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### **Citation**

Rentería, R., Andersson, C., Bendtse, M., Mortier, P., Auerbach, R. P., Bantjes, J., ... Wiers, R. , W. , S. Y. S. , B. , C. (2025). Mental disorders and sexual orientation in college students across 13 countries of differing levels of LGBTQ+ acceptance. *Journal Of Psychiatric Research*, 186, 331-340. doi:10.1016/j.jpsychires.2025.04.021

Version: Publisher's Version

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**Note:** To cite this publication please use the final published version (if applicable).



## Mental disorders and sexual orientation in college students across 13 countries of differing levels of LGBTQ+ acceptance

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<https://doi.org/10.1016/j.jpsychires.2025.04.021>

Received 21 February 2024; Received in revised form 26 February 2025; Accepted 12 April 2025

Available online 18 April 2025

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## ARTICLE INFO

## Keywords:

Sexual orientation

College student

Mental disorder

DSM-5

Social acceptance

Cross-national

## ABSTRACT

Mental health disparities have been reported among sexual minority individuals; minority stress theory posits that such disparities are a result of stigma and discrimination. We estimated the prevalence of mental disorders across sexual orientation groups among first-year college students and whether differences across sexual orientation groups varied by gender and country-level LGBTQ+ (lesbian, gay, bisexual, transgender, queer) social acceptance. Using data ( $N = 53,175$ ; 13 countries) from the World Mental Health Surveys International College Surveys, we performed multilevel logistic regressions to estimate the associations between sexual orientation (i.e., heterosexual, heterosexual with same-gender attraction [SGA], gay/lesbian, bisexual, asexual, questioning, and other) and five twelve-month DSM-5 disorders (major depressive disorder, generalized anxiety disorder, panic disorder, alcohol use disorder, drug use disorder). Heterosexual students with SGA (AORs 1.30–2.15), gay/lesbian (AORs 1.49–2.70), bisexual (AORs 2.26–3.49), questioning (AORs 1.38–2.04), and “other” (AORs 1.76–2.94) students had higher odds of all disorders compared to heterosexual students with no SGA; asexual students did not. Significant interactions with gender show that the gender difference in prevalence was greater among bisexual individuals for most disorders and among all sexual minorities (except “other”) for drug use disorder. Significant interactions with country level LGBTQ+ social acceptance showed some sexual minority groups had lower odds (AORs 0.83–0.95) of disorder as country-level acceptance increased. These findings provide further evidence of mental disorder disparities across a wide range of sexual orientations and how these disparities vary by gender and societal LGBTQ+ acceptance in students from diverse countries.

## 1. Introduction

Sexual minority (e.g., gay, lesbian, bisexual) individuals are more likely to meet criteria for mental and substance use disorders compared to their heterosexual counterparts (Bränström, 2017; Gmelin et al., 2022; Kidd et al., 2016; King et al., 2008; Plöderl and Tremblay, 2015; Sandfort et al., 2014). These disparities have also been found among other non-LGB (lesbian, gay, bisexual) sexual minority groups (e.g., heterosexual-identified individuals with same-gender attraction, questioning, asexual; Borgogna et al., 2019; Gattis et al., 2012; Krueger et al., 2018; Lhomond et al., 2014). Similar mental health disparities across sexual orientation have been found among college student samples (Oswalt and Wyatt, 2011; Przedworski et al., 2015). This increased risk for mental disorders has been partly attributed to stress based on minoritized identities (Hatzenbuehler and Pachankis, 2016; Meyer, 2003), including societal-level stigma and prejudice (e.g., negative attitudes, lack of acceptance; Hatzenbuehler, 2016; Hatzenbuehler et al., 2018). Gender may also interact with sexual orientation given evidence suggesting that mental health disparities may be greater between sexual minority women and men compared to heterosexual women and men, respectively (Batchelder et al., 2021; Kerridge et al., 2017; Krueger et al., 2018; Schuler and Collins, 2020) though differences in gender disparity have been less explored for mental disorders diagnosed by

criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fifth Edition (DSM-5). Little research has examined how gender and societal-level stigma interact with mental health disparities among sexual minority college students. Furthermore, most of the empirical studies on college mental health are focused on Western countries (Hernández-Torrano et al., 2020), limiting generalizability to broader global college mental health. College students are at a unique stage of identity development characterized by a relative increase in autonomy and independence that allows for further personal exploration (Arnett, 2000; Hatano et al., 2022; Jones and Abes, 2013). This period may also provide opportunities to explore sexual attractions and identities beyond the heterosexual norm, including same-gender attractions and/or sexual minority identities (Dillon et al., 2011; Morgan, 2013). College age and emerging adulthood have also been noted as a crucial period for experiencing a high prevalence of mental disorders (Auerbach et al., 2018), and college students with a sexual minority identity or orientation may be at greater risk due in part to prejudice-related stress in a heteronormative context (Bissonette and Szymanski, 2019; Busby et al., 2020).

Sexual orientation has been conceptualized as a multidimensional construct comprised of sexual identity, sexual attractions, and sexual behaviors (Dillon et al., 2011; Korchmaros et al., 2013). Sexual identity refers to one's self-identification within a group (i.e., heterosexual, gay/lesbian, etc.) while sexual attraction refers to the “direction” towards the gender to which someone experiences sexual arousal (e.g., women, men, non-binary, or neither). Utilizing a multidimensional approach to measure sexual orientation through self-identification and attraction has been effective at identifying health disparities among understudied sexual minority populations. For example, individuals who identify as heterosexual and report same-gender attraction (SGA), or identify as “mostly heterosexual” (Igartua et al., 2009; Savin-Williams and Vrangalova, 2013), may also be at greater risk for negative mental

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health symptoms and substance use compared to heterosexual individuals with no SGA (Hughes et al., 2015; Krueger et al., 2020; Maheux et al., 2021; Rentería et al., 2021). Still, there remains a research gap on the prevalence of DSM-5 disorders among emerging sexual orientations (e.g., asexual, questioning, mostly heterosexual) and how gender may interact with sexual identity. This is a critical gap considering research suggesting that mental health risk is greater among bisexual women relative to lesbian/gay women (Schuler and Collins, 2020). The use of a large sample will capture sufficient numbers of sexual minority subgroups enabling the investigation of these interaction effects, which typically cannot be done in smaller samples.

