HHS Public Access

Author manuscript

J Abnorm Psychol. Author manuscript; available in PMC 2019 October 01.

Published in final edited form as:

J Abnorm Psychol. 2018 October ; 127(7): 623–638. doi:10.1037/abn0000362.

The WHO World Mental Health Surveys International College Student Project: Prevalence and Distribution of Mental Disorders

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Abstract

Increasingly, colleges across the world are contending with rising rates of mental disorders, and in many cases, the demand for services on campus far exceeds the available resources. The present study reports initial results from the first stage of the WHO World Mental Health International College Student project, in which a series of surveys in 19 colleges across eight countries

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Declarations of Interest

In the past 3 years, Dr. Kessler received support for his epidemiological studies from Sanofi Aventis; was a consultant for Johnson & Johnson Wellness and Prevention, Shire, Takeda; and served on an advisory board for the Johnson & Johnson Services Inc. Lake Nona Life Project. Kessler is a co-owner of DataStat, Inc., a market research firm that carries out healthcare research.

Dr. Ebert has received consultant fees and served on the scientific advisory board for several companies, including MindDistrict, Lantern, Schoen Kliniken, and German health insurance companies (BARMER, Techniker Krankenkasse). He also is a stakeholder in the institute for health training online (GET.ON), which aims to implement scientific findings related to digital health interventions into routine care.

(Australia, Belgium, Germany, Mexico, Northern-Ireland, South-Africa, Spain, United States) were carried out with the aim of estimating prevalence and basic socio-demographic correlates of common mental disorders among first-year college students. Web-based self-report questionnaires administered to incoming first-year students (45.5% pooled response rate) screened for six common lifetime and 12-month DSM-IV mental disorders: major depression, mania/hypomania, generalized anxiety disorder, panic disorder, alcohol use disorder, and substance use disorder. We focus on the 13,984 respondents who were full-time students: 35% of whom screened positive for at least one of the common lifetime disorders assessed and 31% screened positive for at least one 12-month disorder. Syndromes typically had onsets in early-middle adolescence and persisted into the year of the survey. Although relatively modest, the strongest correlates of screening positive were older age, female sex, unmarried-deceased parents, no religious affiliation, non-heterosexual identification and behavior, low secondary school ranking, and extrinsic motivation for college enrollment. The weakness of these associations means that the syndromes considered are widely distributed with respect to these variables in the student population. Although the extent to which cost-effective treatment would reduce these risks is unclear, the high level of need for mental health services implied by these results represents a major challenge to institutions of higher education and governments.

General Scientific Summary

Roughly one-third of first-year students in 19 colleges across 8 countries who participated in a self-report survey screened positive for at least one common DSM-IV anxiety, mood, or substance disorder (35.3% lifetime, 31.4% 12 months). Basic socio-demographic correlates were modest, showing that the syndromes were widely-distributed rather than concentrated in one small segment of the student population.

Keywords

College; Mental Disorders; Lifetime Prevalence; 12-Month Prevalence

Introduction

College students are a key population segment for determining the economic growth and success of a country. Until recently, little attention was paid to identifying mental disorders among college students other than in the United States (Blanco et al., 2008; Cho et al., 2015; Eisenberg, Golberstein, & Gollust, 2007; Kendler, Myers, & Dick, 2015; Mojtabai et al., 2015). However, given that the college years are a peak period for onset of many common mental disorders, particularly mood, anxiety, and substance use disorders (de Girolamo, Dagani, Purcell, Cocchi, & McGorry, 2012; Kessler et al., 2007), it is not surprising that epidemiological studies consistently find high prevalence of these disorders among college students (Hunt & Eisenberg, 2010; Ibrahim, Kelly, Adams, & Glazebrook, 2013; Pedrelli, Nyer, Yeung, Zulauf, & Wilens, 2015). This high prevalence is significant not only for the distress it causes at a time of major life transition, but also because it is associated with substantial impairment in academic performance (Auerbach et al., 2016; Bruffaerts et al., 2018) as well as suicidal thoughts and behaviors (Mortier et al., in press). While timely and effective treatment is important, the number of students in need of treatment for these

disorders far exceeds the resources of most counseling centers, resulting in substantial unmet need for treatment of mental disorders among college students (Auerbach, et al., 2016; Beiter et al., 2015; Storrie, Ahern, & Tuckett, 2010; Xiao et al., 2017).

