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Original Article

Mapping the global, regional and national burden of bipolar disorder from 1990 to 2019: trend analysis on the Global Burden of Disease Study 2019

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Background

Data on trends in the epidemiological burden of bipolar disorder are scarce.

Aims

To provide an overview of trends in bipolar disorder burden from 1990 to 2019.

Method

Revisiting the Global Burden of Disease Study 2019, we analysed the number of cases, calculated the age-standardised rate (per 100 000 population) and estimated annual percentage change (EAPC) of incidence, prevalence and years lived with disability (YLDs) for bipolar disorder from 1990 to 2019. The independent effects of age, period and cohort were estimated by the age–period–cohort modelling.

Results

Globally, the bipolar disorder-related prevalent cases, incident cases and number of YLDs all increased from 1990 to 2019. Regionally, the World Health Organization Region of the Americas accounted for the highest estimated YLD number and rate, with the highest age-standardised prevalence rate in 1990 and 2019 and highest EAPC of prevalence. By sociodemographic index (SDI) quintiles, all five SDI regions saw an increase in estimated incident cases. Nationally, New Zealand reported the highest age-standardised rate of incidence, prevalence and YLDs in 1990 and 2019. The most prominent age effect on incidence rate was in those aged 15–19 years. Decreased effects of period on incidence, prevalence and YLD rates was observed overall and in females, not in males. The incidence, prevalence and YLD rates showed an unfavourable trend in the younger cohorts born after 1990, with males reporting a higher cohort risk than females.

Conclusions

From 1990 to 2019, the overall trend of bipolar disorder burden presents regional and national variations and differs by age, sex, period and cohort.

Keywords

Bipolar disorder; burden; prevalence; incidence; trend analysis.

Bipolar disorder is a recurrent debilitating mental illness with a complex aetiology.[1] Nonetheless, research specifically reporting the epidemiological trend of bipolar disorder, as well as its contributing factors, is relatively rare. According to the Global Burden of Disease (GBD) Study 2019, the global age-standardised prevalence rate (ASPR) of bipolar disorder has remained consistent between 1990 (ASPR = 490.1 per 100 000 people; 95% uncertainty interval (UI) 411.0–576.5) and 2019 (ASPR = 489.8 per 100 000 people; 95% UI 407.5–580.6).[2] When documented together with other common mental disorders, such as depressive disorders (in 2019, ASPR = 3440.1 per 100 000 people) and anxiety disorders (in 2019, ASPR = 3779.5 per 100 000 people), data regarding the disease burden of bipolar disorder seemed to fade into the background.[2] Although the study report showed the disease burdens of 12 groups of mental disorders from 1990 to 2019, it failed to fully capture the disease burden of bipolar disorder, as well as disease-specific temporal trend and influencing factors.[2]

An array of biological and environmental factors relate to morbidity in bipolar disorder. The clinical presentations and trajectory of bipolar disorder seem to differ in males and females.[3] Socioeconomic status is potentially related to treatment response to mood stabilisers in bipolar disorder,[4] but findings are inconsistent across the literature.[4,5] The mortality risks of bipolar disorder can also be influenced by age, period and birth cohort effects. In recent decades, bipolar disorder appears to be increasingly prevalent among younger age groups.[6] The rate of bipolar diagnosis among American youth who visited out-patient clinics increased rapidly by 40 times between 1994–1995 and 2002–2003, although the rate for adults only doubled over the same period.[7] In Brazil between 2005 and 2014, the incidence of bipolar disorder among children and adolescents increased by 34.2% in the north-east region, but by 12.4% in the general Brazilian population.[6] These findings revealed the geographical inequalities and potential effects of age, period or birth cohort on trends in bipolar disorder burden, which might be simultaneously influenced by the introduction of new diagnosis and treatment strategies,[5] as well as mental health-related policies. Therefore, exploring the effects of age, period and birth cohort on bipolar disorder burden helps to identify successes and gaps in prevention and treatment practices.

There are ongoing efforts towards a comprehensive and impartial understanding of global burden trends for bipolar disorder. In August 2016, the first GBD study addressing the prevalence and disability-adjusted life years (DALYs) for bipolar disorder was published based on GBD 2013 findings across 188 countries.[8] In June 2020, the GBD 2017 study updated the age- and sex-specific bipolar disorder incidence and DALYs, as well as their relationships with the sociodemographic index (SDI) and human development index (HDI) across 195 countries and territories.[9] In the latest GBD study of mental illnesses (GBD 2019),[2] information regarding bipolar disorder is limited and no trend analysis has been carried out. Each of the aforementioned studies measured only part of the three parameters (prevalence, incidence and DALYs or years lost to disability, YLDs) and did not estimate the age,

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cohort and birth cohort effects on the disease burden of bipolar disorder. To fill these research gaps, here we aimed to quantify, for the period 1990–2019, the trend of bipolar disorder incidence, prevalence and YLDs at global, regional and national levels across 204 countries and territories and to evaluate independent effect estimates of age, period and birth cohort on the burden of bipolar disorder.

Method

Data source

The GBD 2019 study was a large international collaboration project supported by the Institute for Health Metrics and Evaluation (IHME) and maintained by ongoing multinational collaboration.[10] These accessible epidemiological data have been used in the estimation of the global burden of 369 diseases and injuries and 87 risk factors for different age groups and sexes in 204 countries and territories between 1990 and 2019.[10]

We obtained and utilised repeated cross-sectional data, including numbers and age-standardised rates (ASRs) with the 95% UI, on incidence, prevalence and YLDs by sex, age, region and country for bipolar disorder over three decades. Specifically, the age-standardised incidence rate (ASIR) corresponds to the number of incident cases per 100 000 persons. The ASPR corresponds to the number of prevalent cases per 100 000 persons after age standardisation, and the age-standardised YLD rate (ASYR) corresponds to the years lived with disability per 100 000 persons after age standardisation. The 95% UI was a range of values that reflected the certainty of an estimate based on the 25th and 975th ordered values of 1000 draws of the posterior distribution.

We also obtained information on the SDI of each country or territory, which is generated from a combination of lag distributed income per capita, mean education for individuals aged 15 years and older and total fertility rate in females under the age of 25 years.[10] This measure, scaled from 0 to 1, represents the social and economic conditions for health outcomes in each location. Higher values denote higher socioeconomic levels. Based on the SDI values, the countries are categorised into five SDI quintiles: low-, low-middle-, middle-, high-middle- and high-SDI regions.

Case definition

The case definition for bipolar disorder in GBD 2019 was predominately according to ICD-10 and DSM-IV-TR, including bipolar I disorder, bipolar II disorder, cyclothymia and bipolar disorder not otherwise specified.[2] We estimated the whole burden of the bipolar disorder spectrum simultaneously, rather than individually for each subtype of bipolar disorder.

The Institutional Review Board of the First Affiliated Hospital, Zhejiang University School of Medicine waived its approval because data used were publicly available. This study follows the Guidelines for Accurate and Transparent Health Estimates Reporting for cross-sectional studies.[11]

Statistical analysis

Analysis of overall temporal trends

The first aim of this study was to explore the temporal trend of incidence, prevalence and YLD rates for bipolar disorder from 1990 to 2019. To quantify such trends in a specified time interval, an ASR-estimated annual percentage change (EAPC) measurement was applied. Assuming a linear relationship between the natural logarithm of ASR and time, the regression-line-fitted rate was determined as follows:[12]

$$Y = \alpha + \beta X + \varepsilon$$

where Y is ln(ASR), X is the calendar year, ε is the error term and β is the positive or negative ASR trend. The EAPC was calculated based on the formula $EAPC = 100 \times (\exp(\beta) - 1)EAPC = 100 \times (\exp(\beta) - 1)$, and the 95% confidence interval (CI) of the EAPC value was also obtained from the linear regression model.[12] If the EAPC estimation and the lower boundary of its 95% CI were both >0, the ASR was considered to be growing in trend. On the contrary, if the EAPC estimation and the upper boundary of its 95% CI were both <0, the ASR was considered to be declining in trend. Otherwise, ASR was regarded as stable.