Minority stress theory (Brooks, 1981; Meyer, 2003) posits that disparities in mental disorders among sexual minority populations may be attributed to exposure to hostile environments due to prejudice, rejection, and discrimination on the basis of sexual orientation. Minority stress includes external (e.g., physical assault, slurs) and internal processes (e.g., expectations of rejection, internalized negative schemas; Borgogna and Aita, 2023; Douglass and Conlin, 2022; Walch et al., 2016) and may affect individuals with sexual minority experiences that do not fit the normative heterosexual identity (e.g., heterosexual with SGA or questioning; Gattis et al., 2012; Rentería et al., 2021; Williams et al., 2003). Stigma and prejudice may also include social-structural factors, for example, social attitudes towards sexual minority populations. In fact, sexual minority individuals living in countries with higher structural stigma (i.e., discriminatory laws, policies, and negative social attitudes) report lower levels of life-satisfaction compared to those living in countries with lower structural stigma (Pachankis and Bränström, 2018; van der Star et al., 2021). Social attitudes of acceptance towards the LGBTQ+ community have previously been used as a component in measuring structural stigma towards sexual minority individuals, and the evidence suggests that increased structural stigma is associated with poorer health outcomes (Hatzenbuehler et al., 2018; Pachankis et al., 2014; Pachankis and Bränström, 2018). These studies utilized an index of structural stigma composed of population attitudes towards LGBTQ+ populations and an index of discriminatory legislation and policies using data collected by the International Lesbian, Gay, Bisexual, Trans and Intersex Association on European laws and policies (Annual Review of the Human Rights Situation of Lesbian, Gay, Bisexual, Trans and Intersex People in Europe, 2015) thus the scope of such research only included European member states. A World Mental Health Surveys study (Gmelin et al., 2022) that examined the relative risk of twelve-month disorders among LGB groups compared to heterosexual adults found no differences in relative risk across country-level social acceptance as measured by the Global Acceptance Index (GAI; Barrientos and González, 2022; Flores, 2021). However, this study was exploratory and did not investigate the interaction between social acceptance and sexual orientation in predicting twelve-month disorders.

The current study, which included cross-national samples of college students from 13 countries ( $N = 53,175$ ), examined the twelve-month prevalence of five common DSM-5 disorders across sexual orientation groups. These disorders are major depressive disorder (MDD), generalized anxiety disorder (GAD), panic disorder (PD), and alcohol (AUD) and drug use (DUD) disorders. Additionally, we tested the interaction effects of gender and the Global Acceptance Index (GAI) with sexual orientation for twelve-month mental disorders to assess differences based on gender and country-level social acceptance. Informed by prior sexual minority health research (Bränström and Pachankis, 2018; Gmelin et al., 2022; Krueger et al., 2020), we hypothesized that sexual minority groups (heterosexual with SGA, gay/lesbian, bisexual, questioning, and asexual) would present greater risk for mental disorders compared to heterosexual students without SGA, although we expected that disparities would vary across sexual orientation. We expected bisexual students would present greatest odds based on prior research indicating bisexual individuals present greater health disparities relative to heterosexual and gay/lesbian individuals (Oswalt and Wyatt, 2011;

Shokoohi et al., 2022). We expected a significant interaction effect between sexual orientation and gender, such that the difference in prevalence between sexual minority women and men would be greater than between heterosexual women and men with no SGA. Finally, we expected a significant interaction effect between sexual orientation and GAI, such that the odds of a disorder among sexual minority groups would decrease relative to the heterosexual group at higher levels of GAI.

## 2. Method

### 2.1. Procedures & sample

Data came from the World Mental Health International College Surveys (WMH-ICS; Cuijpers et al., 2019), a cross-national sample across 13 countries and regions (Australia, Belgium, Canada, Chile, France, Germany, Hong Kong [Special Administrative Region of the People's Republic of China], Mexico, Netherlands, Northern Ireland, Romania, South Africa, and Sweden) collected between 2017 and 2021. All college students enrolled in their first year were invited to participate in a web-based survey. Sampling methods varied by country (See Supplementary Table 1 for an overview) but all recruitment strategies included inviting students to participate during registration, health screenings, or via email invitation. All participants were provided with a description of the study after which informed consent was obtained. Each country's survey obtained approval from their relevant institutional review board and carried out the study in accordance with the 2013 Declaration of Helsinki. All students were given information on mental health resources available at their institution. Further details on ethics approval per each country is available online ([https://www.hcp.med.harvard.edu/wmh/ftpd/IRB\\_EthicsApproval\\_WMHI-ICS\\_DSM-5.pdf](https://www.hcp.med.harvard.edu/wmh/ftpd/IRB_EthicsApproval_WMHI-ICS_DSM-5.pdf)).

To reduce participant burden, a variation on the split questionnaire design (Raghunathan and Grizzle, 1995) to shorten assessments while still obtaining information about all outcomes from all respondents was launched in 2020. This instrument version was administered in universities where concerns were raised about survey length by administering diagnostic stem questions for diagnoses with long question series to all respondents and then administering full diagnostic sections only to a randomized subsample of 40 % of the respondents who endorsed the stems. Students who screened negative were coded No. Students who screened positive and had the full assessment were coded either Yes or No depending on subsequent question responses. Students who screened positive but were randomized not to have the full assessment were assigned predicted probabilities based on multiple imputation methods (van Buuren, 2012). Panic disorder and alcohol use disorder were the only disorders in the present study where split questionnaire design randomization was applied. This instrument version was administered to 28,756 of the 54,526 (52.7 %) respondents. In addition, the 12-month MDD, GAD, and panic disorder indicators required respondents to endorse problems with 12-month impairment (mental or emotional health causing moderate, severe, or very severe interference with school performance, personal life, or social life in the past 12 months). This question was not asked in all surveys and was imputed in those cases. Panic disorder was imputed for 8158 respondents (14.9 % of all surveys). Alcohol use disorder was imputed for 9547 respondents (17.5 % of all surveys). Major depressive disorder and generalized anxiety disorder were imputed for 1493 respondents (2.7 % of all surveys) and 523 respondents (1.0 % of all surveys), respectively. Drug use disorder was fully assessed for all participants.

### 2.2. Measures

#### 2.2.1. Demographic variables

Participants were asked about age, gender identity (asked “what is your gender?” and provided the responses male, female, or other; only female and male identities were included to construct the sexual



orientation groups and for the interaction analyses), and their parents' highest educational attainment (higher of two parents; secondary school or less coded as "low", some post-secondary as "medium", and university or more as "high").