Emerging adulthood—which includes the college years—represents a distinct period of development straddling the adolescent and young adulthood life stages. While emerging adulthood (ages 18–29 years) shares many features with these earlier and later periods, it is defined by increased autonomy from parents (e.g., leaving the home), marked shifts in social roles, and relational instability (Arnett, 2000; Sussman & Arnett, 2014). In contrast to adolescents, emerging adults have reached sexual maturity and often pursue a range of educational and occupational opportunities (e.g., tertiary education, full-time work, combination of education and work). However, in comparison to adults, emerging adults have not yet established a stable life structure (e.g., long-term romantic relationship, stable job). More broadly, Sussman and Arnett (2014) differentiate emerging adulthood from other life stages across five dimensions: (i) identity exploration, (ii) feeling in-between, (iii) entertaining possibilities, (iv) self-focus; and (v) instability. While these dimensions are developmentally normative among college students, each has potential mental health implications, especially during a period when there is a high likelihood of disengaging from treatment (see Auerbach et al., 2016; Stroud, Mainero, & Olson, 2013). For example, although identity exploration is developmentally appropriate, within collegiate environments in which students can reinvent themselves, it is not without its challenges, particularly if students feel they have made the *wrong choices*. Similarly, college is characterized by substantial instability—changes in romantic status (including sexual orientation), peer groups, course selection (i.e., major, concentration), and career choices. This instability may contribute to reduced social support and increased stress, which are known contributors to mental disorders (Slavich & Auerbach, 2018). Thus, while there is doubtlessly overlap with other life stages, the college years represent a distinct period in which there is a critical need to improve early identification and treatment for debilitating mental disorders.

It is a challenge for universities to determine whether and, if so, how to identify college students for outreach and treatment of existing mental disorders or for preventive interventions when at high risk of mental disorders and, once identified, how to offer services to the very large proportion of students likely to profit from either treatment or preventive interventions. Internet-based cognitive behavior therapy (CBT), which has been shown to have effects equivalent to those of face-to-face CBT (Andersson, Cuijpers, Carlbring, Riper, & Hedman, 2014), is an attractive option for addressing the latter challenges based on its low cost and ease of implementation. However, little is known about the disorders for which such interventions are most needed or the effectiveness of internet-based CBT among college students. The WHO World Mental Health (WMH) International College Student (WMH-ICS) project was launched in an effort to address this critical knowledge gap. The first stage of the WMH-ICS is administering web-based mental health needs assessment surveys to convenience samples of entering first-year students in colleges and universities throughout the world and then following these students over their college careers to examine patterns and baseline predictors of onset and persistence of common mental disorders and impairments in academic performance associated with those disorders. As part of this initiative, a number of surveys also embed pragmatic clinical trials that screen

for mood and anxiety disorders and then randomize screened positives either to internet-based CBT or usual care. Baseline survey data are then being used in the latter samples to develop precision medicine treatment models aimed at guiding the subsequent targeting of internet-based interventions to the students most likely to be helped by them.

The current report presents data from the first year of baseline WMH-ICS surveys among first-year college students from 8 countries. In carrying out these surveys, we aimed to determine the feasibility of successfully implementing large-scale cross-national surveys of first-year college students across a number of institutions using a web-based screening assessment of common mental disorders. We also aimed to determine whether such surveys would yield similarly high prevalence estimates of common DMS-IV disorders and low estimates of treatment as in previous college surveys and in the representative sample of 1,572 college students across 21 countries surveyed in two-hour face-to-face interviews as part of the larger WMH surveys (Auerbach, et al., 2016). The WHO Composite International Diagnostic Interview (CIDI; Kessler & Ustun, 2004), a validated fully-structured diagnostic interview that generates diagnoses according to the definitions and criteria of the Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition (American Psychiatric Association, 1994), was used in the WMH surveys. One-fifth of college students in those surveys had 12-month DSM-IV/CIDI disorders, with anxiety and mood disorders the most common class of disorders. Only 16.4% of all 12-month cases received any treatment for these disorders. One of our aims in the current report is to determine whether comparable estimates of prevalence and treatment are found in the web-based WMH-ICS surveys. We also aimed in the WMH-ICS surveys to determine if the socio-demographic correlates of 12-month mental disorders in the WMH-ICS surveys would be the same as in previous surveys of college student mental health. These associations have typically been found to be small, but with women having higher rates of anxiety and mood disorders than men, men having higher rates of substance use disorders than women, and socio-economic background being inversely related to prevalence of all disorders (Chen & Jacobson, 2012; Eisenberg, Hunt, & Speer, 2013).

