58.7%) had another psychiatric diagnosis. These proportions were also significantly different from the sole diagnosis of substance-related problems ($p < 0.001$).

Table 3 presents the rates of psychiatric diagnoses for each sociodemographic variable. In the 1978/1979 cohort, all variables showed significant differences between individuals with and without psychiatric disorders in the univariable analysis. We observed higher rates of diagnosis among women (OR=1.83, 95% CI 1.48–2.26), non-White individuals (OR=1.36, 95% CI 1.07–1.74), single individuals (OR=1.69, 95% CI 1.36–2.11), and those who were financially dependent (OR=1.89, 95% CI 1.47–2.45). In the multivariable analysis, all variables remained significantly associated with the occurrence of a mental disorder, except self-reported skin color (aOR=1.14, 95% CI 0.88–1.48), and intermediate level of education attainment (aOR=1.26, 95% CI 0.99–1.60).

In the 1994 cohort, sex at birth, skin color, and financial dependence status were not significantly associated with the risk of psychiatric diagnosis. Although lower education attainment was linked to a higher risk of mental disorders in the univariable analysis (<9 years: OR=1.85, 95% CI 1.07–3.18; 9–12 years: OR=1.38, 95% CI 1.05–1.82), this association did not persist in the multivariable analysis. Unlike the older cohort, single individuals in the younger cohort had a lower risk of psychiatric diagnosis (aOR=0.68, 95% CI 0.47–0.97).

Satisfaction with health and health service use

Table 4 details the satisfaction with health and health service use characteristics of the sample. Individuals with

Table 1 Sociodemographic and service use features of individuals from two birth cohorts from Ribeirão Preto, Brazil (1978/1979 and 1994) in 2016/2017

	Cohort 1978/79 (37–38 years old) n (%*)	Cohort 1994 (22–23 years old) n (%*)	χ^{2*}	p
Sex at birth			9.049	0.003
Female	925 (52.3)	603 (58.1)		
Male	844 (47.7)	434 (41.9)		
Skin color			4.137	0.042
White	1396 (78.9)	784 (75.6)		
Non-white	373 (21.1)	253 (24.4)		
Education			43.985	< 0.001
<9 years	220 (12.5)	61 (5.9)		
9–12	760 (43.1)	410 (39.6)		
>12 years	782 (44.4)	564 (54.5)		
Marital status			748.124	< 0.001
Married	1254 (71.0)	181 (17.5)		
Single	512 (29.0)	854 (82.5)		
Missing	3	2		
Financial independence			298.760	< 0.001
Yes	1463 (82.7)	530 (52.0)		
No	306 (17.3)	489 (48.0)		
Missing	0	18		
Self-rated health			10.279	0.001
Satisfied	979 (55.5)	635 (61.7)		
Dissatisfied	785 (44.5)	394 (38.3)		
Missing	5	8		
Consulted health professional			7.483	0.006
Yes	1522 (86.2)	853 (82.3)		
No	244 (13.8)	183 (17.6)		
Missing	3	1		
Consulted psychiatrist or psychologist			4.238	0.04
Yes	219 (12.4)	102 (9.8)		
No	1547 (87.5)	935 (90.2)		
Missing	3	0		
Total	1769	1037		

*Missing data were excluded from calculations

Table 2 Prevalence of each diagnosis assessed by the MINI in individuals from two birth cohorts from Ribeirão Preto, Brazil (1978/1979 and 1994) in 2016/2017

| Diagnosis	n	Cohort 1978/1979 % (95% CI)	n	Cohort 1994 % (95% CI)
Major depressive disorder	213	12.0 (10.7–13.5)	117	11.3 (9.3–13.4)
Generalized anxiety disorder	167	9.4 (8.1–10.7)	109	10.5 (8.8–12.5)
Bipolar disorder	85	4.8 (3.8–5.9)	42	4.1 (2.9–5.3)
Alcohol-related problems	76	4.3 (3.3–5.3)	51	4.9 (3.6–6.3)
Substance-related problems	68	**3.8 (3.3–5.3)**	94	**9.1 (7.3–10.9)**
Panic disorder	61	**3.4 (2.7–4.3)**	18	**1.7 (1.1–2.5)**
Social anxiety disorder	44	2.5 (1.8–3.1)	23	2.2 (1.3–3.2)
Posttraumatic stress disorder	30	1.7 (1.1–2.3)	18	1.7 (1.0-2.6)
Obsessive-compulsive disorder	29	1.6 (1.1–2.2)	9	0.9 (0.4–1.5)
Non-affective psychotic disorder	24	1.4 (0.8–1.9)	9	0.9 (0.3–1.5)
Dysthymia	21	1.2 (0.7–1.8)	13	1.3 (0.7-2.0)
Antisocial personality disorder	14	0.8 (0.4–1.2)	16	1.5 (0.9–2.3)
Eating disorder	14	0.8 (0.4–1.2)	8	0.8 (0.3–1.4)