We reported the global, regional and national trends of bipolar disorder. To account for the gender disparity, we estimated male: female ASIR ratio (and the male:female ASPR and ASYR ratios) in the same year. Additionally, the relative change in a certain measure of bipolar disorder (incidence, prevalence and YLDs) between 1990 and 2019 was computed to be:

$$\text{Relative change} = \frac{(\text{numbers of incidence/prevalence/YLDs in 2019} - \text{numbers of incidence/prevalence/YLDs in 1990})}{\text{numbers of incidence/prevalence/YLDs in 1990}}$$

We also assessed the relationships between ASR and SDI values at the regional and national levels to further investigate the ASR-influencing elements.

Age–period–cohort analysis

The second goal was to use age–period–cohort (APC) analysis to evaluate independent effect estimates of age, period and birth cohort on the incidence, prevalence and YLD rates of bipolar disorder. The age effect represents the social and biological processes of ageing.[13] The period effect reflects events and alterations across time affecting the incidence, prevalence and YLD rates of bipolar disorder in all age groups (e.g. the updating of diagnostic criteria, preventive measures or treatment innovations). The cohort effects refer to changes in disease burden due to varying degrees of risk factor exposure among different generations of the population.[13]

Before running the APC analysis, we processed the data in a desired format. Owing to a paucity of data, we did not include age groups under 10 years old. Next, we tabulated the remaining data, which included: (a) 18 age groups, from 10–14 years old to 95+ years old in successive 5-year age intervals; (b) six consecutive 5-year calendar periods, from 1990–1994 (mid-year, 1992.5) to 2015–2019 (mid-year, 2017.5); and (c) 23 consecutive 5-year birth cohorts, from 1893–1897 (mid-year, 1895) to 2003–2007 (mid-year, 2005). In this analysis, the central calendar period (2002.5, 2000–2004) was used to calculate the period rate ratio (RR), and the central birth cohort (1950, 1948–1952) was used as the reference to determine the cohort RR.

Estimable parameters were derived using the APC Web Tool[14] (Biostatistics Branch, National Cancer Institute, Bethesda, MD; http://analysistools.nci.nih.gov/apc/). The main parameters were listed as follows: (a) the net drift, which is a log-linear trend by calendar year and birth cohort, showing the overall annual percentage change; (b) the local drifts, which are the log-linear trends for each age group by calendar year and birth cohort, showing annual percentage changes for each age group; (c) the longitudinal age curves, which display the fitted longitudinal ASR in the reference cohort adjusted for period deviations; (d) the period RR, which

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refers to the relative risk in a period relative to the reference period after adjusting for age and non-linear cohort effects; (e) the cohort RR, which refers to the relative risk of a birth cohort in comparison to the reference birth cohort after adjusting for age and non-linear period effects. The Wald chi-squared test was employed to assess the significance of the estimable parameters and functions. We reported the overall age, period and cohort effects of bipolar disorder and further categorised these effects by sex and SDI region.

All statistics were performed using the R program (Windows, Version 4.1.3, R Core Team). $P < 0.05$ (two-sided) was regarded as significant.

Results

The following results are based on a revisiting of GBD findings regarding the global burden of bipolar disorder from 1990 to 2019. All original data are available on the IHME website (https://ghdx.healthdata.org/gbd-2019).

Global trends

Overall, there were 24.8 million estimated prevalent cases of bipolar disorder (95% UI 20.6–29.4) in 1990 and 39.5 million prevalent cases (95% UI 33.0–46.8) in 2019, with an increase of 59.3% from 1990 to 2019 (Table 1). No remarkable change was observed in the ASPR between 1990 and 2019 (EAPC = −0.001, 95% CI −0.009 to 0.007). Although the ASPR of bipolar disorder in females remained higher than that in males, the trend of the EAPC was decreasing for females (EAPC = −0.058, 95% CI −0.065 to −0.050) but increasing for males (EAPC = 0.062, 95% CI 0.053–0.071).

Additionally, bipolar disorder accounted for 2.2 million estimated incident cases (95% UI 1.9–2.7) in 1990 and 3.4 million cases (95% UI 2.8–4.0) in 2019 (Table 1). The ASIR increased between 1990 and 2019, with an EAPC of 0.128 (95% CI 0.113–0.143). The ASIR showed an increasing trend in both females (EAPC = 0.108; 95% CI 0.094–0.122) and males (EAPC = 0.149; 95% CI 0.133 to 0.165).

The number of YLDs increased from 5.3 million (95% UI 3.3–8.2) in 1990 to 8.5 million (5.2–13.0) in 2019, with a growing trend in the ASYR (EAPC = 0.015; 95% CI 0.008–0.023) (Table 1). Notably, the changing trend in YLDs in females (EAPC = −0.043; 95% CI −0.049 to −0.036) and males (EAPC = 0.078; 95% CI 0.069–0.087) was the opposite (Table 1).

Regional trends

The World Health Organization (WHO) Member States are grouped into six regions. Although the ASIR and ASPR remained almost constant in the African Region and Eastern Mediterranean Region, the estimated incident cases and prevalent cases remarkably doubled overall between 1990 and 2019 (Table 1). The Region of the Americas had the highest ASPR in 1990 (816.8 per 100 000 population; 95% UI 704.4–934.5) and 2019 (845.1 per 100 000 population; 95% UI 721.8–947.3), with the highest EAPC in the ASPR (EAPC = 0.123; 95% CI 0.114–0.131), and accounted for the highest estimated number of YLDs. On the contrary, the Western Pacific Region had the lowest ASPR in 1990 (263.5 per 100 000 population; 95% UI 221.4–306.9) and 2019 (256.5 per 100 000 population; 95% UI 214.9–300.4), with an EAPC of −0.104 (95% CI −0.117 to −0.091), and accounted for the lowest number of YLDs (Table 1).

The GBD regional classification system divided the 204 countries and territories into 21 regions. Except for Central Europe and Eastern Europe, the estimated incident cases, prevalent cases and number of YLDs increased in most regions between 1990 and 2019 and even doubled in Oceania, Central Sub-Saharan Africa and Eastern Sub-Saharan Africa. Western Europe accounted for the highest YLDs (0.8 million; 95% UI 0.5–1.2) in 1990, whereas South Asia accounted for the highest YLDs (1.4 million; 95% UI 0.9–2.1) in 2019. The ASYR grew most rapidly in Southern Latin American countries (EAPC = 0.299; 95% CI 0.245–0.352), but decreased slightly in regions including Central Asia, the Caribbean, Central Latin America, North Africa and the Middle East, North America–high income, Oceania and Southern Sub-Saharan Africa (Table 1).

National trends

The 20 countries with the highest ASIRs of bipolar disorder are displayed in Fig. 1. Notably, most of these high-scoring countries are located in Oceania and Southern Latin America. New Zealand reported the highest ASIR in both 1990 (113.9 per 100 000 population; 95% UI 94.6–135.7) and 2019 (117.0 per 100 000 population; 95% UI 97.3–139.1) (ASIRs for all 204 countries are shown Supplementary Table 1 and Supplementary Fig. 1, available at https://dx.doi.org/10.1192/bjp.2023.127), the highest ASPR in 1990 (1482.9 per 100 000 population; 95% UI 1244.1–1745.0) and 2019 (1506.4 per 100 000 population; 95% UI 1259.7–1769.8) (Fig. 2; Supplementary Table 1; Supplementary Fig. 2), as well as the highest ASYR in 1990 (318.5 per 100 000 population; 95% UI 194.7–489.8) and 2019 (324.2 per 100 000 population; 95% UI 195.8–495.4) (Supplementary Table 1; Supplementary Figs 3, 4).

Between 1990 and 2019, Argentina had the most pronounced increase in ASIR, from 76.8 per 100 000 population (95% UI 60.2–95.2) to 81.8 per 100 000 population (95% UI 64.4–100.1) (EAPC = 0.3; 95% CI 0.25–0.36) (Fig. 1; Supplementary Table 1; Supplementary Fig. 2); in ASPR, from 977.6 per 100 000 population (95% UI 747.4–1225.8) to 1039.1 per 100 000 population (95% UI 717.6–1290.2) (EAPC = 0.3; 95% UI 0.24–0.35) (Fig. 2; Supplementary Table 1; Supplementary Fig. 2); and in ASYR, from 211.9 per 100 000 population (95% UI 123.0–325.3) to 225.2 per 100 000 population (95% UI 131.4–347.0) (EAPC = 0.3; 95% UI 0.25–0.36) (Supplementary Table 1; Supplementary Figs 3, 4).