Methods

Samples

The initial round of WMH-ICS surveys was administered in a convenience sample of 19 colleges and universities (henceforth referred to as “colleges”) in eight mostly high-income countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States). Each institution received ethics approval to participate in the project and all participants provided consent. Web-based self-report questionnaires were administered to all incoming first-year students in each participating school (7 private, 12 public) between October 2014 and February 2017. A total of 14,371 questionnaires were completed, with sample sizes ranging from a low of 633 in Australia to a high of 4,580 in Belgium. The response rates were quite variable across countries, from a low of 7.0% in Australia to a high of 79.3% in Mexico. The weighted (by achieved sample size) mean response rate across all surveys was 45.5%. Table 1 summarizes the sample design in each participating country.

Procedures

Before initiating data collection, the country-specific Institutional Review Boards provided approval for a project entitled, Survey on College Adjustment (Australia: HR65/2016; Belgium: S54803(ML8724); Germany: 193_16 B; Mexico: CEI/C/032/2016; Northern Ireland: REC/15/0004; South Africa: N13/10/149; Spain: 2013/5252/I; United States: 2015P002664). All incoming first-year students in the participating schools were invited to participate in a web-based self-report health survey. Mode of contact varied widely across schools but in all cases other than in Mexico consisted of an approach that attempted to recruit 100% of incoming first-year students either as part of a health evaluation, as part of the registration process, or in a stand-alone survey administered to students via their student email addresses. Attempts were then made to convert initial non-respondents through a series of personalized reminder emails. Incentives were used in the final stages of recruitment (e.g., a raffle for store credit coupons, movie passes) in 10 schools. In addition, one country (Spain) used an “end-game” strategy consisting of a random sample of non-respondents at the end of the normal recruitment period that was offered incentives for participation. The sampling scheme was quite different in Mexico, where 100% of entering first-year students were invited to participate in conjunction with mandatory activities that varied from school to school (e.g., student health evaluations; tutoring sessions) and time was set aside for completing the survey during those activities. No follow-up of non-respondents was carried out in Mexico because it was assumed that students who failed to complete the survey even though time was set aside for it during mandatory activities were firm non-respondents. Informed consent was obtained before administering the survey in all countries. The text statement used to obtain informed consent varied across schools and was approved by the institutional review boards of the organizations coordinating the surveys in each country.

Measures

The self-report questionnaire was developed in English and translated into local languages using a translation, back-translation, and harmonization protocol that expanded on the standard WHO protocol in ways developed by survey methodologists to maximize cross-national equivalence of meaning and consistency of measurement (Harkness et al., 2008).

Mental disorders.—The questionnaire included short validated self-report screening scales for lifetime and 12-month prevalence of six common DSM-IV mood (major depressive disorder, mania/hypomania), anxiety (generalized anxiety disorder, panic disorder), and substance (alcohol abuse or dependence [AUD], drug abuse or dependence, involving either cannabis, cocaine, any other street drug, or a prescription drug either used without a prescription or used more than prescribed to get high, buzzed, or numbed out). This is a larger set of disorders than used in most previous college mental health surveys, some of which focused only on depression (for review see Ibrahim, et al., 2013) or screening scales of current anxious and depressive symptoms (Mahmoud, Staten, Hall, & Lennie, 2012). Although a larger set of disorders is used in the face-to-face WMH surveys (Scott, de Jonge, Stein, & Kessler, in press), participating colleges were unwilling to administer student surveys that would be long enough to include all those disorders. The six disorders in the core WMH-ICS surveys were a compromise that included the disorders associated

with the highest levels of role impairment among college students in the WMH surveys. As an indication that these disorders capture the vast majority of students with seriously impairment psychopathology, 83% of the college students in the WMH surveys who reported suicidal ideation in the 12 months before interview met criteria for one or more of these six disorders during that same 12-month time period (Mortier et al., 2018).

The assessments of five of the six disorders were based on the Composite International Diagnostic Interview Screening Scales (CIDI-SC; Kessler et al., 2013; Kessler & Ustun, 2004). The exception was the screen for AUD, which was based on the Alcohol Use Disorders Identification Test (AUDIT; Saunders, Aasland, Babor, de la Fuente, & Grant, 1993). The CIDI-SC scales have been shown to have good concordance with blinded clinical diagnoses based on the Structured Clinical interview for DSM-IV (SCID; First, Spitzer, Gibbon, & Williams, 1994), with AUC in the range 0.70–0.78 (Kessler et al., 2013a; Kessler et al., 2013b). However, these validation studies have not yet been carried out in samples of college students. The version of the AUDIT we used, which defined alcohol use disorder as either a total score of 8+ or a score of 4+ on the AUDIT dependence questions (Babor, Higgins-Biddle, Saunders, & Monteiro, 2001), has been shown to have concordance with clinical diagnoses in the range AUC = 0.78–0.91 (Reinert & Allen, 2002). Additional items taken from the CIDI (Kessler & Ustun, 2004) were used to assess age-of-onset of each disorder and number of lifetime years with symptoms.