Significant differences are in bold
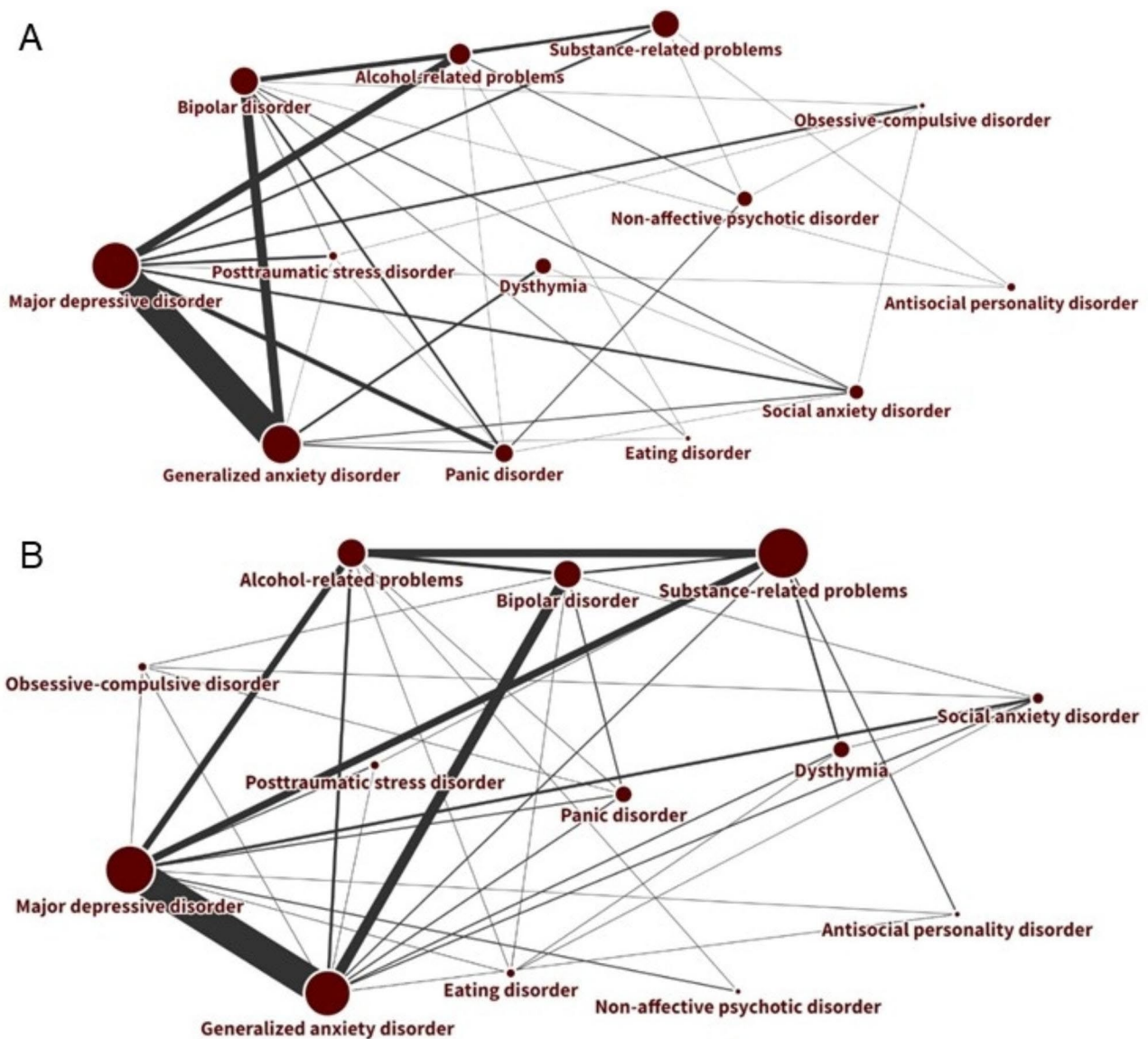
Fig. 1 Network graph of psychiatric diagnoses and comorbidities according to the MINI among individuals from two birth cohorts from Ribeirão Preto, cohort 1978/1979 (**A**) and cohort 1994 (**B**), as assessed in 2016/2017. Circles represent isolated diagnoses. Circles size represent the prevalence of each isolated diagnosis. Lines width represent comorbidity rates between pairs of diagnoses

mental disorders were more prone to report low satisfaction with health than individuals without mental disorders (1978/1979: OR=2.14, 95% CI 1.74–2.64; 1994: OR=2.31, 95% CI 1.76–3.03). They were also more likely to have sought consultation with a mental health professional in the previous year (1978/1979: OR=2.64, 95% CI 1.98–3.52; 1994: OR=3.69, 95% CI 2.42–5.66), although only approximately one-fifth consulted a mental health practitioner. Consultation with any health professional was similar in both groups.