To fully display the disease burden of bipolar disorder and its trend from 1990 to 2019, a global map of ASPR, the relative change in prevalent cases and EAPC in the 204 countries and territories is given in Fig. 2. The global maps for the disease burden of bipolar disorder and the ASPRs, incidence and YLDs are shown in Supplementary Figs 1 and 3 respectively.

Global trends by SDI

Between 1990 and 2019, all five SDI regions accounted for an increase in estimated incident cases. Although the high-SDI region accounted for the highest ASIR over the period, the most pronounced increment in number was in the low-SDI region, from 0.2 million (95% UI 0.2–0.3) in 1990 to 0.6 million (95% UI 0.4–0.7) in 2019 (Table 1), with a relative change of 130.6%. The highest number of prevalent cases and YLDs between 1990 and 2019 was observed in the high-SDI region (Supplementary Fig. 5). Notably, the ASPR and ASYR slowly decreased in the high-middle- and high-SDI regions, but kept growing in the low-, low-middle- and middle-SDI regions (Table 1; Supplementary Fig. 5). The changing trends in the ASIR, ASPR and ASYR concerning the SDI values at the regional and national levels are displayed in Supplementary Fig. 6.

Globally, from 1990 to 2019, the incidence, prevalence and YLD rates of bipolar disorder were higher in females than in males, but this gap gradually decreased over the three decades (Supplementary Fig. 7). For the SDI regions, compared with males, females had a higher ASIR in the high-middle-, middle-, low-middle- and low-SDI regions, but a lower ASIR in the high-

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Table 1 The number and age-standardised rate (per 100 000) of incidence, prevalence, YLD of bipolar disorders at the global and regional levels in 1990 and 2019, and its temporal trends from 1990 to 2019

	Incidence					Prevalence					YLD				
	1990		2019		1990–2019	1990		2019		1990–2019	1990		2019		1990–2019
Characteristics	Number, No. (95% UI)	ASR, No. (95% UI)	Number, No. (95% UI)	ASR, No. (95% UI)	EAPC, No. (95% CI)	Number, No. (95% UI)	ASR, No. (95% UI)	Number, No. (95% UI)	ASR, No. (95% UI)	EAPC, No. (95% CI)	Number, No. (95% UI)	ASR, No. (95% UI)	Number, No. (95% UI)	ASR, No. (95% UI)	EAPC, No. (95% CI)
Overall	2 242 065 (1867751–2670393)	41.59 (34.82–49.29)	3 388 806 (2835180–4029561)	43.3 (36.07–51.49)	0.128 (0.113 to 0.143)	24 798 455 (20591929–29381735)	490.08 (411.04–576.46)	39 546 461 (32959761–46811445)	489.82 (407.53–580.65)	−0.001 (−0.009 to 0.007)	5 348 080 (3265792–8220750)	105.05 (64.52–160.55)	8502427 (5200033–13046630)	105.43 (64.33–162.04)	0.015 (0.008 to 0.023)
Sex															
Male	1 107 338 (921742–1319319)	40.86 (34.3–48.58)	1 688 254 (1411631–2012593)	42.79 (35.77–50.99)	0.149 (0.133 to 0.165)	11 638 540 (9643030–13810474)	459.36 (384.86–540.57)	18 802 917 (15657908–22286910)	466.94 (388.53–552.91)	0.062 (0.053 to 0.071)	2 537 168 (1547027–3930334)	99.4 (61.02–152.06)	4 085 900 (2483224–6288037)	101.46 (61.68–156.25)	0.078 (0.069 to 0.087)
Female	1 134 727 (945341–1353299)	42.37 (35.42–50.14)	1 700 553 (1420663–2020085)	43.85 (36.42–52.18)	0.108 (0.094 to 0.122)	13 159 915 (10933524–15548082)	520.9 (435.06–613.33)	20 743 544 (17283529–24608866)	512.81 (425.55–609)	−0.058 (−0.065 to −0.05)	2 810 912 (1720937–4290857)	110.72 (68.03–168.99)	4 416 527 (2716945–6758593)	109.43 (66.67–167.46)	−0.043 (−0.049 to −0.036)
Sociodemographic index															
Low	243 594 (193150–301916)	49.76 (40.75–60.34)	561 633 (443848–699153)	50.39 (41.2–61.23)	0.035 (0.032 to 0.038)	2 099 838 (1666377–2582225)	510.05 (413.47–619.01)	4 876 442 (3851255–6034061)	517.24 (418.12–629.62)	0.042 (0.04 to 0.045)	452 180 (272792–701932)	108.57 (65.5–166.83)	1 058 415 (638268–1647608)	110.9 (66.8–170.12)	0.075 (0.072 to 0.078)
Low-middle	441 337 (360897–534883)	40.16 (33.37–48.02)	762 706 (630159–921414)	41.65 (34.54–49.97)	0.112 (0.106 to 0.118)	4 093 966 (3321601–4946077)	424.45 (350.47–504.64)	7 743 269 (6337949–9278445)	440.98 (363.39–525.97)	0.135 (0.133 to 0.138)	883 149 (533692–1355223)	90.55 (55.57–138.51)	1 670 659 (1009162–2561519)	94.62 (57.46–144.43)	0.158 (0.155 to 0.162)
Middle	639 391 (526918–773588)	36.01 (30.13–42.73)	961 490 (802506–1148536)	39.45 (32.93–47.03)	0.291 (0.278 to 0.303)	6 513 746 (5323612–7797316)	401.47 (333.18–474.55)	11 246 002 (9331004–13361314)	435.49 (360.99–516.1)	0.278 (0.275 to 0.281)	1 418 179 (855224–2204685)	86.58 (52.92–133.46)	2 429 996 (1481939–3756744)	94.2 (57.1–145.54)	0.290 (0.285 to 0.294)
Middle-high	475 564 (396286–562340)	40.41 (33.68–47.74)	571 566 (477052–677223)	40.94 (34–48.5)	0.052 (0.005 to 0.099)	5 800 531 (4791131–6890506)	489.1 (405.02–578.43)	7 765 906 (6455656–9173052)	478.63 (395.14–569.49)	−0.086 (−0.106 to −0.065)	1 248 622 (757874–1920436)	105.04 (63.85–160.33)	1 665 025 (1025298–2527930)	103.42 (62.69–158.37)	−0.064 (−0.085 to −0.043)