### 2.2.2. Sexual orientation

Participants were first asked about their sexual orientation and provided with the following options: "heterosexual", "gay or lesbian", "bisexual", "asexual", "unsure", and "other". Participants who selected "unsure" were coded as "questioning". Two additional questions asked participants to rate their level of sexual attraction to men and to women using a 5-point Likert scale ranging from "1- not at all sexually attracted" to "5- very sexually attracted". Responses to these two questions were used to categorize heterosexual students into two groups: "Heterosexual with no same-gender attraction (SGA)" for those who selected no sexual attraction towards their own gender (i.e., eq (1)) or "Heterosexual with SGA" for those who indicated any level of attraction towards their own gender (i.e., >1). This approach aligns with coding methods previously used to examine sexual orientation disparities (Gattis et al., 2012; Krueger et al., 2018).

### 2.2.3. Twelve-month DSM-5 disorders

The WMH-ICS survey instrument utilized the Composite International Diagnostic Interview Screening Scales (CIDI-SC; Kessler et al., 2013; Kessler and Üstün, 2004) to assess four twelve-month DSM-5 diagnoses: major depressive disorder, generalized anxiety disorder, panic disorder, and drug use disorder (involving either cannabis, cocaine, or any other street drug, or on a prescription drug either used without a prescription or with but used more than prescribed to get high, buzzed, or numbed out). The CIDI-SC scales have concordance with blinded clinical diagnoses in the range AUC = 0.70–0.78 (Kessler et al., 2013). The Alcohol Use Disorders Identification Test (AUDIT; Saunders et al., 1993) screening scale was used to assess for alcohol use disorder. In line with a prior recommendation (Babor et al., 1992), we defined alcohol use disorder (AUD) in the AUDIT as having a total score of 16 or more on the AUDIT or having a total score of 8–15 and 4 or more on the AUDIT dependence subscale. This definition includes high risk or harmful use or moderate risk/hazardous use and possible dependence. This version of AUDIT scoring has concordance with clinical diagnosis in the range AUC = 0.78–0.91 (Reinert and Allen, 2002).

### 2.2.4. LGBTQ+ social acceptance

The Global Acceptance Index (GAI; Flores, 2021) was used to assess social acceptance towards LGBTQ+ populations in each country. This index was developed by the University of California Los Angeles Williams Institute using data from more than 2750 surveys collected over 30 years to measure changing levels of acceptance toward LGBTQ+ people. This index was created using statistical analyses and computational modeling of cross-national global and regional surveys that measured social attitudes toward LGBTQ+ people to estimate social acceptance. The GAI provides each nation with a score of 0–10 to indicate their level of acceptance, where greater scores indicate greater acceptance.

## 2.3. Statistical analysis

Data were weighted to adjust for nonresponse bias based on sociodemographic variables provided by officials from each participating institution (Groves and Couper, 1998). Multiple imputation by chained equations was utilized to adjust for within-survey item missingness (van Buuren, 2012), random internal subsampling of survey sections, and any missing data due to skip logic errors that occurred in some surveys. We first calculated the percent frequencies of the sociodemographic variables and twelve-month disorders across sexual orientation groups. Next, we estimated adjusted odds ratios associated with sexual orientation and twelve-month mental disorders (using heterosexual with no SGA as the reference group), using multilevel logistic regression with

random intercepts for country and college, controlling for age, gender, parental education, survey year, and GAI. We also estimated models where gender and GAI were included as interactions with sexual orientation. Risk for Type I error was adjusted using the false discovery rate method ( $Q = 0.05$ ; Benjamini and Hochberg, 1995). All data was weighted, and estimates were pooled across imputed datasets. Analysis was carried out using SAS 9.4.

## 3. Results

### 3.1. Sociodemographic characteristics

A total of 54,526 surveys were completed with a weighted average response rate of 23.8 % across all surveys (weighted by achieved sample size). Given the focus on mental and substance disorder prevalence across sexual orientation groups, the analytic sample only included students who provided responses to the survey items on sexual orientation and sexual attraction for a pooled sample size  $N = 53,175$  students. The sexual orientation variable was constructed based on participants' responses to a series of items (i.e., sexual identity, gender identity, and sexual attraction to women and men) at the observation level per imputed data set, resulting in variation in frequencies across the main demographic variables (see Supplemental Table 2 for more details on pre- and post-imputation frequencies). Table 1 includes the raw sample size and weighted, pooled frequencies for the sociodemographic characteristics across sexual orientation groups. In the overall sample, students identified as heterosexual with no same-gender attraction ( $n = 34,037$ ; 65.8 %), as heterosexual endorsing any level of same-gender attraction ( $n = 9054$ ; 16.0 %), as gay or lesbian ( $n = 1406$ ; 3.0 %), bisexual ( $n = 4400$ ; 7.6 %), asexual ( $n = 768$ ; 1.4 %), questioning ( $n = 3008$ ; 5.3 %), and "other" ( $n = 501$ ; 0.9 %). Over half the sample identified as a woman (36,830; 59.0 %), over half were under 20 years old (i.e., 30.6 % were 18; and 22.3 % were 19 years old) and 47.1 % were 20 years or older. Parental educational attainment ranged from low (31.4 %), medium (25.3 %), to high (43.4 %). GAI scores ranged from 4.1 to 9.5 (See Supplemental Table 1 for country-specific index score and sample proportion).

### 3.2. Twelve-month disorders and sexual orientation

In Table 1, we report the prevalence rates for twelve-month major depressive disorder (16.7 %), generalized anxiety disorder (7.8 %), panic disorder (6.3 %), alcohol use disorder (5.6 %), and drug use disorder (5.8 %) by sexual orientation. Mental disorder prevalence varied by sexual orientation. Heterosexual students with no SGA had the lowest prevalence across twelve-month disorders (except for AUD where 4.1 % of asexual students met criteria for AUD vs 4.8 % of heterosexual students with no SGA). Bisexual students had the highest prevalence across all disorders (except AUD where gay/lesbian had the highest).