Socio-demographic correlates.—Only a handful of basic socio-demographic variables were included in the survey. Gender was assessed by asking respondents whether they identified themselves as male, female, transgender (male-to-female, female-to-male), or “other.” Respondent age was divided into three categories (18 years, 19 year, 20 or more years old). Parental educational level was assessed for father and mother separately (none, elementary, secondary, some post-secondary, college graduate, doctoral degree), and was categorized into high (college graduate or more), medium (some post-secondary education), and low (secondary school or less) based on the highest-of-both parents’ educational level. Parental marital status was dichotomized into “parents not married or parent(s) deceased” versus “parents married and both alive.” Respondents were asked about the urbanicity of the place they were raised (small city, large city, town or village, suburbs, rural area), and their religious background (categorized into Christian, Other religion, No religion). Sexual orientation was classified into heterosexual, gay or lesbian, bisexual, asexual, not sure, and other. Additional questions were asked about the extent to which respondents were attracted to men and women and the gender(s) of people they had sex with (if any) in the past 5 years. Respondents were categorized into the following categories: heterosexual with no same-sex attraction, heterosexual with same-sex attraction, non-heterosexual without same-sex sexual intercourse, and non-heterosexual with same-sex sexual intercourse.

College-related correlates.—Respondents were asked where they ranked academically compared to other students at the time of their high school graduation (from top 5% to bottom 10%; categorized into quartiles) and what their most important reason was to go to university. Based on the results of a tetrachoric factor analysis (see Supplemental Table 1) the most important reason to go to university was categorized into extrinsic reasons (i.e.,

family wanted me to, my friends were going, teachers advised me to, did not want to get a job right away) versus intrinsic reasons (to achieve a degree, I enjoy learning and studying, to study a subject that really interests me, to improve job prospects generally, to train for specific type of job). Respondents were also asked where they were living during the first semester of the academic year (parents', other relative's, or own home, college hall of residence, shared house, apartment, or flat/private hall of residence, other), and if they expect to work during the school year.

Analysis methods

Weighting: We noted above that one Spanish survey used an "end-game" strategy in which a random sample of non-respondents at the end of the normal recruitment period was offered incentives for participation. Respondents in this end-phase were given a weight equal to 1/p, where p represented the proportion of non-respondents at the end of the normal recruitment period that was included in the end-game, to adjust for the under-sampling of these hard-to-recruit respondents. In addition, in an effort to make increase the representativeness of the WMH-ICS sample in each college with respect to known population characteristics, a post-stratification weight was applied to the survey data to adjust for differences between survey respondents and non-respondents on socio-demographic information made available about the student body by college officials. Standard methods for post-stratification weighting were used for this purpose (Groves & Couper, 1998). In the case of the Spanish survey, this meant that the data were doubly-weighted: once to include the end-game weight and then with the post-stratification weight applied to those weighted data.

Item-level missing data in the completed surveys were imputed using the method of multiple imputation (MI) by chained equations (van Buuren, 2012). Four kinds of item-missing data were imputed simultaneously in this way. The first was a 50% random subsampling of the drug use section in Belgium, which was done to reduce interview length. The second was the complete absence of the panic disorder section in Mexico, Northern Ireland, and South Africa due to a skip logic error. The third was the complete absence of some socio-demographic variables in Australia, Belgium, and Spain because of a decision by school administrators not to assess those variables (sexual orientation, current living situation, expected student job, and most important reason for going to college in all these countries; parent education and marital status in Australia and Belgium; religion in Australia; self-reported high school ranking in Belgium). The fourth were invalid responses to individual questions made by some respondents in each country, although this fourth category was uncommon: less than 0.1% for lifetime disorders, 0.0–2.3% for 12-month disorders other than AUD, and in the range 3.0–9.3% (3.8–7.0% inter-quartile range) for AUD, 0.0–12.0% (inter-quartile range 1.9–2.7%) for disorder age-of-onset, 0.0–24.6% (inter-quartile range 2.4–8.8%) for disorder persistence, 1.8–25.4% (inter-quartile range 8.8–24.1%) for most important reasons for attending college, 1.0–10.8% (inter-quartile range 3.0–3.4%) for high school ranking, and 0.0–7.0% for the other socio-demographic and college-related variables.

Prevalence estimates are reported as weighted within-country proportions, with associated MI-adjusted standard errors obtained through the Taylor series linearization method. Estimates of age of onset and proportional persistence (i.e., the percentage of lifetime years

with symptoms of each disorder from the age-of-onset to the age when survey was completed) are reported as median values with associated inter-quartile ranges. To obtain pooled estimates of prevalence, age of onset, and proportional persistence across countries, each country was given an equal sum of weights.