Suicidality

Individuals with any psychiatric diagnosis carried a 5 to 9-fold increased likelihood of having suicide risk, as assessed by the MINI (cohort 1978/1979: OR=9.19, 95% CI 6.76–12.50; cohort 1994: OR=5.60, 95% CI 3.85–8.14). Also, they were 5 to 7 times more likely to report a previous suicide attempt (cohort 1978/1979: OR=7.80, 95% CI 5.20–11.69; cohort 1994: OR=5.16, 95% CI 3.07–8.66).

SRQ-20

The SRQ-20 performed similarly across men and women from both cohorts. The areas under the curve (AUCs) were 0.796 (95% CI 0.750–0.842) for men and 0.779 (95% CI 0.747–0.810) for women in the 1978/1979 cohort; 0.790 (95% CI 0.735–0.844) for men and 0.762 (95% CI 0.720–0.803) for women in the 1994 cohort. Supplementary Figure S1 displays the ROC curves for each cohort.

Table 3 Univariable and multivariable binary logistic regression for sociodemographic features of individuals from two Ribeirão Preto, Brazil birth cohorts (1978/1979 and 1994) with and without psychiatric disorders diagnosed through the MINI in 2016/2017

	Cohort 1978/1979						Cohort 1994					
	No diagnosis		With diagnosis		OR (95% CI)[b]	aOR (95% CI)[b]	No diagnosis		With diagnosis		OR (95% CI)[b]	aOR (95% CI)[b]
	n	%	n	%			n	%	n	%		
Sex at birth												
Male	656	77.7	188	22.3	Reference	Reference	415	58.2	188	31.2	Reference	Reference
Female	607	65.6	318	34.4	**1.83 (1.48–2.26)**	**1.76 (1.41–2.20)**	301	69.4	133	30.6	1.02 (0.78–1.34)	1.06 (0.81–1.40)
Skin color												
White	1016	72.8	380	27.2	Reference	Reference	550	70.2	234	29.8	Reference	Reference
Non-white	247	66.8	126	33.8	**1.36 (1.07–1.74)**	1.14 (0.88–1.48)	166	65.6	87	34.4	1.23 (0.91–1.66)	1.08 (0.79–1.49)
Education												
<9 years	110	50.0	110	50.0	**3.30 (2.41–4.50)**	**3.19 (2.30–4.43)**	36	59.0	25	41.0	**1.85 (1.07–3.18)**	1.47 (0.82–2.63)
9–12	546	71.8	214	28.2	**1.29 (1.03–1.62)**	1.26 (0.99–1.60)	270	65.9	140	34.1	**1.38 (1.05–1.82)**	1.25 (0.93–1.69)
>12 years	600	76.7	182	23.3	Reference	Reference	410	72.7	154	27.3	Reference	Reference
Missing[a]	7	0.6	0	0			0	0	2	0,6		
Marital status												
Married	936	74.6	318	25.4	Reference	Reference	108	56.9	73	43.1	Reference	Reference
Single	325	63.5	187	36.5	**1.69 (1.36–2.11)**	**1.60 (1.28–2.01)**	607	71.1	247	28.9	**0.60 (0.43–0.84)**	**0.68 (0.47–0.97)**
Missing[a]	2	0	1	0,2			1	0,1	1	0,3		
Financial independence												
Yes	1080	73.8	383	26.2	Reference	Reference	359	67.7	171	32.3	Reference	Reference
No	183	59.8	123	40.2	**1.89 (1.47–2.45)**	**1.48 (1.13–1.94)**	343	70.1	146	29.9	0.89 (0.68–1.17)	1.01 (0.76–1.33)
Missing[a]							14	2.0	4	1.2		
Total	1263	100	506	100			716	100	321	100		

OR: odds ratio / aOR: adjusted odds ratio for all sociodemographic variables

[a] Missing on database / [b] Missing data were not considered for logistic regression analysis

The best cutoff points for our sample were 5/6 for men and 7/8 for women. For men, the 5/6 cutoff provided a sensitivity ranging from 0.758 to 0.772 and a specificity ranging from 0.658 to 0.688. For women, the 7/8 cutoff yielded a sensitivity ranging from 0.782 to 0.814 and a specificity ranging from 0.621 to 0.635. The misclassification rates varied from 0.30 to 0.33. Supplementary Table S5 presents detailed SRQ-20 performance data.