Table 2 presents the adjusted odds ratios (AOR) for each twelve-month disorder across sexual orientation groups. The odds of twelve-month disorders were greater for all sexual minority groups when compared to heterosexual students who reported no SGA, except for asexual students (see Figs. 1–5 for graphic comparison). Gay/lesbian and bisexual students had higher odds of twelve-month disorders (AOR range 1.49–3.49), as did heterosexuals with SGA (AOR range 1.43–2.15). Students who were questioning or reported "other" sexual orientation also had higher odds of twelve-month disorders (AOR range 1.38–2.94). Last, we did not observe any statistically significant differences in the odds of disorders associated with asexual students compared to heterosexual students with no SGA (AOR range 0.89–1.29).

### 3.3. Interactions with gender

The multiplicative interaction effects between gender and sexual orientation groups are presented in Table 3. We found an interaction

**Table 1**  
Prevalence of demographic variables, twelve-month mental and substance use disorders by sexual orientation.

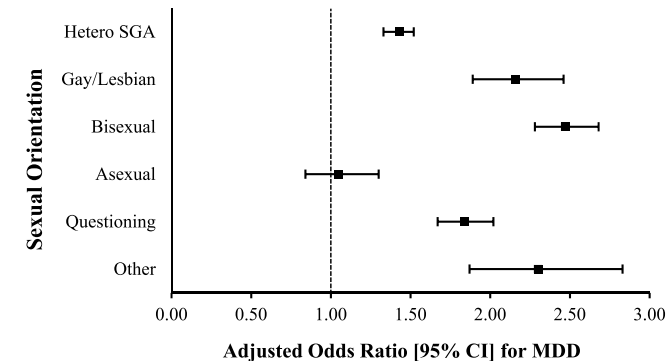
|                              | Total      | Hetero with No SGA | Hetero with SGA | Gay/ Lesbian | Bisexual   | Asexual    | Questioning | Other      |                                |
|------------------------------|------------|--------------------|-----------------|--------------|------------|------------|-------------|------------|--------------------------------|
| <i>n</i>                     | 53,175     | 34,037             | 9054            | 1406         | 4400       | 768        | 3008        | 501        | <i>F</i> (ndf) <i>p</i> -value |
|                              | % (SE)     | % (SE)             | % (SE)          | % (SE)       | % (SE)     | % (SE)     | % (SE)      | % (SE)     |                                |
| <i>Age</i>                   |            |                    |                 |              |            |            |             |            | 22.12 (12) < 0.001             |
| 18                           | 30.6 (0.2) | 30.2 (0.3)         | 29.8 (0.5)      | 31.4 (1.3)   | 34.2 (0.8) | 16.6 (1.4) | 36.4 (0.9)  | 29.5 (2.1) |                                |
| 19                           | 22.3 (0.2) | 22.1 (0.2)         | 21.1 (0.5)      | 21.3 (1.2)   | 24.8 (0.7) | 16.4 (1.4) | 25.6 (0.9)  | 24.2 (2.0) |                                |
| 20+                          | 47.1 (0.2) | 47.6 (0.3)         | 49.0 (0.6)      | 47.3 (1.5)   | 41.0 (0.8) | 67.0 (1.8) | 38.0 (1.0)  | 46.3 (2.5) |                                |
| <i>Gender</i>                |            |                    |                 |              |            |            |             |            | 272.55 (6) < 0.001             |
| Women                        | 59.0 (0.2) | 53.7 (0.3)         | 72.5 (0.6)      | 33.3 (1.3)   | 74.8 (0.8) | 67.4 (1.9) | 72.8 (1.0)  | 68.0 (2.5) |                                |
| Men                          | 41.0 (0.2) | 46.3 (0.3)         | 27.5 (0.6)      | 66.7 (1.3)   | 25.2 (0.8) | 32.6 (1.9) | 27.3 (1.0)  | 32.0 (2.5) |                                |
| <i>Parental Education</i>    |            |                    |                 |              |            |            |             |            | 20.43 (12) < 0.001             |
| Low                          | 31.4 (0.2) | 32.6 (0.3)         | 29.1 (0.5)      | 32.6 (1.4)   | 24.8 (0.7) | 47.3 (1.9) | 28.4 (0.9)  | 26.1 (2.3) |                                |
| Med                          | 25.3 (0.2) | 25.4 (0.3)         | 24.5 (0.5)      | 27.5 (1.3)   | 26.6 (0.7) | 18.1 (1.5) | 24.6 (0.9)  | 21.3 (2.0) |                                |
| High                         | 43.4 (0.2) | 41.9 (0.3)         | 46.4 (0.6)      | 39.9 (1.4)   | 48.6 (0.8) | 34.6 (1.8) | 46.9 (1.0)  | 52.6 (2.5) |                                |
| <i>Survey Year/Month</i>     |            |                    |                 |              |            |            |             |            | 74.44 (6) < 0.001              |
| Before March 2020            | 33.9 (0.2) | 36.8 (0.3)         | 29.4 (0.5)      | 34.8 (1.4)   | 28.4 (0.7) | 16.1 (1.4) | 23.8 (0.9)  | 24.8 (2.1) |                                |
| After March 2020             | 66.1 (0.2) | 63.2 (0.3)         | 70.6 (0.5)      | 65.2 (1.4)   | 71.6 (0.7) | 83.9 (1.4) | 76.2 (0.9)  | 75.2 (2.1) |                                |
| <i>Twelve Month DSM-5</i>    |            |                    |                 |              |            |            |             |            |                                |
| Major depressive disorder    | 16.7 (0.2) | 12.7 (0.2)         | 20.2 (0.5)      | 24.2 (1.3)   | 32.2 (0.8) | 14.6 (1.3) | 26.9 (0.9)  | 31.9 (2.3) | 208.34 (6) < 0.001             |
| Generalized anxiety disorder | 7.8 (0.1)  | 5.8 (0.1)          | 8.8 (0.3)       | 12.7 (1.0)   | 16.8 (0.6) | 8.3 (1.0)  | 12.6 (0.7)  | 16.0 (1.7) | 125.18 (6) < 0.001             |
| Panic disorder               | 6.3 (0.1)  | 4.3 (0.1)          | 7.8 (0.3)       | 9.6 (0.8)    | 16.2 (0.6) | 6.7 (0.9)  | 9.7 (0.6)   | 13.8 (1.6) | 160.62 (6) < 0.001             |
| Alcohol use disorder         | 5.6 (0.1)  | 4.8 (0.1)          | 7.6 (0.4)       | 8.1 (0.9)    | 7.8 (0.5)  | 4.1 (0.9)  | 5.1 (0.5)   | 6.5 (1.3)  | 15.85 (6) < 0.001              |
| Drug use disorder            | 5.8 (0.1)  | 4.3 (0.1)          | 7.9 (0.3)       | 8.3 (0.8)    | 11.8 (0.6) | 5.7 (0.9)  | 8.0 (0.6)   | 8.9 (1.5)  | 72.34 (6) < 0.001              |

*Note.* Ndf = numerator degrees of freedom; SE = standard error; SGA = Same-gender attraction. Sample sizes and percentages are weighted and pooled across imputations.