High	440 532 (380368–509964)	54.28 (46.63–62.26)	528 903 (454946–611485)	55.85 (48.12–63.76)	0.104 (0.097 to 0.111)	6 271 900 (5425356–7159030)	702.45 (606.33–800.6)	7 884 688 (6821508–8996434)	699.2 (603.48–798.18)	−0.013 (−0.02 to −0.006)	1 341 944 (838014–2014334)	150.88 (94.26–226.95)	1 671 828 (1048753–2489339)	150.16 (93.76–226.84)	−0.012 (−0.019 to −0.006)
WHO region															
African Region	266 649 (210966–332374)	55.59 (45.36–67.65)	599 744 (475863–743587)	55.29 (45.09–67.36)	−0.022 (−0.024 to −0.021)	2 303 911 (1821841–2837705)	575.72 (464.99–700.56)	5 306 174 (4191739–6549203)	574.62 (463.52–700.05)	−0.006 (−0.008 to −0.004)	498 686 (300768–775479)	123.21 (74.28–189.17)	1 154 157 (691847–1794680)	123.55 (74.25–189.35)	0.016 (0.012 to 0.02)
Eastern Mediterranean Region	209 696 (165384–259224)	56.47 (46.32–68.21)	412 224 (331802–503934)	55.47 (45.28–67.15)	−0.074 (−0.094 to −0.053)	2 001 620 (1578801–2462467)	644.32 (517.08–784.13)	4 466 977 (3526855–5518410)	643.23 (514.24–783.72)	0.002 (−0.014 to 0.018)	435 150 (259822–680285)	138.65 (82.75–215.87)	968 451 (576119–1508283)	138.36 (82.31–213.62)	0.004 (−0.013 to 0.021)
European Region	474 452 (394464–566938)	54.69 (45.07–65.22)	506 829 (418018–605278)	56 (46.13–66.88)	0.133 (0.114 to 0.152)	6 586 374 (5451162–7817657)	715.22 (588.74–851.64)	7 608 986 (6298136–9025114)	727.49 (596.85–868.4)	0.073 (0.065 to 0.081)	1 408 673 (854006–2140769)	153.57 (93.02–234.04)	1 619 524 (995193–2459221)	156.62 (94.75–239.8)	0.084 (0.075 to 0.092)
Region of the Americas	510 475 (430780–600255)	69.32 (58.67–81.08)	710 600 (604482–825479)	71.11 (60.48–83.33)	0.081 (0.076 to 0.086)	5 779 811 (4958094–6638362)	816.77 (704.36–934.5)	9 052 030 (7759240–10405095)	845.06 (721.76–974.31)	0.123 (0.114 to 0.131)	1 247 814 (775019–1907834)	175.68 (109.49–266.33)	1 940 536 (1221057–2945441)	181.9 (113.46–276.36)	0.125 (0.115 to 0.134)
South-East Asia Region	417 579 (347871–503819)	33.47 (28.03–39.62)	708 576 (590534–839121)	33.54 (28.11–39.71)	0.006 (0.004 to 0.008)	3 929 813 (3243601–4675027)	348.63 (291.64–410.62)	7 269 184 (6063359–8597971)	348.96 (292.12–410.88)	0.003 (0.001 to 0.004)	843 704 (512184–1291622)	73.93 (45.69–113.02)	1 558 995 (966430–2387053)	74.5 (45.85–114.31)	0.032 (0.029 to 0.034)
Western Pacific Region	356 324 (297657–421511)	22.17 (18.64–26)	440 964 (368484–521860)	22.5 (18.88–26.51)	0.039 (0.008 to 0.07)	4 116 684 (3435261–4829232)	263.5 (221.39–306.88)	5 718 999 (4845982–6656989)	256.48 (214.87–300.38)	−0.104 (−0.117 to −0.091)	896 618 (547037–1376310)	56.98 (35.02–87.6)	1 234 044 (753768–1887142)	55.76 (34.11–85.63)	−0.086 (−0.097 to −0.075)
Region															
Asia Pacific–high income	88 972 (74596–105163)	48.53 (40.62–57.13)	86 654 (72328–104046)	48.62 (40.52–57.55)	0.011 (−0.014 to 0.036)	1 173 269 (978822–1372234)	608.4 (505.74–713.83)	1 300 507 (1095926–1512203)	601.05 (496.62–705.99)	−0.034 (−0.07 to 0.001)	254 221 (156092–389791)	132.11 (80.93–203.33)	278 696 (171624–423394)	131.01 (79.47–201.19)	−0.025 (−0.061 to 0.012)
Central Asia	30 551 (24130–38396)	45.25 (35.94–56.01)	42 222 (33358–52658)	45.28 (35.92–56.06)	0.001 (0.001 to 0.002)	322 786 (247410–409840)	514.75 (403.1–649.63)	489 986 (378428–622530)	513.6 (401.51–647.54)	−0.008 (−0.008 to −0.007)	70 321 (40933–109226)	111.44 (65.05–172.05)	106 582 (62511–165214)	111.4 (65.59–171.77)	−0.002 (−0.003 to −0.001)
East Asia	203 114 (170746–240098)	16.16 (13.66–18.8)	248 787 (208824–293121)	16.2 (13.68–18.85)	−0.01 (−0.018 to −0.002)	2 254 460 (1884676–2649353)	182.08 (153.67–211.18)	3 174 645 (2716626–3688838)	182 (153.56–211.09)	0.003 (−0.001 to 0.006)	493 221 (301552–756795)	39.49 (24.3–60.48)	686 681 (420130–1047733)	39.68 (24.36–61.13)	0.021 (0.015 to 0.026)
South Asia	359 634 (300682–432654)	34.94 (29.26–41.19)	652 810 (547713–774133)	34.91 (29.26–41.11)	−0.004 (−0.007 to −0.002)	3 331 055 (2760320–3938054)	361.86 (303.86–423.35)	6 506 531 (5440614–7672287)	361.35 (303.7–423.5)	−0.006 (−0.008 to −0.005)	713 299 (436454–1093058)	76.51 (47.44–116.91)	1 394 579 (863412–2135968)	76.94 (47.71–118.03)	0.023 (0.021 to 0.025)
Southeast Asia	141 410 (115827–172177)	30.97 (25.52–37.11)	217 013 (178814–259904)	30.98 (25.56–37.13)	−0.001 (−0.002 to 0.000)	1 364 223 (1102233–1664199)	331.4 (272.07–399.81)	2 362 999 (1935140–2852940)	331.44 (272.51–399.55)	0.000 (0.000 to 0.001)	296 655 (179749–459237)	71.25 (43.26–109.47)	511 591 (310876–786394)	71.57 (43.43–109.78)	0.022 (0.019 to 0.025)
Australasia	18 433 (15435–21762)	91.47 (76.13–108.07)	24 510 (20497–28724)	92.96 (76.78–110.03)	0.089 (0.068 to 0.111)	254 392 (213820–297219)	1177.48 (988.25–1379.08)	364 293 (310493–417966)	1182.06 (993.71–1373.18)	0.028 (0.017 to 0.039)	54 558 (32767–82247)	252.97 (152.5–380.17)	77 641 (47808–118197)	254.35 (152.96–389.42)	0.033 (0.021 to 0.045)
Caribbean	27 982 (21415–35272)	75.68 (59.4–93.95)	36 115 (28635–44533)	76.05 (59.57–94.33)	0.016 (0.015 to 0.017)	313 699 (235778–399039)	920.03 (704.37–1160.17)	447 949 (344466–562353)	908.21 (695.03–1141.58)	−0.047 (−0.049 to −0.045)	68 332 (39542–106469)	199.35 (115.57–310.16)	96 733 (56405–149158)	196.38 (115.42–302.63)	−0.05 (−0.054 to −0.046)