Substantive analyses: All substantive analyses were conducted with SAS version 9.4 (SAS Institute Inc, 2010), and weighted data were used in all data analytic procedures. Logistic regression analyses were used to identify correlates of lifetime and 12-month mental disorders in the total sample and 12-month disorders among lifetime cases. Logistic regression coefficients and their 95% confidence intervals (CIs; +/− 1.96 times their MI-based standard errors) were exponentiated to create odds ratios (OR) and associated 95% CIs. Negative binomial regression was used to identify correlates of number of years with symptoms among lifetime cases. These regression coefficients and their 95% CIs were exponentiated to create persistence rate ratios (RR) and their associated 95% CIs. Estimates were pooled across countries to examine both main effects and all possible two-way interactions among correlates, with risk for Type I error adjusted for using the false discovery rate method (Q=0.05) (Benjamini & Hochberg, 1995). We then examined between-country variation in associations by including correlate-by-country interactions and an adjusted interaction dummy coding scheme that kept the product of all country-specific ORs and RRs equal to one. The latter method allowed us to detect significant between-country variation by evaluating the statistical significance of deviation of within-country coefficients from the median 1.0 value. Statistical significance in all analyses was evaluated using two-sided MI-based tests with significance level α set at 0.05.

Results

Preliminary Analyses

Although there were 14,371 respondents in the total sample, 35 respondents were excluded because of missing information on gender or full-time status, which we required as anchor variables for purposes of imputing other missing values. An additional 302 respondents were excluded because they were part-time students. Most of these students came from the Australian sample and were older, full-time employed people who would normally be expected to access mental health services, if they were needed, through their employer or employer-sponsored health insurance rather than through their college. In addition, preliminary analyses reported below showed that the majority of the 50 remaining students who identified either as transgender or “other” rather than as male or female endorsed a number of mental disorders and experienced considerable impairment, leading us to focus on them in a separate report. The analyses reported here are based on the remaining 13,984 respondents.

Prevalence of Common Mental Disorders

Thirty-five percent of the 13,984 respondents in the main sample reported at least one of the lifetime mental disorders assessed in the survey (Table 2). Prevalence was similar for the additional respondents excluded because of missing information on gender or full-time student status (35.9%) and because of being part-time (41.2%), whereas the students who

self-identified as either transgender or “other” had much higher lifetime prevalence of any disorder (76.5%). Twelve-month prevalence of any of the disorders considered in the main sample was 31%. Lifetime and 12-month prevalence estimates ranged from a high of 48.3–43.3% in Australia to a low of 22.4–19.1% in Belgium. Median age-of-onset was 14.2 years of age, from a high of 14.6 in Spain to a low of 13.6 in the U.S. Median proportional annual persistence (i.e., the proportion of years in episode between age-of-onset and age at interview) was 65.0%, from a high of 72.2% in the U.S. to a low of 50.3% in Mexico. The vast majority (89.0%) of respondents with a lifetime disorder had 12-month prevalence, from a high of 94.2% in Northern Ireland to a low of 83.3% in Spain.

Major depressive disorder (MDD) was the most common of the disorders examined across all countries combined (21.2% lifetime prevalence; 18.5% 12-month prevalence) followed by generalized anxiety disorder (18.6–16.7%) (Table 3). The other disorders had comparatively much lower prevalence, from a high of 6.8–6.3% for AUD to a low of 3.5–3.1% for broadly-defined bipolar disorder. Median ages-of-onset of individual disorders were in the range 14.3 (major depressive disorder) to 16.2 (drug use disorder). Proportional annual persistence was considerably lower for drug use disorder (45.9%) than other disorders (62.4–73.3%). Twelve-month prevalence among lifetime cases also was considerably lower for drug use disorder (59.8%) than the other disorders (87.1–92.8%).

Socio-Demographic and College-Related Correlates of Mental Disorders

Female gender and older age (i.e., aged 19 and 20+ years) emerged as significant positive correlates of both lifetime and 12-month prevalence (Table 4). Parental education was unrelated to the disorders assessed, but students with unmarried parents or a parent who was deceased had significantly elevated odds of both lifetime and 12-month disorders. Respondents who endorsed no religious affiliation had a greater likelihood of reporting the presence of lifetime and 12-month mental disorders than those identifying as Christian. Relative to students reporting heterosexual identification with no same-sex attraction (72.6%), students identifying as heterosexual with some same-sex attraction (14.1%), non-heterosexual without same-sex intercourse (8.0%), or non-heterosexual with same-sex intercourse (5.4%) had two- to three-fold elevated odds of lifetime and 12-month disorders. Finally, extrinsically motivated (as compared to intrinsically motivated) students and students with lower high school rankings (relative to students with higher high school rankings) had elevated odds of mental disorders. Importantly, these associations were quite stable across countries, with only 6.3% of country-specific odds-ratios differing significantly from the cross-national average (Table 5).