**Table 2**  
Adjusted odds ratios from multilevel logistic regressions of sexual orientation group for each 12-month DSM-5 mental disorder.

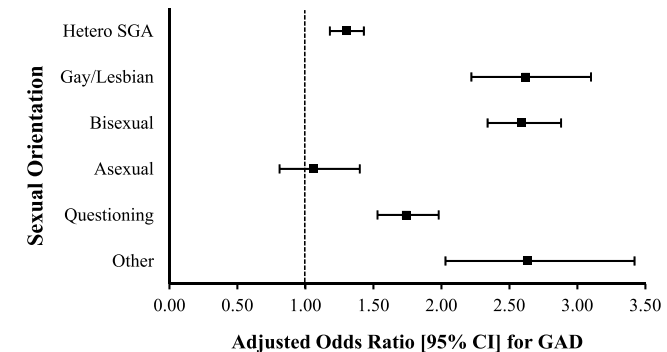
|                                | Major depressive disorder |              | Generalized anxiety disorder |              | Panic disorder    |              | Alcohol use disorder |              | Drug use disorder |              |
|--------------------------------|---------------------------|--------------|------------------------------|--------------|-------------------|--------------|----------------------|--------------|-------------------|--------------|
|                                | AOR (95 % CI)             | Adj <i>p</i> | AOR (95 % CI)                | Adj <i>p</i> | AOR (95 % CI)     | Adj <i>p</i> | AOR (95 % CI)        | Adj <i>p</i> | AOR (95 % CI)     | Adj <i>p</i> |
| Hetero No SGA                  | Ref                       |              | Ref                          |              | Ref               |              | Ref                  |              | Ref               |              |
| Hetero SGA                     | 1.43 (1.33, 1.52)         | <0.001       | 1.30 (1.18, 1.43)            | <0.001       | 1.56 (1.41, 1.72) | <0.001       | 2.00 (1.78, 2.24)    | <0.001       | 2.15 (1.95, 2.37) | <0.001       |
| Gay/Lesbian                    | 2.16 (1.89, 2.46)         | <0.001       | 2.62 (2.22, 3.10)            | <0.001       | 2.70 (2.24, 3.25) | <0.001       | 1.49 (1.18, 1.86)    | 0.001        | 1.59 (1.32, 1.93) | <0.001       |
| Bisexual                       | 2.47 (2.28, 2.68)         | <0.001       | 2.59 (2.34, 2.88)            | <0.001       | 3.40 (3.06, 3.78) | <0.001       | 2.26 (1.94, 2.63)    | <0.001       | 3.49 (3.11, 3.92) | <0.001       |
| Asexual                        | 1.05 (0.84, 1.30)         | 0.756        | 1.06 (0.81, 1.40)            | 0.745        | 1.29 (0.96, 1.74) | 0.129        | 0.89 (0.56, 1.42)    | 0.700        | 1.24 (0.91, 1.71) | 0.243        |
| Questioning                    | 1.84 (1.67, 2.02)         | <0.001       | 1.74 (1.53, 1.98)            | <0.001       | 1.83 (1.58, 2.11) | <0.001       | 1.38 (1.13, 1.69)    | 0.003        | 2.04 (1.75, 2.37) | <0.001       |
| Other                          | 2.30 (1.87, 2.83)         | <0.001       | 2.63 (2.03, 3.42)            | <0.001       | 2.94 (2.24, 3.86) | <0.001       | 1.76 (1.15, 2.67)    | 0.016        | 2.50 (1.80, 3.47) | <0.001       |
| <i>F</i> (ndf) <i>p</i> -value | 110.23 (6) < 0.001        |              | 73.84 (6) < 0.001            |              | 95.72 (6) < 0.001 |              | 34.19 (6) < 0.001    |              | 91.97 (6) < 0.001 |              |

*Note.* AOR = adjusted odds ratio; CI = confidence intervals; GAI = Global Acceptability Index; SGA = same-gender attraction; ndf = numerator degrees of freedom. Odds ratios were adjusted for gender, parental education, age, time of survey completion, and GAI. All estimations are weighted and pooled across imputations. Reference group was heterosexual with no same-gender attraction.



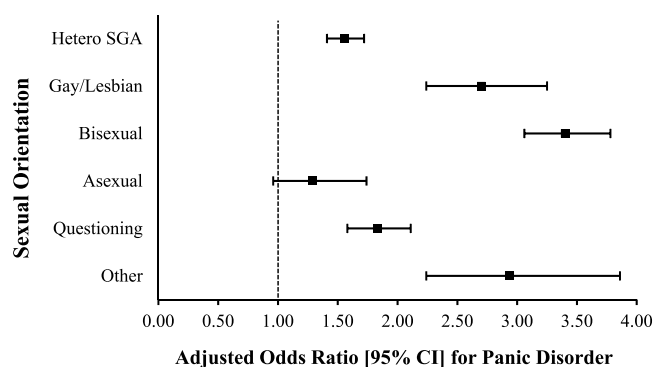
*Note:* Reference group was heterosexual with no same-gender attraction.  
SGA = same-gender attraction.

**Fig. 1.** Adjusted odds ratios across sexual orientation groups for major depressive disorder.



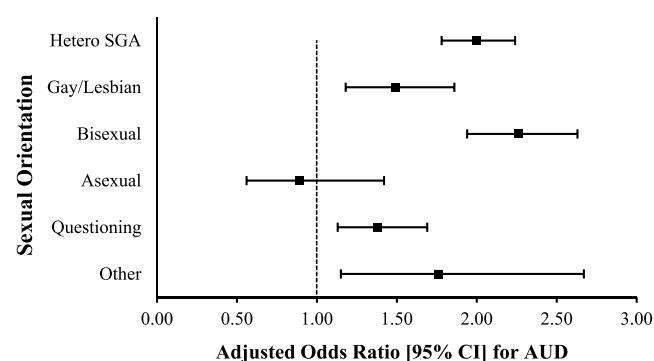
*Note:* Reference group was heterosexual with no same-gender attraction.  
SGA = same-gender attraction.