Discussion

We aimed to estimate the prevalence of mental disorders using the structured interview MINI in adults (37–38 years old) and young adults (22–23 years old) from two Brazilian birth cohorts. We observed a high prevalence of mental disorders in both samples (28.6% and 31%, respectively) with substantial psychiatric comorbidity.

The prevalence of any psychiatric diagnosis in our study (28.6% and 31.0%) was remarkable and similar to those demonstrated by the São Paulo Megacity Survey between 2005 and 2007 [4]. Our prevalence rates were also similar to those reported in other upper-middle-income countries, such as Mexico and South Africa [21]. The most common diagnoses in both studies were mood and anxiety disorders with some differences in specific diagnostic categories. However, we observed a lower prevalence than that previously reported for Ribeirão Preto [6]. In contrast to our study, Moscovici et al. [6] recruited individuals directly from their homes and included a wider age span. It also targeted areas with more significant social disadvantages, possibly leading to a higher prevalence of mental disorders [6, 13].

The prevalence rates for each diagnosis in our sample were comparable to those previously described [4]. Nonetheless, bipolar disorder surprisingly exhibited a high prevalence in our sample: approximately four times higher than that previously reported [22]. Psychometric analyses of the MINI in diagnosing bipolar disorder have indicated high sensitivity and lower specificity [23], a pattern we believe was replicated in our results. Also, 40% of individuals with borderline personality disorder may receive an initial misdiagnosis of bipolar disorder [24]. Since we overlooked the diagnosis of borderline personality disorder in our study, some of these individuals may have been misclassified as having bipolar disorder, thereby overestimating the prevalence rate.

Comorbid psychiatric diagnoses were common in our sample. Over 40% of individuals with one psychiatric disorder had at least one additional disorder categorized by the MINI. In the São Paulo metropolitan area, the overall comorbidity rate was similar (42.5%) [4]. Similarly, the prevalence of psychiatric comorbidities in a national cohort from the United States was estimated to be 54% [25].

Notably, the comorbidity of alcohol and substance-related problems with other diagnoses surpassed 50% in both cohorts. A cross-national analysis, including data from Brazil, revealed a comorbid psychiatric diagnosis in 43.9% of the individuals diagnosed with alcohol use disorder and 36.9% among those diagnosed with substance use disorder [26, 27]. Upon visual inspection of each pair of diagnoses, our data showed that major depressive disorder correlated with generalized anxiety disorder and alcohol and substance-related problems as previously described [26, 27].

We observed a similar prevalence of mental disorders among men and women in the younger cohort. These proportions stand out because studies have traditionally shown a higher prevalence of mental disorders among women [4, 28]. Our cross-sectional design prevents us from concluding whether the observed sex at birth disparities between the two cohorts are due to age-specific or cohort-specific features. However, we propose some hypotheses for this phenomenon.

First, previous studies classified age with a broader span (e.g., 18–34 years) rather than analyzing specific ages [3, 4, 29]. Second, the only diagnosis with a higher prevalence in the younger cohort was substance-related problems, which corresponded to a 5-percentage-point increase compared to the older cohort. According to cross-national population surveys, men have a higher incidence of substance abuse especially in younger ages: 50% of the men who will receive a substance abuse diagnosis do so by the age of 20 years old, which corresponds to the age of the 1994 cohort [29]. Also, we showed high comorbidity rates between substance-related problems and other mental disorders in the younger cohort. Therefore, we believe the prevalence of mental disorders in men from the younger cohort was inflated by the diagnosis of substance-related problems and its possible comorbidities.

In our study, we observed conflicting results regarding the association between marital status and mental disorders. In the older cohort, single individuals exhibited a higher prevalence of mental disorders, whereas in the younger cohort, single individuals showed a lower prevalence. The findings from the older cohort are consistent with previous analyses [12, 30]. However, the results from the younger cohort partially contradict earlier studies. Additionally, we found a gender disparity in the prevalence of mental disorders among married individuals, with married women showing a higher prevalence than married men (data not shown). We hypothesize that early marriage may be associated with socioeconomic deprivation among women in our society, as socially disadvantaged women may be compelled to marry rather than pursue education or employment. A similar finding

Scarabelot *et al. BMC Public Health*   (2024) 24:2465

Page 9 of 12

Table 4 Satisfaction with health and service use characteristics of individuals from two Ribeirão Preto, Brazil birth cohorts (1978/1979 and 1994) with and without psychiatric disorders diagnosed through the MINI in 2016/2017