Discussion

The present study reports initial results from the WHO WMH-ICS project administered to first-year college students—a series of surveys in 19 colleges across eight countries (Australia, Belgium, Germany, Mexico, Northern-Ireland, South-Africa, Spain, United States). At least one-third of the college students that participated in the surveys reported a history of one or more of the mental disorders examined in the survey. This finding is broadly consistent with earlier college student surveys in documenting high recent

prevalence of common mental disorders (Blanco et al., 2008; Cho et al., 2015; Eisenberg et al., 2007; Kendler et al., 2015); although most earlier surveys were carried out in the U.S. and assessed only current disorders (Merikangas et al., 2010). Direct comparisons of prevalence estimates are not possible, as the measures, time frames (12-month and lifetime in the current surveys versus current prevalence in most other surveys) and populations represented differed across surveys. It is noteworthy in the latter regard that the colleges in the WMH-ICS project were not selected to be representative of all colleges in their countries but were instead a convenience sample of the colleges in which WMH collaborators worked or had close contacts. It is also noteworthy that the response rates in the college surveys were quite variable and were lower overall than in the nationally representative face-to-face community household surveys in the WMH initiative. An earlier WMH report based on face-to-face interviews with the subset of WMH household survey respondents in 21 countries who were college students found somewhat lower lifetime (29.3%) and 12-month (25.2%) prevalence estimates of any disorder in mostly high-income countries, but this result was based on a wider range of DSM-IV disorders and on most in-depth assessments of these disorders than in the WMH-ICS surveys (Auerbach et al 2016).

It is impossible to tell the extent to which these differences reflect the fact that the colleges included in the WMH-ICS surveys were atypical of all colleges in their countries, that the 8 countries considered in the WMH-ICS surveys were different from the 21 included in the WMH surveys, that the mode of data collection was different in the two sets of surveys (self-administration in the WMH-ICS surveys versus face-to-face in the WMH surveys, with self-administration known to be associated with increased rates of reporting embarrassing behaviors; (Gnambs & Kaspar, 2015), that the diagnostic measures were different, or some combination of these factors. It is noteworthy, though, that both sets of surveys documented that most lifetime mental disorders among college students started prior to college entrance and that persistence of these disorders was very high, suggesting that clinical interventions early in the college career might be warranted. Given the limited mental health resources that exist on most college campuses relative to the scope of the problem, there is also a need to consider cost-effective approaches to reduce the treatment gap for this important segment of the population (e.g., group psychotherapy, internet-based psychotherapy).

We found a number of socio-demographic and college-related variables that had statistically significant but substantively modest associations (OR=1.4–1.5) with overall disorder prevalence: being female, having parents who were not married or deceased, having no religious affiliation, graduating in the bottom 70% of their high school class, and having primarily extrinsic reasons for going to college. Odds-ratios of this size are equivalent to values of Cohen's d indicative of *small* effect sizes, whereas the 27% of students who reported either a non-heterosexual orientation or some same-sex attraction had relative-odds of disorder (OR=2.0–3.4) equivalent to values of Cohen's d in the *small to medium* range, and the roughly 0.4% of respondents who reported themselves to be either transsexual or "other" had a relative-odds of disorder (OR=5.6) equivalent to a Cohen's d in the *large* range (Hasselblad & Hedges, 1995). The small effects for basic socio-demographic and college-related factors are in line with prior research (mostly conducted in the United States; e.g., Eisenberg et al., 2013; Pedrelli et al., 2016), and similarly, the elevated odds of disorder among students with non-heterosexual orientations are consistent with previous studies of

the association between sexual orientation and mental health among college students (Kerr, Santurri, & Peters, 2013; Kisch, Leino, & Silverman, 2005; Oswalt & Wyatt, 2011; Przedworski et al., 2015).