**Fig. 2.** Adjusted odds ratios across sexual orientation groups for generalized anxiety disorder.



Note: Reference group was heterosexual with no same-gender attraction.  
SGA = same-gender attraction.

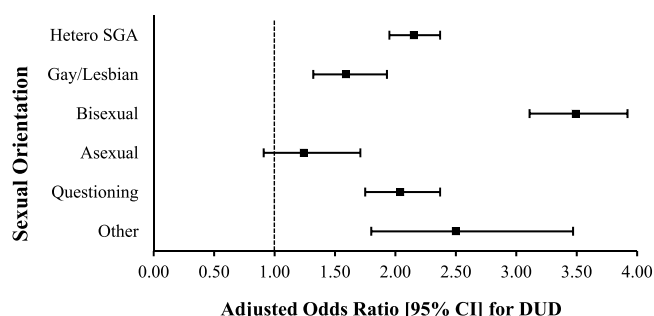
Fig. 3. Adjusted odds ratios across sexual orientation groups for panic disorder.



Note: Reference group was heterosexual with no same-gender attraction.  
SGA = same-gender attraction.

Fig. 4. Adjusted odds ratios across sexual orientation groups for alcohol use disorder.

between gender and bisexual (AOR = 1.47) and asexual (AOR = 3.97) orientations for GAD, indicating that the difference in odds ratio between women and men were greater among bisexual and asexual groups relative to the difference in odds ratio among heterosexual men and women with no SGA (i.e., there was a greater gender disparity among bisexual and asexual students compared to heterosexual students with no SGA). Gender also interacted with heterosexual orientation with SGA (AOR = 1.41) and bisexual orientation (AOR = 1.82) in predicting AUD. Gender also had a significant interaction with every sexual orientation



Note: Reference group was heterosexual with no same-gender attraction.  
SGA = same-gender attraction.

Fig. 5. Adjusted odds ratios across sexual orientation groups for drug use disorder.

group except “other” in predicting DUD (AOR range 1.47–3.95).

### 3.4. Global Acceptance Index (GAI)

Interaction effects between GAI and sexual orientation groups are presented in Table 4. There were statistically significant interactions between GAI and heterosexual with SGA, bisexual, and asexual orientations with respect to MDD. This interaction effect indicated that higher scores of GAI were associated with a decrease in odds ratios of MDD among heterosexual with SGA (AOR = 0.95) and bisexual (AOR = 0.93) groups (relative to heterosexual students with no SGA), yet increased odds among asexual (AOR = 1.23) students. Similarly, there were interactions between GAI and gay/lesbian (AOR = 0.83) and bisexual (AOR = 0.88) orientations with respect to AUD as well as between GAI and heterosexual students with SGA (AOR = 0.91) with respect to DUD (decreased odds as GAI increased). In sum, particular sexual minority groups had lower odds (or no significant difference) of disorder as country-level social acceptance increased.

## 4. Discussion

To our knowledge, this is the first study to examine DSM-5 disorder prevalence and disparities across sexual orientation groups using a large cross-national college student sample. Sexual minority college students had higher odds of mental and substance use disorders even after adjusting for relevant sociodemographic correlates (i.e., age, gender, parental education). These findings support our hypotheses and corroborate prior research (Bränström and Pachankis, 2018; King et al., 2008; Plöderl and Tremblay, 2015).

Bisexual students reported the highest prevalence rates across each disorder (MDD, GAD, PD, DUD) except AUD, where gay/lesbian students had the highest prevalence. This aligns with extant evidence suggesting that the bisexual population is a uniquely vulnerable group, often reporting greater risk for mental disorders, suicidality, and substance use compared to heterosexual and gay/lesbian individuals (Kerridge et al., 2017; Plöderl and Tremblay, 2015; Rentería et al., 2021; Ross et al., 2018; Salway et al., 2019). These disparities have been, in part, attributed to unique forms of discrimination and prejudice experienced by bisexual adults from both heterosexual and gay/lesbian individuals (Dyar et al., 2019; Feinstein and Dyar, 2017; Manalastas et al., 2024). Emerging research has posited potential underlying mechanisms that may be driving these disparities, including challenges with identity management (e.g., decision to conceal or disclose bisexual identity; Dyar et al., 2022; Feinstein et al., 2021), internalized negative views of bisexuality (Dyar and London, 2018; Pollitt and Roberts, 2021), and the invisibility and/or erasure of bisexuality within systems and institutions (Elia, 2014; Flanders et al., 2016). Further research on these underlying risk factors is needed to inform the development of bisexuality-affirming interventions aimed at reducing mental health disparities in this populations.

Results also demonstrated that there was also a higher prevalence of mental disorders among heterosexual students with SGA and students questioning of their sexual orientation compared to heterosexual students with no SGA. These findings are consistent with previous research that has found similar disparities among individuals who may not align with a traditional heterosexual experience (Boyer and Lorenz, 2020). Moreover, students who identified as “other” also reported high prevalence of mental health problems suggesting that individuals identifying with emerging sexual identities (or not aligning with more well-known identities; Watson et al., 2020) may also be subjected to stigma. This highlights the importance of including more expansive survey questions to better capture sexual orientation experiences, especially given evidence of emerging sexual identities (e.g., pansexual, queer, polysexual) among younger generations (Morandini et al., 2017; Watson et al., 2020). Further research is needed to examine the relevant predictors and underlying mechanisms contributing to these disparities to inform