	Cohort 1978/1979					Cohort 1994				
	No diagnosis		With diagnosis		OR (95% CI)[b]	No diagnosis		With diagnosis		OR (95% CI)[b]
	n	%	n	%		n	%	n	%	
Satisfaction with health										
Satisfied	767	60.9	212	42.1	Reference	483	67.9	152	47.8	Reference
Dissatisfied	493	39.1	292	57.9	**2.14 (1.74–2.64)**	228	32.1	166	52.2	**2.31 (1.76–3.03)**
Missing[a]	3		2			5		3		
Consulted health professional[c]										
No	176	14.0	68	13.5	Reference	116	16.2	67	21.1	Reference
Yes	1085	86.0	437	86.5	1.04 (0.77–1.41)	600	83.8	253	78.9	0.73 (0.52–1.02)
Missing[a]	2		1			0		1		
Consulted psychologist or psychiatrist[c]										
No	1147	91.0	400	79.2	Reference	674	94.1	261	81.3	Reference
Yes	114	9.0	105	20.8	**2.64 (1.98–3.52)**	42	5.9	60	18.7	**3.69 (2.42–5.66)**
Missing[a]	2		1			0		0		
Total	1263	100	506	100		716	100	321	100	

[a] Missing on database / [b] Missing data were not considered for logistic regression analysis / [c] In the previous year

in India has been attributed to the lower social status of women [31].

In general, the educational attainment was better in the younger cohort, probably reflecting the improvements in overall Brazilian education coverage over recent decades [32]. However, individuals with a psychiatric diagnosis had lower educational attainment in both cohorts. Psychiatric diagnoses may cause or result from early school leaving [33]. Additionally, higher education attainment protects against psychiatric disorders [25].

Individuals with psychiatric disorders had seen a mental health professional more frequently over the previous year than those without a diagnosis. However, only one out of five individuals with a mental disorder had seen a psychiatrist or psychologist. These findings align with the São Paulo Megacity Survey, which reported that 15.1% of individuals with a mental disorder had seen a mental health professional during the previous 12 months [34]. Our data on specialized mental health consultations in the previous year surpasses those reported for other upper-middle-income countries, such as Colombia (11.7%) and Mexico (10.3%), and is comparable to data from some high-income countries, such as the United States (22.0%) and Spain (20.5%) [35].

Despite the rates of specialized mental health care found in our analysis, a previous study showed that only approximately 10% of individuals with depression, anxiety, and substance use disorders in São Paulo city had received minimally adequate treatment [34, 36, 37]. São Paulo city and Ribeirão Preto are part of the southeastern region of Brazil, the wealthiest part of the country. The southeastern region centralizes 53.4% of all psychiatrists in Brazil (a ratio of 12.84 psychiatrists per 100,000 inhabitants) compared to only 2.1% of the psychiatrists in the northern region (a ratio of 0.69 psychiatrists per 100,000 inhabitants) [38]. These data suggest that the mental health gap remains significant in Brazil, even in the country's wealthiest region.

However, in our sample, approximately 80% of individuals with a psychiatric diagnosis had consulted a non-specialized health professional in the previous year, a rate similar to that of individuals without a psychiatric diagnosis. Therefore, our data reinforce the premise of the World Health Organization's Mental Health Gap Action Program (mhGAP) that the integration of mental health care into non-specialized health settings may be an effective strategy to address the mental health gap [39].

Most individuals with a psychiatric diagnosis of our sample were dissatisfied with their health and significantly differed from those without a diagnosis. Health-related quality-of-life comparisons between individuals with and without mental disorders are scarce in the scientific literature. However, patient-related outcomes may provide a comprehensive view of the impact of a

psychiatric disorder on a patient's life [40]. Our results suggest that satisfaction with health is responsive to the presence of a mental disorder; therefore, it is a potential outcome to estimate the influence of psychopathology on the patient.

The odds of suicide risk were 5.6 to 9.1 times higher among individuals with mental disorders in our sample. Also, they were five times more likely to report a previous suicide attempt. Our findings are consistent with a recent meta-analysis that estimated the relative risk of suicide associated with psychiatric disorders to be 7.5 [41].

The SRQ-20 demonstrated satisfactory performance in our sample. The most adequate cutoff points in our sample were the same as those described in the Brazilian validation study [18]. However, this is the first time that the SRQ-20 was tested with the MINI as the gold standard, which naturally impairs comparisons with previous studies. Also, our sample comprised young adults from two birth cohorts instead of primary care patients, the instrument's original target population.