(*Continued*)

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Table 1 (*Continued*)

Characteristics	Incidence					Prevalence					YLD				
	1990		2019		1990–2019	1990		2019		1990–2019	1990		2019		1990–2019
	Number, No. (95% UI)	ASR, No. (95% UI)	Number, No. (95% UI)	ASR, No. (95% UI)	EAPC, No. (95% CI)	Number, No. (95% UI)	ASR, No. (95% UI)	Number, No. (95% UI)	ASR, No. (95% UI)	EAPC, No. (95% CI)	Number, No. (95% UI)	ASR, No. (95% UI)	Number, No. (95% UI)	ASR, No. (95% UI)	EAPC, No. (95% CI)
Central Europe	58 042 (47959–69585)	45.98 (37.74–55.41)	51 353 (42170–61959)	45.91 (37.76–55.31)	−0.005 (−0.006 to −0.004)	732 126 (596142–886178)	558.18 (450.43–677.6)	726 290 (597785–869976)	556.66 (449.15–675.64)	−0.011 (−0.013 to −0.010)	157 231 (94962–241147)	120.34 (72.15–185.28)	155 094 (94628–237088)	120.51 (72.51–186.14)	0.005 (0.000 to 0.009)
Eastern Europe	107 321 (90453–126472)	46.96 (39.41–55.58)	97 230 (81864–115235)	46.91 (39.38–55.51)	−0.004 (−0.005 to −0.004)	1 267 268 (1072696–1482536)	516.5 (434.64–604.87)	1 234 486 (1043849–1442652)	516.2 (434.73–603.66)	0.000 (−0.001 to 0.000)	270 332 (167273–410377)	110.73 (68.92–168.06)	262 920 (163455–398624)	111.3 (68.99–170.17)	0.024 (0.020 to 0.027)
Western Europe	239 498 (199127–283626)	62.59 (51.74–74.52)	264 359 (217955–315334)	63.75 (52.45–75.48)	0.084 (0.072 to 0.096)	3 834 061 (3153040–4517990)	890.6 (731.59–1055.94)	4 450 332 (3696772–5259940)	901.8 (735.72–1069.3)	0.059 (0.052 to 0.065)	817 188 (500890–1232405)	191.12 (117.22–291.07)	941 872 (580480–1423756)	193.71 (118.31–294.75)	0.064 (0.057 to 0.071)
Andean Latin America	29 998 (22763–38239)	75.27 (59.2–93.28)	48 822 (38259–60908)	75.17 (59.13–92.98)	−0.005 (−0.005 to −0.004)	307 698 (230625–391238)	912.14 (701.26–1142.77)	586 180 (448074–740202)	910.49 (700.57–1142.17)	−0.006 (−0.007 to −0.006)	67 284 (39612–105191)	197.85 (118.31–306.61)	127 711 (74826–199338)	197.94 (115.96–306.56)	0.006 (0.004 to 0.009)
Central Latin America	124 141 (100613–150620)	71.43 (59.15–85.23)	184 821 (152899–220905)	71.31 (58.94–85.11)	−0.009 (−0.012 to −0.006)	1 257 760 (1021328–1509089)	855.23 (704.45–1012.11)	2 224 123 (1827447–2644521)	854.03 (703.04–1015.84)	−0.008 (−0.009 to −0.006)	274 921 (165836–429047)	184.9 (111.79–283.69)	482 092 (291331–741088)	184.86 (111.94–283.81)	−0.008 (−0.011 to −0.005)
Southern Latin America	38 129 (29751–47408)	75.54 (59.23–93.56)	52 958 (42493–64919)	80.48 (63.41–99.02)	0.305 (0.25 to 0.36)	470 228 (362915–584773)	964.49 (746.2–1202.91)	729 383 (567133–907701)	1024.54 (794.62–1273.01)	0.293 (0.24 to 0.346)	101 921 (58955–156121)	208.77 (121.27–319.65)	157 417 (91683–243599)	221.87 (129.38–342.66)	0.299 (0.245 to 0.352)
Tropical Latin America	153 882 (127630–183779)	93.65 (78.65–110.74)	210 372 (177558–247454)	93.53 (78.51–110.55)	−0.005 (−0.005 to −0.004)	1 627 154 (1351694–1904882)	1111.96 (934.71–1287.77)	2 685 005 (2267190–3110889)	1111.09 (933.75–1288.05)	−0.003 (−0.004 to −0.003)	352 116 (214054–547517)	238.68 (147 365.13)	577 592 (354661–886314)	239.39 (146.69–365.52)	0.007 (0.002 to 0.012)
North Africa and Middle East	225 116 (174540–282349)	64.11 (51.38–78.78)	400 594 (318034–494967)	64 (51.04–78.88)	−0.007 (−0.01 to −0.003)	2 251 120 (1728342–2815961)	762.15 (598.86–942.59)	4 722 943 (3671840–5896449)	758.78 (595.66–939.1)	−0.014 (−0.017 to −0.011)	490 061 (286723–763451)	164.32 (97.46–256.7)	1 023 456 (605192–1590701)	163.66 (96.85–253.47)	−0.012 (−0.016 to −0.007)
North America–high income	140 266 (127670–153698)	52.74 (48.01–57.43)	181 414 (163797–198473)	53.23 (48.54–58.07)	0.026 (0.019 to 0.034)	1 850 496 (1728058–1970492)	622.94 (581.7–663.92)	2 433 357 (2272493–2587769)	621.17 (579.46–663.65)	−0.005 (−0.009 to −0.001)	393 505 (250180–573217)	133.01 (84.45–194.44)	510 564 (328797–744335)	132 (84.19–192.34)	−0.019 (−0.026 to −0.013)
Oceania	1634 (1264–2102)	26.97 (21.31–33.76)	3426 (2672–4396)	27.06 (21.4–34)	0.013 (0.013 to 0.013)	14291 (10805–18416)	266.21 (207.04–334.66)	31 397 (2 390 039 949)	265.06 (206.84–333.31)	−0.016 (−0.017 to −0.015)	3093 (1783–4864)	56.85 (33.59–89.12)	6802 (3965–10762)	56.74 (33.4–88.39)	−0.011 (−0.014 to −0.007)
Central Sub-Saharan Africa	27 586 (20908–35366)	53.83 (42.54–67.43)	69 070 (52512–88680)	53.81 (42.48–67.36)	−0.001 (−0.002 to −0.001)	237 551 (178336–304624)	554.2 (431.32–696.49)	597 178 (448602–767522)	554.35 (431.98–696.3)	0.001 (0.001 to 0.001)	50 906 (29405–80419)	117.37 (69.57–185.13)	129 408 (74092–204848)	118.62 (69.94–185.76)	0.041 (0.035 to 0.046)
Eastern Sub-Saharan Africa	103 948 (82211–129990)	58.48 (47.78–70.96)	239 590 (189979–299136)	58.52 (47.75–71.03)	0.001 (0 to 0.002)	861 584 (674833–1063336)	595.8 (480.38–722.68)	2 024 454 (1584958–2499152)	595.56 (480.26–722.63)	−0.002 (−0.003 to −0.002)	186 359 (112730–292001)	127.26 (76.87–197.4)	441 366 (263189–693341)	128.14 (76.9–196.91)	0.034 (0.029 to 0.04)
Southern Sub-Saharan Africa	29 533 (24209–36259)	56.09 (46.52–67.07)	44 806 (37119–54024)	56.02 (46.42–66.97)	−0.002 (−0.003 to −0.002)	253 610 (207637–303565)	552.44 (459.29–654.55)	432 827 (357270–515032)	553.2 (459.04–654.11)	0.006 (0.005 to 0.006)	54 964 (33431–84713)	118.38 (73.12–179.56)	92 725 (56737–143339)	117.8 (72.91–180.02)	−0.015 (−0.025 to −0.005)
Western Sub-Saharan Africa	92 875 (74062–114633)	52.29 (42.84–63.3)	231 880 (184340–286818)	52.27 (42.76–63.27)	−0.002 (−0.003 to −0.001)	819 622 (654967–1001460)	547.25 (445.85–661.1)	2 021 596 (1611579–2476549)	546.64 (445.2–661.4)	−0.004 (−0.005 to −0.003)	177 591 (107726–275870)	117.38 (71.23–179.85)	440 905 (264945–686972)	117.83 (71.49–180.19)	0.017 (0.014 to 0.02)

YLD, years lived with disability; UI, uncertainty interval; ASR, age standardised rate; EAPC, estimated annual percentage change.

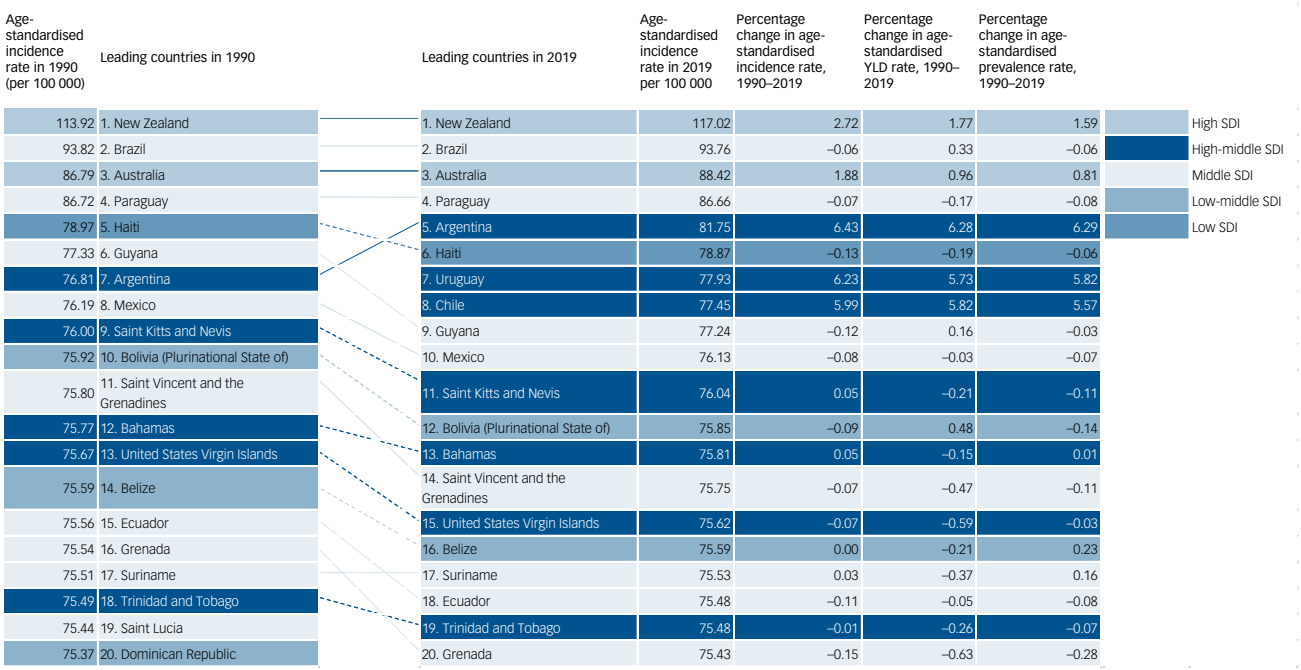

Fig. 1 The 20 countries with the highest age-standardised incidence rates of bipolar disorder in 1990 and 2019, with percentage change in age-standardised incidence rates, years lived with disability (YLD) rates and prevalence rates.