**Table 3**  
Sexual orientation and gender interaction effects for twelve-month DSM-5 disorders.

|                         | Major depressive disorder |              | Generalized anxiety disorder |              | Panic disorder    |              | Alcohol use disorder |              | Drug use disorder |              |
|-------------------------|---------------------------|--------------|------------------------------|--------------|-------------------|--------------|----------------------|--------------|-------------------|--------------|
|                         | AOR (95 % CI)             | Adj <i>p</i> | AOR (95 % CI)                | Adj <i>p</i> | AOR (95 % CI)     | Adj <i>p</i> | AOR (95 % CI)        | Adj <i>p</i> | AOR (95 % CI)     | Adj <i>p</i> |
| Hetero No SGA           | Ref                       |              | Ref                          |              | Ref               |              | Ref                  |              | Ref               |              |
| Hetero SGA X Gender     | 0.97 (0.83, 1.13)         | 0.780        | 0.97 (0.76, 1.23)            | 0.836        | 1.05 (0.80, 1.37) | 0.794        | 1.41 (1.13, 1.77)    | 0.005        | 1.47 (1.20, 1.80) | <0.001       |
| Gay/Lesbian X Gender    | 0.86 (0.67, 1.12)         | 0.350        | 0.78 (0.56, 1.10)            | 0.224        | 1.06 (0.73, 1.53) | 0.826        | 1.56 (0.93, 2.64)    | 0.138        | 3.95 (2.66, 5.87) | <0.001       |
| Bisexual X Gender       | 1.14 (0.94, 1.39)         | 0.259        | 1.47 (1.12, 1.94)            | 0.011        | 1.19 (0.90, 1.58) | 0.309        | 1.82 (1.35, 2.45)    | <0.001       | 2.53 (1.98, 3.23) | <0.001       |
| Asexual X Gender        | 1.59 (0.91, 2.79)         | 0.153        | 3.97 (1.28, 12.34)           | 0.030        | 1.02 (0.47, 2.20) | 0.980        | 1.31 (0.57, 3.00)    | 0.616        | 2.24 (1.18, 4.23) | 0.023        |
| Questioning X Gender    | 0.88 (0.70, 1.10)         | 0.340        | 0.98 (0.71, 1.37)            | 0.956        | 0.75 (0.53, 1.07) | 0.164        | 1.42 (0.96, 2.10)    | 0.119        | 1.95 (1.43, 2.67) | <0.001       |
| Other X Gender          | 0.99 (0.63, 1.58)         | 0.991        | 1.06 (0.56, 2.02)            | 0.901        | 2.37 (0.98, 5.75) | 0.085        | 1.48 (0.64, 3.43)    | 0.445        | 1.12 (0.58, 2.17) | 0.786        |
| F (ndf) <i>p</i> -value | 1.34 (6) 0.311            |              | 2.85 (6) 0.015               |              | 1.41 (6) 0.280    |              | 4.01 (6) 0.001       |              | 16.18 (6) < 0.001 |              |

*Note.* AOR = adjusted odds ratio; CI = confidence intervals; GAI = Global Acceptability Index; SGA = same-gender attraction; ndf = numerator degrees of freedom. Odds ratios were adjusted for gender, parental education, age, time of survey completion, and GAI. All estimations are weighted and pooled across imputations. To test interaction effect, interaction term (sexual orientation X Gender) was included in model estimation. Reference group was heterosexual with no same-gender attraction and men.

**Table 4**  
Sexual orientation and GAI interaction effects for twelve-month DSM-5 disorders.

|                         | Major depressive disorder |              | Generalized anxiety disorder |              | Panic disorder    |              | Alcohol use disorder |              | Drug use disorder |              |
|-------------------------|---------------------------|--------------|------------------------------|--------------|-------------------|--------------|----------------------|--------------|-------------------|--------------|
|                         | AOR (95 % CI)             | Adj <i>p</i> | AOR (95 % CI)                | Adj <i>p</i> | AOR (95 % CI)     | Adj <i>p</i> | AOR (95 % CI)        | Adj <i>p</i> | AOR (95 % CI)     | Adj <i>p</i> |
| Hetero No SGA           | Ref                       |              | Ref                          |              | Ref               |              | Ref                  |              | Ref               |              |
| Hetero SGA X GAI        | 0.95 (0.91, 0.99)         | 0.048        | 0.97 (0.91, 1.03)            | 0.394        | 0.99 (0.92, 1.06) | 0.792        | 1.00 (0.92, 1.09)    | 0.985        | 0.91 (0.85, 0.97) | 0.010        |
| Gay/Lesbian X GAI       | 0.95 (0.87, 1.04)         | 0.362        | 0.92 (0.82, 1.03)            | 0.211        | 1.01 (0.89, 1.15) | 0.929        | 0.83 (0.70, 0.98)    | 0.049        | 0.97 (0.85, 1.10) | 0.680        |
| Bisexual X GAI          | 0.93 (0.88, 0.99)         | 0.030        | 0.99 (0.93, 1.06)            | 0.836        | 1.04 (0.96, 1.12) | 0.405        | 0.88 (0.79, 0.99)    | 0.046        | 0.92 (0.85, 1.00) | 0.063        |
| Asexual X GAI           | 1.23 (1.06, 1.43)         | 0.010        | 1.22 (1.01, 1.47)            | 0.056        | 1.09 (0.88, 1.35) | 0.522        | 0.62 (0.36, 1.09)    | 0.143        | 0.75 (0.56, 1.01) | 0.083        |
| Questioning X GAI       | 0.94 (0.88, 1.01)         | 0.123        | 1.02 (0.93, 1.11)            | 0.786        | 0.93 (0.84, 1.03) | 0.219        | 0.87 (0.75, 1.01)    | 0.114        | 0.93 (0.84, 1.04) | 0.272        |
| Other X GAI             | 0.96 (0.83, 1.10)         | 0.621        | 1.00 (0.85, 1.17)            | 0.986        | 1.05 (0.87, 1.26) | 0.712        | 0.88 (0.66, 1.16)    | 0.439        | 1.07 (0.85, 1.35) | 0.648        |
| F (ndf) <i>p</i> -value | 3.30 (6) 0.005            |              | 1.38 (6) 0.298               |              | 0.81 (6) 0.648    |              | 2.61 (6) 0.029       |              | 2.24 (6) 0.058    |              |

*Note.* AOR = adjusted odds ratio; CI = confidence intervals; GAI = Global Acceptability Index; SGA = same-gender attraction; ndf = numerator degrees of freedom. Odds ratios were adjusted for gender, parental education, age, time of survey completion, and GAI. All estimations are weighted and pooled across imputations. To test interaction effect, interaction term (sexual orientation X GAI) was included in model estimation. GAI was mean-centered. Reference group was heterosexual with no same-gender attraction.

effective interventions that mitigate these disparities.