Our study has several limitations. First, only individuals who accepted the invitation and attended the assessment were included. Hence, we composed a convenience sample from two birth cohorts rather than a mathematically representative sample of the city population or the total cohort. Individuals who agreed to participate differed from the total cohort in sex at birth and maternal education, which may limit the generalizability of our results to the entire cohort. Wide advertising in the local media and invitations by phone numbers and addresses previously collected attenuated selection bias. Second, we were unable to assess all possible mental disorders (e.g., various personality disorders). Nevertheless, the MINI offers a comprehensive diagnostic framework, enabling accurate estimation of general prevalence and comorbidities within our sample. Third, our cross-sectional design from two birth cohorts limited our examination to two restricted age groups; thus, generalizability to some scenarios may be inappropriate. However, comparisons with other population studies showed similar results [4, 26, 27]. Also, our cross-sectional design prevents analysis of causality and the complexity of mental disorders across the lifespan. Future studies should consider longitudinal approaches.

Conclusions

Our study highlights the significant and concerning prevalence of psychiatric disorders among young adults and adults from two birth cohorts in Ribeirão Preto, Brazil, with similar rates when compared to larger metropolitan areas. We observed noteworthy rates of comorbid psychiatric disorders, especially alcohol and substance-related disorders. The psychiatric diagnoses were associated with social vulnerabilities, such as lower educational attainment and financial dependence, which reflect the socioeconomic challenges faced by low- and middle-income countries. Despite the negative impacts of mental disorders, including worse self-rated health satisfaction, only a minority of individuals with a psychiatric diagnosis had sought evaluation from a mental health professional. Our findings indicate that, even when examining one of the wealthiest regions in the country, a substantial mental health gap persists in Brazil. Moreover, our data can contribute to the limited scientific literature on psychiatric epidemiology in low- and middle-income countries, potentially informing regional mental health policies.

Abbreviations

AUC	Area under the curve
CI	Confidence interval
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, Fourth edition
GDP	Gross domestic product
HDI	Human development index
MA	Maranhão (Brazilian state)
mhGAP	Mental Health Gap Action Program
MINI	Mini International Neuropsychiatric Interview
OR	odds ratio
aOR	adjusted odds ratio
ROC	Receiver operating characteristics
RS	Rio Grande do Sul (Brazilian state)
SRQ-20	Self-Reporting Questionnaire
STROBE	Strengthening the Reporting of Observational Studies in Epidemiology

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s12889-024-19957-x.

Supplementary Material 1

Data availability

The data that support the findings of this study are available from NESCA (Núcleo de Estudos da Saúde da Criança e do Adolescente), Ribeirão Preto Medical School, University of São Paulo, but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of NESCA.

Declarations

Ethics approval and consent to participate
The Ethics Committee of the Ribeirão Preto Medical School, University of São Paulo, granted approval for this study (process number: 49992521.3.0000.5440). Written informed consent was obtained from all participants in this study.

Consent for publication
Not applicable.

Competing interests
The authors declare no competing interests.

Author details
[1]Department of Neuroscience and Behavior, Ribeirão Preto Medical School, University of São Paulo, Av dos Bandeirantes 3900, Ribeirão Preto 14040-900, Brazil
[2]Leônidas and Maria Deane Institute, Oswaldo Cruz Foundation, Manaus, Brazil
[3]Department of Pediatrics, Ribeirão Preto Medical School, University of São Paulo, Ribeirão Preto, Brazil
[4]Department of Gynecology and Obstetrics, Ribeirão Preto Medical School, University of São Paulo, Ribeirão Preto, Brazil
[5]Postgraduate Program in Epidemiology, Federal University of Pelotas, Pelotas, Brazil