Dashed lines indicate decreasing ranking; solid lines indicate increasing ranking. SDI, sociodemographic index.

SDI region. Females had a higher ASPR than males in all five SDI regions, but the gap was gradually narrowing in the high-, high-middle- and middle-SDI regions, increasing progressively in the low-middle- and low-SDI regions (Supplementary Figs 5, 7). Compared with males, females had a higher ASYR in the high-, high-middle- and middle-SDI regions, but a lower ASYR in the low-middle- and low-SDI regions (Supplementary Fig. 7).

Age, period and cohort effects on the global trend

Between 1990 and 2019, there was a decreasing incidence risk with age overall (net drift −0.0248; 95% CI −0.0494 to −0.00003) in females (net drift −0.0488; 95% CI −0.0754 to −0.0223), but not in males (net drift −0.0012; 95% CI −0.0357 to 0.0334). Regardless of gender, the incidence risk increased in those aged 10–44 years, but decreased in those aged 45–89 years (Supplementary Fig. 8; Supplementary Table 2). The risk of bipolar disorder incidence was highest in those aged 15–19 years for both females and males (Fig. 3; Supplementary Table 3). The risk of prevalence and YLDs also decreased with age overall in both sexes, but increased in those aged 10–39 years (Supplementary Fig. 8; Supplementary Tables 4, 5). The most prominent age effect on bipolar disorder prevalence was in those aged 50–54 years for both females and males (Fig. 3; Supplementary Table 6). The most prominent age effect on the YLD rate of bipolar disorder was in those aged 20–24 years for males and those aged 25–29 years for females (Fig. 3; Supplementary Table 7).

Period effects generally showed a declining risk of bipolar disorder incidence, prevalence and YLDs over the period and in both sexes (Supplementary Tables 8–10). Compared with the reference period of 2000–2004, the period 1990–1994 had the highest period risk for the incidence, prevalence and YLD rates regardless of gender (Supplementary Tables 8–10).

In the 23 consecutive 5-year birth cohorts from 1985–1899 to 2005–2009, the cohort risk for the bipolar disorder incidence, prevalence and YLD rates fluctuated slightly overall, and increased in the successive cohorts since 1990–1995 (Fig. 3; Supplementary Tables 11–13). Compared with the central birth cohort (1950–1954), the earlier cohorts (before 1950) showed a higher risk for incidence, prevalence and YLD rates. In the cohorts earlier than the reference cohort, males had a lower risk for incidence, prevalence and YLD rates than females. In those later than the reference cohort, the risk was higher in males than in females (Fig. 3; Supplementary Tables 11–13).

Age, period and cohort effects by SDI quintiles

The age effects on the incidence, prevalence and YLD rates overall were not significant in the low-SDI region, but the risk increased with age in the low-middle- and middle-SDI regions and decreased in the high-middle- and high-SDI regions (Supplementary Tables 14–16; Supplementary Figs 9–11). Notably, the age group with a higher risk of incidence, prevalence and YLD rates was younger in the high-middle- and high-SDI regions than those in the low-, middle-low- and middle-SDI regions (Supplementary Tables 14–16; Supplementary Figs 9–11). In all SDI regions, the incidence risk was highest in those aged 15–19 years for females and males (Supplementary Table 17; Supplementary Fig. 12). In the high-SDI region, the most prominent age effect on the prevalence and YLD rates was in those aged 20–24. In the other four SDI regions, the most prominent age effect on the prevalence and YLD rate was in those aged 25–29 (Supplementary Tables 18, 19; Supplementary Figs 13, 14).

From 1990 to 2019, an unfavourable period risk on incidence, prevalence and YLD rates was observed in the low-middle- and middle-SDI regions, a decreasing period effect in the high-middle- and high-SDI regions, and a stable risk in the low-SDI region (Supplementary Tables 20–22; Supplementary Figs 12–14).

In the birth cohorts later than the reference cohort (1950–1954), the highest cohort risk for the incidence, prevalence and YLD rates

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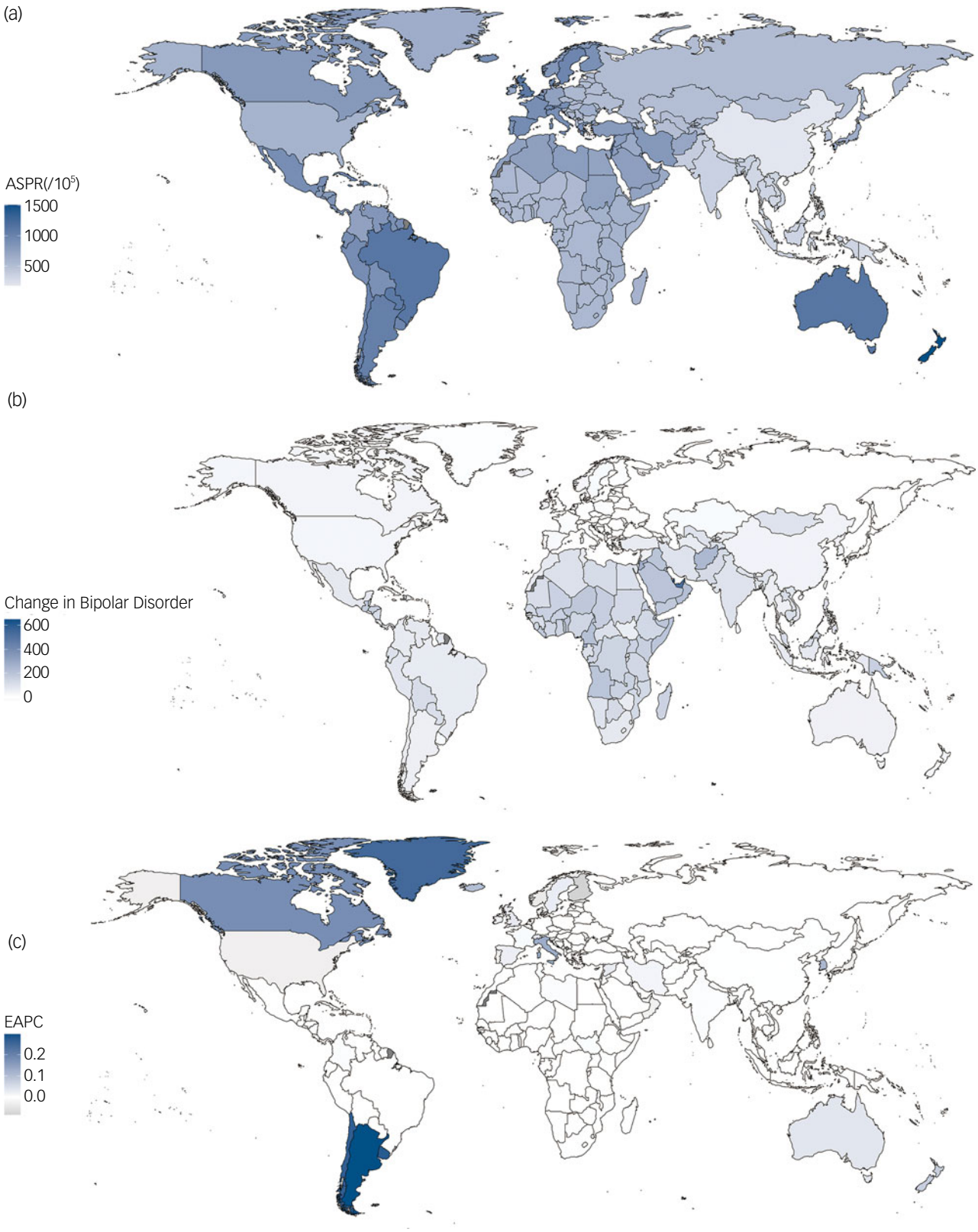

Fig. 2 The global disease burden of bipolar disorder for both sexes in 204 countries and territories.