Notably, we did not find any statistically significant differences in prevalence rates of mental disorders among asexual students compared to heterosexual students with no SGA. There may be a number of factors underlying these findings. Asexuality has been characterized as an enduring “lack of sexual attraction” which does not necessarily preclude romantic attraction and/or orientation (Bogaert, 2015). The asexual community is a heterogeneous group that may include a range of sexual orientations and experiences (Yule et al., 2017), thus it is unclear to what extent asexual individuals may experience sexual orientation-based stigma. Emerging research does suggest this population may experience different forms of stressors such as isolation, invisibility, and invalidation (Kelleher et al., 2023; Robbins et al., 2016), which may contribute to mental health problems (Chan and Leung, 2023).

Interaction effects by gender varied by sexual orientation group and disorder. Findings showed that there were significantly greater gender disparities among bisexual students, relative to heterosexual students with no SGA, for GAD, AUD, and DUD. That is, there was a greater gender disparity among bisexual students compared to heterosexual students with no SGA for each disorder. This gender disparity aligns with other epidemiological reports indicating that bisexual women also tend to be at a greater risk for mental health disorders and problematic substance use compared to lesbian/gay and heterosexual women (Fredriksen-Goldsen et al., 2010; Schuler and Collins, 2020; Shokoohi et al., 2022). These disparities may be in part due to antibisexual and sexist prejudice specifically directed at bisexual women, as shown by evidence that bisexual women are at greater risk for childhood sexual abuse, sexual assault, and intimate partner violence (Bermea et al.,

2018; Ford and Soto-Marquez, 2016; Hequembourg et al., 2013). Additional interaction effects also indicated greater gender disparity for AUD among asexual students, DUD among heterosexual with SGA, and DUD for all sexual orientations (except “other”). Further research needs to explore individual and systemic risk factors that are contributing to this increased risk among sexual minority women to inform multi-level interventions geared towards eliminating the risk of violence and harassment towards sexual minority women.

This study examined country-level social acceptance attitudes towards LGBTQ+ populations as a moderator in the association between sexual orientation and risk for a past-year DSM-5 disorder. Our findings provide some support that for some sexual minority groups (i.e., heterosexual with SGA and bisexual), greater country-level social acceptance was associated with a decrease in odds for MDD relative to the reference group. These interaction effects were also found for bisexual and gay/lesbian students with regards to AUD and for heterosexual students with SGA with regards to DUD. These findings suggest that increases in social acceptance may reduce risk of mental disorders in certain sexual orientation groups. It is possible that the impact of acceptance and support on mental health may vary across different sexual minority groups. For example, some research suggests that bisexual individuals may experience distinct forms of stigma and discrimination compared to gay and lesbian individuals, which may impact their mental health (Brewster and Moradi, 2010). Importantly, these interaction effects were not found for the emerging sexual orientation groups (questioning and other) and were not consistent across disorders. Further research would benefit from including additional measures of structural stigma (e.g., laws/policies) and interpersonal forms of stigma and discrimination.



These findings need to be considered in light of the following limitations. The cross-sectional data precludes making claims regarding the temporal relationship between changes in sexual orientation and identity (e.g., changes in sexual identification) and a DSM-5 diagnosis. Another limitation is the exclusive focus on a binary gender identity (e.g., male or female) and the lack of inclusion of transgender, intersex, and/or nonbinary groups. Same-gender attraction was only examined among heterosexuals and not in any other group, an approach that may be informative in better understanding specific sexual orientation groups (e.g., asexual, questioning, “other”). Further research needs to include a more expansive definition and measurement of gender and examine sexual attraction to better understand the disparities present among these populations (Beckwith et al., 2019; Jones, 2018; Price-Feeney et al., 2020). While the social acceptance index used in this study enabled the measurement of a form of structural stigma, the measure was based on country-level attitudes towards LGBTQ+ and did not include measures of legislation or policy that may have direct effects on LGBTQ+ health (Hatzenbuehler, 2016). Furthermore, research has shown that structural stigma in the local environment (e.g., local state or city laws, college campus policies; Russell et al., 2010; Woodford et al., 2018) may have more impact on college student mental health than country-level. Similarly, while the studies included data from multiple countries, the study focused only on high and upper-middle income countries and not on lower-middle and low-income countries. Finally, the current study did not examine the role of additional intersecting identities that have been historically marginalized (e.g., racial/ethnic minority identity, first-generation university student, disability status, etc.). Despite these limitations, this study presents new and important evidence on the disparities in DSM-5 disorders across sexual orientations among college students using a large, cross-national sample. These findings will help inform a global understanding of college student mental health as well as ways to mitigate disparities among sexual minority college students.

#### CRedit authorship contribution statement

**Roberto Rentería:** Writing – original draft, Software, Methodology, Formal analysis, Conceptualization. **Claes Andersson:** Writing – review & editing, Conceptualization. **Marcus Bendtsen:** Writing – review & editing, Conceptualization. **Philippe Mortier:** Writing – review & editing, Conceptualization. **Randy P. Auerbach:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **Jason Bantjes:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **Harald Baumeister:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **Anne H. Berman:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **Erik Bootsma:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **Ronny Bruffaerts:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **Irina F. Cohut:** Writing – review & editing, Project administration, Investigation. **Marcelo A. Crockett:** Writing – review & editing, Investigation. **Pim Cuijpers:** Writing – review & editing, Project administration, Methodology, Investigation. **Oana A. David:** Writing – review & editing, Project administration, Investigation, Funding acquisition. **David D. Ebert:** Writing – review & editing, Project administration, Investigation. **Raúl A. Gutierrez-García:** Writing – review & editing, Project administration, Investigation. **Penelope A. Hasking:** Writing – review & editing, Investigation. **Xanthe Hunt:** Writing – review & editing, Project administration, Investigation. **Petra Hurks:** Writing – review & editing, Project administration, Investigation. **Mathilde M. Husky:** Writing – review & editing, Project administration, Investigation. **Ana Lucia Jimenez:** Writing – review & editing, Project administration, Investigation. **Fanny Köhlke:** Writing – review & editing, Project administration, Investigation. **Ann-Marie Küchler:** Writing – review & editing, Project administration, Investigation. **Scarlett Mac-Ginty:**

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#### Declaration of competing interest

All other authors reported no conflict of interest.

#### Acknowledgements

The survey was carried out in conjunction with the WHO World Mental Health International College Surveys Initiative (WHO WMH-ICS). We thank the staff of the WMH Data Analysis Coordination Centre for assistance with instrumentation, and data analysis.

#### Appendix A. Supplementary data

Supplementary data to this article can be found online at <https://doi.org/10.1016/j.jpsychires.2025.04.021>.

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