References
1. Rehm J, Shield KD. Global burden of Disease and the impact of Mental and Addictive disorders. Curr Psychiatry Rep. 2019;21.
2. Almeida-Filho N, de Jesus Mari J, Kieling C. A narrative historical review of psychiatric epidemiology in Brazil: Focus on social and cultural determinants of mental health. SSM - Mental Health. 2023;3:100212.
3. Almeida-Filho N, De Jesus Mari J, Coutinho E, França JF, Fernandes J, Andreoli SB, et al. Brazilian multicentric study of psychiatric morbidity. Br J Psychiatry. 1997;171:524–9.
4. Andrade LH, Wang YP, Andreoni S, Silveira CM, Alexandrino-Silva C, Siu ER et al. Mental disorders in megacities: findings from the São Paulo megacity mental health survey, Brazil. PLoS ONE. 2012;7.
5. Nunes MA, Pinheiro AP, Bessel M, Brunoni AR, Kemp AH, Benseñor IM, et al. Common mental disorders and sociodemographic characteristics: baseline findings of the Brazilian Longitudinal Study of Adult Health (ELSA-Brasil). Revista Brasileira De Psiquiatria. 2016;38:91–7.
6. Moscovici L, Balco EM, Degani NC, Bolsoni LM, Marques JMA, Zuardi AW. Associations between primary health care strategies and outcomes of mental disorders. Brazilian J Psychiatry. 2020;42:360–6.
7. Orellana JDY, Ribeiro MRC, Barbieri MA, Saraiva M da, Cardoso C, Bettiol VC et al. H,. Mental disorders in adolescents, youth, and adults in the RPS Birth Cohort Consortium (Ribeirão Preto, Pelotas and São Luís), Brazil. Cad Saude Publica. 2020;36:e00154319.
8. Confortin SC, Ribeiro MRC, Barros AJD, Menezes AMB, Horta BL, Victora CG et al. RPS Brazilian birth Cohort Consortium (Ribeirão Preto, Pelotas and São Luís): history, objectives and methods. Cad Saude Publica. 2021;37.
9. Barbieri MA, Ferraro AA, Simões VMF, Goldani MZ, Cardoso VC, Moura Da Silva AA, et al. Cohort Profile: the 1978-79 Ribeirao Preto (Brazil) birth cohort study. Int J Epidemiol. 2022;51:27–G28.
10. Fabbri CE, Barbieri MA, Silva AM, Gutierrez MR, Bettiol H, Speciali JG, et al. Maternal smoking during pregnancy and primary headache in school-aged children: a cohort study. Cephalalgia. 2012;32:317–27.
11. Cardoso VC, Simões VMF, Barbieri MA, Silva AAM, Bettiol H, Alves MTSSB, et al. Profile of three Brazilian birth cohort studies in Ribeirão Preto, SP and São Luís, MA. Braz J Med Biol Res. 2007;40:1165–76.
12. Gutiérrez-Rojas L, Porras-Segovia A, Dunne H, Andrade-González N, Cervilla JA. Prevalence and correlates of major depressive disorder: a systematic review. Brazilian J Psychiatry. 2020;42:657–72.
13. Lund C, Breen A, Flisher AJ, Kakuma R, Corrigall J, Joska JA, et al. Poverty and common mental disorders in low and middle income countries: a systematic review. Soc Sci Med. 2010;71:517–28.
14. Sheehan DV, Lecrubier Y, Sheehan KH, Amorim P, Janavs J, Weiller E et al. The Mini-International Neuropsychiatric Interview (M.I.N.I.): The development and validation of a structured diagnostic psychiatric interview for DSM-IV and ICD-10. Journal of Clinical Psychiatry. 1998;59 SUPPL. 20:22–33.
15. Amorim P. Mini International Neuropsychiatric interview (MINI): validação de entrevista breve para diagnóstico de transtornos mentais. Revista Brasileira De Psiquiatria. 2000;22:106–15.
16. de Azevedo Marques JM, Zuardi AW. Validity and applicability of the Mini International Neuropsychiatric interview administered by family medicine residents in primary health care in Brazil. Gen Hosp Psychiatry. 2008;30:303–10.
17. Harding TW, Climent CE, De Arango MV, Baltazar J, Ibrahim HHA, Ladrido-Ignacio L, et al. Mental disorders in primary health care: a study of their frequency and diagnosis in four developing countries. Psychol Med. 1980;10:231–41.
18. Mari JJ, Williams P. A validity study of a psychiatric screening questionnaire (SRQ-20) in primary care in the city of Sao Paulo. Br J Psychiatry. 1986;148:23–6.
19. Gonçalves DM, Stein AT, Kapczinski F. Avaliação De Desempenho do self-reporting questionnaire como instrumento de rastreamento psiquiátrico: um estudo comparativo com o structured clinical interview for DSM-IV-TR. Cad Saude Publica. 2008;24:380–90.
20. Beusenberg M, Orley JH. World Health Organization. A User's guide to the self reporting questionnaire (SRQ / compiled by M. Beusenberg and J. Orley. 1994;:ONLINE.
21. Kessler RC, Angermeyer M, Anthony JC, DE Graaf R, Demyttenaere K, Gasquet I, et al. Lifetime prevalence and age-of-onset distributions of mental disorders in the World Health Organization's World Mental Health Survey Initiative. World Psychiatry. 2007;6:168–76.
22. Clemente AS, Diniz BS, Nicolato R, Kapczinski FP, Soares JC, Firmo JO, et al. Bipolar disorder prevalence: a systematic review and meta-analysis of the literature. Revista Brasileira De Psiquiatria. 2015;37:155–61.
23. Rodrigues GS, Pellini GL, Rocha R, Lima AF, Pio de Almeida Fleck M, Panzen-hagen AC, et al. Diagnosis of bipolar and major depressive disorders: the appropriateness of MINI compared to the clinical interview in a sample of patients with mood disorders in tertiary mental health care. J Psychiatr Res. 2024;169:341–6.
24. Ruggero CJ, Zimmerman M, Chelminski I, Young D. Borderline personality disorder and the misdiagnosis of bipolar disorder. J Psychiatr Res. 2010;44:405–8.
25. Barr PB, Bigdeli TB, Meyers JL. Prevalence, Comorbidity, and Sociodemographic correlates of Psychiatric diagnoses reported in the all of Us Research Program. JAMA Psychiatry. 2022;79:622.
26. Glantz MD, Bharat C, Degenhardt L, Sampson NA, Scott KM, Lim CCW et al. The epidemiology of alcohol use disorders cross-nationally: findings from the World Mental Health surveys. Addict Behav. 2020;102.
27. Harris MG, Bharat C, Glantz MD, Sampson NA, Al-Hamzawi A, Alonso J, et al. Cross-national patterns of substance use disorder treatment and associations with mental disorder comorbidity in the WHO World Mental Health Surveys. Addiction. 2019;114:1446–59.
28. Errazuriz A, Avello-Vega D, Ramirez-Mahaluf JP, Torres R, Crossley NA, Undurraga EA, et al. Prevalence of depressive disorder in the adult population of Latin America: a systematic review and meta-analysis. Lancet Reg Health - Americas. 2023;26:100587.
29. McGrath JJ, Al-Hamzawi A, Alonso J, Altwaijri Y, Andrade LH, Bromet EJ, et al. Age of onset and cumulative risk of mental disorders: a cross-national analysis of population surveys from 29 countries. Lancet Psychiatry. 2023;10:668–81.
30. Regier DA, Farmer ME, Rae DS, Myers JK, Kramer M, Robins LN, et al. One-month prevalence of mental disorders in the United States and sociodemographic characteristics: the Epidemiologic Catchment Area study. Acta Psychiatr Scand. 1993;88:35–47.
31. Cheng HG, Shidhaye R, Charlson F, Deng F, Lyngdoh T, Chen S, et al. Social correlates of mental, neurological, and substance use disorders in China and India: a review. Lancet Psychiatry. 2016;3:882–99.
32. Helene O. Evolução Da Escolaridade Esperada no Brasil Ao Longo do século XX. Educação E Pesquisa. 2012;38:197–216.
33. Esch P, Bocquet V, Pull C, Couffignal S, Lehnert T, Graas M, et al. The downward spiral of mental disorders and educational attainment: a systematic review on early school leaving. BMC Psychiatry. 2014;14:237.