(a) The age-standardised prevalence rate (ASPR) of bipolar disorder in 2019. (b) The relative change in prevalent cases of bipolar disorder between 1990 and 2019. (c) The estimated annual percentage change (EAPC) in the ASPR between 1990 and 2019.

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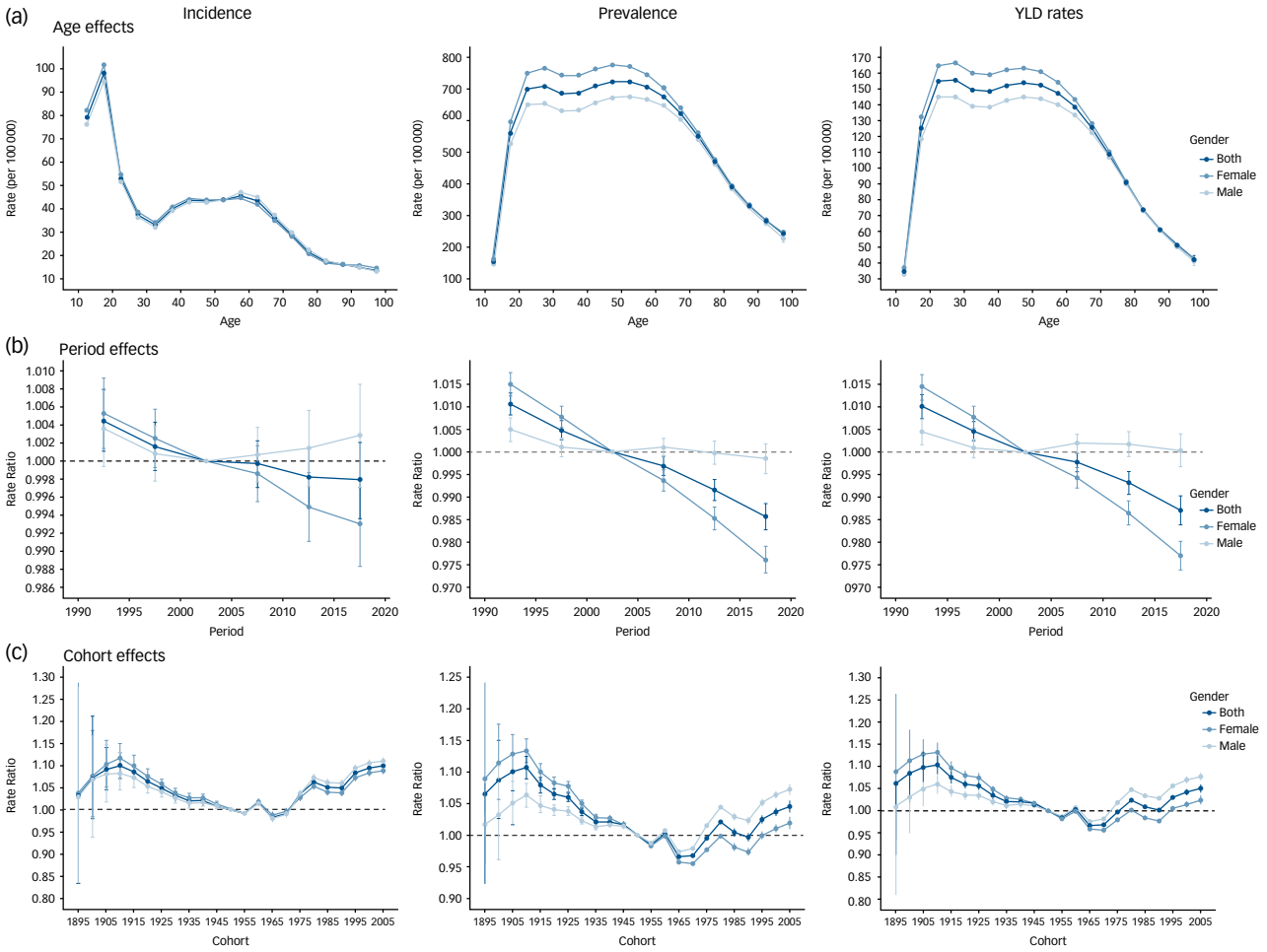

Fig. 3 Age, period and cohort effects on incidence, prevalence and years lived with disability (YLD) rates of bipolar disorder by sex from 1990 and 2019 in those over 10 years of age.

(a) Age effects are shown by the fitted longitudinal age curves of incidence, prevalence and YLD rates (per 100 000 person-years) adjusted for period deviations. (b) Period effects are shown by the relative risk of incidence, prevalence and YLD rates (incidence, prevalence and YLD rate ratio) and computed as the ratio of age-specific rates from 1990–1994 to 2015–2019, with the reference period set at 2000–2004. (c) Cohort effects are shown by the relative risk of incidence, prevalence and YLD rates and computed as the ratio of age-specific rates from the 1895 birth cohort to the 2005 cohort, with the reference cohort set at 1950. The data points and error bars denote incidence, prevalence or YLD rates or rate ratios and their corresponding 95% CIs.

was in the middle-SDI region (Supplementary Tables 23–25; Supplementary Figs 12–14).

Discussion

Main findings

Globally, bipolar disorder receives a significant amount of attention in the field of psychiatry, but it is not adequately addressed in public health and epidemiological research. This study presents a worldwide panorama of trends in burden of bipolar disorder by using three measures (incidence, prevalence and YLDs) across geographical, demographic and socioeconomic stratification, from 1990 to 2019. We found that since 1990, the number of individuals with bipolar disorder had a substantial increased, characterised by geographical disequilibrium, sociodemographic divergence, a younger age structure and a narrowing sex gap between males and females. These new findings will be a crucial reference for future management strategies for bipolar disorder.

Overall trend

Although the bipolar disorder ASPR remained largely consistent globally over the three decades, the ASIR and ASYR had an inconspicuous upward tendency, indicating constant growth in disease burden. The current study revealed an increase in prevalent cases by 59.3%, incident cases by 51.1% and YLDs number by 59.0% between 1990 and 2019. These results are consistent with previous findings.[8,9] The GBD 2013 study reported a 49.1% increase in prevalent cases between 1990 and 2013,[8] and the GBD 2017 study found that incident cases increased by 47.7% and DALYs increased by 54.4%.[9] The growing total number of people with bipolar disorder may be explained by the increase and ageing of the world's population. High suicide and mortality risks are leading clinical challenges when caring for individuals with bipolar disorder. The suicide attempt risk in adults with bipolar disorder has been estimated to be as least 20 times higher than in the general adult population and over 50 times higher in the juvenile population.[15] A systematic review reported the summary standardised mortality ratio for all-cause mortality in bipolar disorder to be 2.05 (95% CI 1.89–2.23) when compared with the general population, which could be mainly attributed to unnatural causes (e.g. suicide and other violent deaths) rather than natural causes (deaths from circulatory, respiratory and infectious diseases and neoplasm).[16] In our study, although the incident cases constantly increased, the ASPR of bipolar disorder that remained stable over time was possibly related to the high suicide and mortality rates. Additionally,

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individuals with bipolar disorder are at a high risk of comorbid non-suicidal self-injury,[17] which can further aggravate the disease burden, such as YLDs. Therefore, public health interventions for preventing new-onset bipolar disorder, reducing the risk of premature mortality, and early and appropriate treatment are needed to reverse the disease burden attributed to bipolar disorder.