While our results show a median age-of-onset in early to middle adolescence, these findings are not easy to reconcile with prior epidemiological research that has assessed individuals across a much broader age range (~18–65 years; e.g., National Comorbidity Replication [NCS-R], National Epidemiologic Survey on Alcoholism and Related Conditions [NESARC]). Moreover, even among studies that stratify the prevalence of disorders across age groups, there is no delineation among students and non-students, which has important implications (Auerbach et al., 2016). Of note, the majority of WMH-ICS respondents were aged 18–19 years, and this necessarily impacts the interpretation of age-of-onset. For example, in both NCS-R and NESEARC, median age-of-onset for major depression (Hasin et al., 2005) and mood disorders (Kessler et al., 2005) was ~30 years compared to ~14 years within the WMH-ICS sample. Similarly, age-of-onset for substance use disorders also is older (~20 years) in the NCS-R sample relative to the WMH-ICS (~14–16 years). These differences most likely reflect the age ranges of the samples as opposed to methodological differences (e.g., survey versus face-to-face interviews). That said, relative to the NCS-R, the WMH-ICS shows an older age-of-onset for anxiety disorders (~11 years vs. ~14 years); potentially indicating subtle differences in reporting accuracy (and potential recall biases) across instruments or across retrospective recall periods in samples where respondents are either mostly young (WMH-ICS) or have an unrestricted age range (NCS-R).

Trajectory of Mental Disorders and Associated Outcomes

The WMH-ICS was designed to follow first-year students though their college years to address key questions about illness onset, course, and consequences. Of particular importance, we want to determine if the syndromes detected in this baseline survey predict a range of key outcomes that are the focus of considerable concern on college campuses, including academic functioning (e.g., grades, attrition), sexual assault, and suicidal thoughts and behaviors. There is some precedent for expecting associations with these outcomes to be found. For example, in a prospective study of college students implemented as a forerunner to the WMH-ICS surveys, reports obtained during students' first year identified students with persistent suicidal thoughts and behaviors during subsequent college years (Mortier et al., 2017). If similar prospective associations are obtained between the richer set of baseline symptoms probed in the current survey and a wider range of outcomes, such results could be important in targeting cost-effective interventions.

There also is strong reason to believe that rates of disorders, particularly externalizing disorders (e.g., substance use disorder) and serious mental illness (e.g., bipolar disorder, thought disorders), will show higher prevalence during later college years. Indeed, substance use disorders, bipolar disorder, and thought disorders typically emerge in the early-to-mid 20s, and the typical college lifestyle—irregular sleep, increased interpersonal stress, experimental substance use—may confer increased risk of disorder onset (Arnett, 2005; Sussman & Arnett, 2014). Additionally, although our results show that female gender is a meaningful correlate of increased lifetime and 12-month disorder prevalence of the disorders

considered, it also may be that (a) our assessment reflects an imbalanced assessment of internalizing versus externalizing disorders but (b) perhaps more critically, the assessment of these disorders is conducted before their peak period of onset. As first-year students are being followed throughout their collegiate career, the WMH-ICS project has a unique opportunity to identify factors that may be present before the unfolding of symptoms, which again, will ultimately afford institutions an opportunity to identify high-risk students who might benefit from preventative-intervention efforts.

Improving Access to Care

The finding that one-third of students from a range of countries in the WMH-ICS screened positive for at least one of the six12-month mental disorders assessed represents a key global mental health issue and raises questions about appropriate screening and intervention. As noted earlier, precise population prevalence estimates cannot be obtained because our surveys are not nationally representative and survey response rates are generally low, but it is nonetheless clear from our results, in conjunction with the larger literature, that a substantial proportion of college students meet criteria for common mental disorders. Furthermore, as symptoms of mental disorders range from sub-clinical through to severe, it is likely that more than one-third of our respondents suffered from significant distress and that fewer than the one-third suffered from a serious mental disorder. Fortunately, colleges often have a range of resources, and in recent years have developed programs to reduce stigma and increase mental health literacy, to screen and link students to mental health services, and to train key gatekeepers about mental disorders and treatment (Eisenberg, Hunt, & Speer, 2012).

As screening mental disorders on college campuses becomes more commonplace, early identification will increase. However, one-third of students have one or more of the 12-month disorders considered here and other disorders that we did not consider are likely to be present among a substantial number of other students. It is unlikely in light of this that college campuses will have sufficient resources to support student needs for mental health services, exacerbating the problems that already exist in the mental health treatment system of escalating financial expenses and long waitlists (Andersson & Titov, 2014; Webb, Rosso, & Rauch, 2017). As noted in the earlier, one practical response would be to offer internet-based interventions in addition to the services already offered by student mental health and counselling centers. A number of internet-based interventions exist for a broad range of psychiatric disorders (e.g., depression, anxiety, eating disorders) and associated problems (e.g., sleep, stress) and have been shown to be effective for both prevention and treatment of these conditions (e.g., Ebert et al., 2015; Josephine, Josefine, Philipp, David, & Harald, 2017; Olthuis, Watt, Bailey, Hayden, & Stewart, 2015; Riper et al., 2014; Rosso et al., 2017; van Straten, Cuijpers, & Smits, 2008); particularly guided internet-based CBT interventions (e.g., Baumeister, Reichler, Munzinger, & Lin, 2014; Palmqvist, Carlbring, & Andersson, 2007; V. Spek et al., 2007). In addition to their low cost, these interventions address a number of other important barriers to treatment, most notably stigma and inconvenience. Internet-based interventions could be especially useful if they are used in campus mental health counseling centers to triage care, with students experiencing less severe symptoms receiving these interventions. Importantly, sub-threshold cases are known to have substantial