34. Wang YP, Chiavegatto Filho ADP, Campanha AM, Malik AM, Mogadouro MA, Cambraia M, et al. Patterns and predictors of health service use among people with mental disorders in São Paulo metropolitan area, Brazil. Epidemiol Psychiatr Sci. 2017;26:89–101.

35. Evans-Lacko S, Aguilar-Gaxiola S, Al-Hamzawi A, Alonso J, Benjet C, Bruffaerts R, et al. Socio-economic variations in the mental health treatment gap for people with anxiety, mood, and substance use disorders: results from the WHO World Mental Health (WMH) surveys. Psychol Med. 2018;48:1560–71.

36. Alonso J, Liu Z, Evans-Lacko S, Sadikova E, Sampson N, Chatterji S, et al. Treatment gap for anxiety disorders is global: results of the World Mental Health Surveys in 21 countries. Depress Anxiety. 2018;35:195–208.

37. Degenhardt L, Glantz M, Evans-Lacko S, Sadikova E, Sampson N, Thornicroft G, et al. Estimating treatment coverage for people with substance use disorders: an analysis of data from the World Mental Health surveys. World Psychiatry. 2017;16:299–307.

38. Razzouk D, Cheli Caparroce D, Sousa A. Community-based mental health services in Brazil. Consortium Psychiatricum. 2020;1:60–70.

39. World Health Organization. Mental Health Gap Action Programme (mhGAP) guideline for mental, neurological and substance use disorders. Geneva; 2023.

40. Revicki DA, Kleinman L, Cella D. A history of health-related quality of life outcomes in psychiatry. Dialogues Clin Neurosci. 2014;16:127–35.

41. Too LS, Spittal MJ, Bugeja L, Reifels L, Butterworth P, Pirkis J. The association between mental disorders and suicide: a systematic review and meta-analysis of record linkage studies. J Affect Disord. 2019;259:302–13.

Publisher's note