Regional and national divergence

Remarkable regional and national divergence in the burden trend of bipolar disorder was observed over the past three decades. The Region of the Americas had the highest ASPR in 1990 and 2019, and accounted for the highest estimated YLDs, and this is likely to be related to the most rapid growth in YLDs from countries in Southern Latin America. Indeed, we found that the top 20 countries with the highest ASIR, ASPR or ASYR were predominantly located in Oceania and Southern Latin America. Notably, Argentina had the most pronounced increase in ASIR, ASPR and ASYR. Among all the five SDI quintiles, although the high-SDI region accounted for the highest prevalence and YLDs, the middle-high- and high-SDI regions presented a slow decreasing trend in ASPR and ASYR, and the low-, low-middle- and middle-SDI regions saw an increasing trend in ASPR and ASYR. Our results were consistent with previous data suggesting that the bipolar disorder prevalence rate varied regionally, with higher rates in North and South America and Australia and low rates in Asian and African countries.[18] Prevalence of risk factors, cultural differences, economic levels, illness stigma and access to mental health services are all potential variables related to the geographical and sociodemographic disparities in the burden trend of bipolar disorder. Coordinated worldwide and nationwide mental health-related policies are needed to tackle this situation.

A younger age structure

One of the most noticeable findings in this report is the ever-increasing disease burden of bipolar disorder among the juvenile population. We found that females and males aged 15–19 had the highest incident risk among all age groups. In addition, the cohort risk for bipolar disorder incidence, prevalence and YLD rates continued to grow in the successive cohorts since 1990–1995 and reached the highest in the 2005–2009 cohort. These results together indicate that the incidence of bipolar disorder exhibits a younger trend. In previous studies, the age at onset of bipolar disorder has been identified as an essential clinical feature that is linked to the hereditary nature and outcomes of the illness.[19] Indeed, terms such as 'paediatric bipolar disorder' and 'early adolescent-onset bipolar disorder' have been frequently used in recent position papers.[20,21] However, whether the early-onset subtype represents a genetically loaded and heterogeneous entity and how this compares with adult-onset bipolar disorder remains a topic rife with controversies.[19] Research focused on early-onset bipolar disorder is still lagging behind and needs more efforts to clarify its aetiology. In our study, we also found that the most prominent age effect on YLDs in males was among those aged 20–24 years old and in females was among those aged 25–29 years old. For adolescents with bipolar disorder, delayed diagnosis and suboptimal treatment, as well as unfavourable treatment outcomes, may contribute to the increasing disease burden in early adulthood.[22] Therefore, urgent and coordinated actions are warranted to identify young individuals at high risk of bipolar disorder, modify the risk factors and promote early diagnosis and intervention in early-onset bipolar disorder.[23,24]

Sex differences

Another conspicuous finding in this report is the narrowing male and female differences regarding the disease burden of bipolar disorder. Previous studies exploring sex differences in the lifetime incidence of bipolar disorder have been inconclusive.[25] We found that although the global male:female ratios of the incidence, prevalence and YLD rates all remained less than 1, there was a constantly increasing trend between 1990 and 2019. However, the changing trend of YLDs in females and males was in opposite directions. In the cohorts earlier than the reference cohort (1950–1954), males had a lower risk for incidence, prevalence and YLDs than females, whereas in those later than the reference cohort, the risk was higher in males than in females. These findings together indicate a steadily increasing burden in young males globally. Sex-dependent phenotypes in individuals with bipolar disorder may be affected by genetic architecture and sex hormones during intrauterine development.[26,27] We hypothesise that the narrowing gap in disease burden between sexes may be partially due to the increasing effects of non-biological factors over biological factors.

Future directions

Our findings update the burden trend of bipolar disorder over the past three decades at global, regional and national levels, and identify remarkable changing trends in different age and sex groups. In general, the burden of bipolar disorder displayed a modest but constant growth between 1990 and 2019. Screening tools for high-risk individuals should be developed and sufficiently validated to facilitate early identification of bipolar disorder. Evidence-based interventions, including pharmacotherapeutic and psychotherapeutic strategies, can also be implemented to prevent new-onset cases especially among the youth. The genuine burden of bipolar disorder will never be alleviated by underdiagnosis but by early prevention and timely and appropriate management.

Strengths and limitations

The strength of the current study is that it provides an up-to-date epidemiological analysis of the global trend of bipolar disorder based on the GBD 2019 findings. This report not only includes the three classic measures (incidence, prevalence and YLDs), as well as their changing trends, at global, regional and national levels, but also employs APC modelling to estimate the independent effects of age, period and birth cohort, thus displaying a clear and multidimensional picture of the trend of bipolar disorder burden over the past three decades.

The limitations of GBD studies have been fully discussed in previous studies.[3,12] When referring to a specific disease, such as bipolar disorder, in our study, some limitations deserve extra attention. For example, case definitions in GBD 2019 for bipolar disorder adhered predominantly to DSM-IV-TR and ICD-10 classifications, which have been most widely used in mental health surveys. The consistency of these classifications across studies may not apply to all cultural contexts. With the emerging use of DSM-5 and ICD-11 classifications in epidemiological studies, more endeavour is needed to assess its impacts on GBD estimates. Inspiringly, the GBD collaborators were committed to emphasising the comparability of measurement by evolving the data processing and synthesis methods to recompute the entire historic time series for changes in case definitions. Another limitation is the potential bias in data sources. The GBD compiles the world's most comprehensive catalogue of surveys, censuses, medical records, administrative health data and health-related financial data.[12] Although many data sources are publicly available, some are not available or need extra authorisation. The IMHE hosts an online catalogue of hundreds of thousands of data sources that has kept growing. Nonetheless, there is always a gap between the diagnostic criteria and real-world practice. For instance, bipolar

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disorder is frequently underdiagnosed, and sometimes overdiagnosed, thus leading to inappropriate or disproportionate treatment and unfavourable prognosis. Different assessment and psychometric instruments can also influence the recognition of bipolar disorder. Therefore, it is a critical dimension of GBD to deal with such a large array of data sources with many potential sources of bias that could arise from underreporting or inconsistent diagnostic practices, potentially affecting the accuracy of the burden estimates. The third limitation is that the disease burden for bipolar disorder was estimated overall rather than by subtype. Characterisation of clinical subtypes is considered an empirical priority for the personalised treatment of bipolar disorder.[28] The GBD study did estimate the burden by individual subtype of bipolar disorder, such as bipolar I disorder, bipolar II disorder and cyclothymia, which may have distinguished clinical characteristics and treatment needs, but failed to provide subtype-specific burden information and facilitate tailored management strategies. In addition, psychiatric and physical comorbidities such as anxiety, substance use and cardiovascular disorders are common in people with bipolar disorder,[29] and cardiovascular disorders have the highest disease burden (as estimated by DALYs) of all GBD diseases and injuries. It has been reported that bipolar disorder predisposed youth to accelerated atherosclerosis and early cardiovascular disease,[30] which constitutes a major cause of premature mortality in individuals with bipolar disorder. Therefore, an examination of the co-occurrence of bipolar disorder with other conditions would provide a more comprehensive picture of the disease burden and inform integrated treatment approaches. However, the GBD data relevant to comorbidity across different diseases and injuries are insufficient. This hinders a holistic understanding of trends in the co-variation of disease burden of bipolar disorder and other interrelated diseases.

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Supplementary material

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Data availability

The data used in this study can be downloaded from the IHME website (https://ghdx.healthdata.org/gbd-2019).

Author contributions

Y.F., P.S. and S.H. designed the study protocol and provided overall guidance. These three authors contributed equally. S.L. conducted data analysis. J.L., S.L. and C.W. prepared the manuscript draft. All authors contributed to the review and editing of the current manuscript. All authors had full access to the data in the study and accept responsibility for submitting this study for publication.

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Declaration of interest

None.

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EXTRA CONTENT ONLINE

Poem

The old psychiatrist at table

Richard E. Kravitz

Each patient, I realise now,
I treated as if a precious piece of crockery,
devoted to their care, so mindful
that they not be chipped or broken,
or, if already cracked and damaged,
to repair them as I could,
to discover to what set they might belong,
their rightful place and function,
to nest them at table
within the company of cutlery and linen,
the gleam of a crystal service.

But now I know, all this time,
they were sitting right across from me
at the same table, each with our own
settings, sometimes matched,
sometimes not, paying less or no attention
to formalities of service, enjoying
shared tastings, savouring each meal
we had prepared without planning,
whipped up for just the occasion,
eating together, quaffing a bold red,
sipping coffee, chewing it over,
the lines, the words and sighs,
coming improvised to our lips,
hungry, but patient, for what we made.

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