impairment (Cuijpers, de Graaf, & van Dorsselaer, 2004; Fergusson, Horwood, Ridder, & Beautrais, 2005) and to benefit from internet-based interventions (Andersson & Cuijpers, 2009; Spek et al., 2008); potentially reducing the incidence of threshold cases (Buntrock et al., 2016).

Limitations and Summary

Our findings should be considered in light of several limitations. First, the cross-national prevalence estimates are based on a convenience sample of colleges with relatively low and quite variable response rates, limiting generalizability of results. Second, only six common mental disorders were assessed in the surveys. The omission of attention-deficit/hyperactivity disorder, eating disorders, phobias, post-traumatic stress disorder, conduct disorder, oppositional-defiant disorder, and intermittent explosive disorder are especially noteworthy because of their comparatively high prevalence in the WMH surveys (Auerbach et al., 2016), and therefore, the true prevalence of mental disorders among college students is likely to be a good deal higher than reported in the current study; particularly as we are only including first-years students who are not yet through the high-risk periods for many common disorders. Although it would have been desirable to include a more comprehensive assessment, this was rejected by the administrations of participating schools. However, as an alternative we developed screening scales for omitted disorders, and we are experimenting with a design in which subsets of these screening scales are rotated in future iterations of the surveys at random to provide partial information about prevalence and correlates of a wider range of disorders. This approach, which is referred to in the survey methodology literature as *matrix sampling* (Merkouris, 2015), is becoming an increasingly popular approach to reduce respondent burden when the number of questions of interest in a survey exceeds the number that causes respondent burden (Hughes, Beaghen, & Asiala, 2015; Thomas, Raghunathan, Schenker, Katzoff, & Johnson, 2006). Third, our results indicated that female gender emerged as a positive correlate of both lifetime and 12-month mental disorder prevalence. While this is not unexpected, it also important to note that this difference may be driven by an imbalance in our assessment of number of internalizing (4) disorders, which are known to be more common among women, and externalizing (2) disorders, which are known to be more common among men. Last, although the surveys used well-validated screening scales calibrated to yield unbiased prevalence estimates in general population samples, calibration studies have not yet been carried out in samples of college students. Nor do we know if calibration studies in separate countries would show that concordance of the structured questions in our diagnostic screens are equally valid in all countries. Fourth, lifetime prevalence and age-of-onset were assessed retrospectively, which may contribute to downward biases given recall errors.

Despite these limitations, our study clearly underscores the fact that mental disorders are common among college students. In line with the precision medicine initiative approach (Insel, 2014), the next step in this work will be to begin constructing personalized approaches that both identify each student's risk profile and then, provide access to intervention resources designed to ameliorate the negative effects of mental disorders on this important segment of the population.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

Funding to support this project was received from the National Institute of Mental Health (NIMH) R56MH109566 (RPA), and the content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health or NIMH; the Belgian Fund for Scientific Research (11N0514N/ 11N0516N/ 1114717N) (PM), the King Baudouin Foundation (2014-J2140150–102905) (RB), and Eli Lilly (IIT-H6U-BX-I002) (RB, PM); BARMER, a health care insurance company, for project StudiCare (DDE); ZonMw (Netherlands Organisation for Health Research and Development; grant number 636110005) and the PFGV (PFGV; Protestants Fonds voor de Geestelijke Volksgezondheid) in support of the student survey project (PC); South African Medical Research Council (DJS); Fondo de Investigación Sanitaria, Instituto de Salud Carlos III - FEDER (PI13/00343), ISCIII (Río Hortega, CM14/00125), ISCIII (Sara Borrell, CD12/00440); European Union Regional Development Fund (ERDF) EU Sustainable Competitiveness Programme for Northern Ireland, Northern Ireland Public Health Agency (HSC R&D), and Ulster University (TB); Ministerio de Sanidad, Servicios Sociales e Igualdad, PNSD (Exp. 2015I015); DIUE Generalitat de Catalunya (2017 SGR 452; 2014 SGR 748), FPU (FPU15/05728) (JA); The World Mental Health International College Student project is carried out as part of the WHO World Mental Health (WMH) Survey Initiative. The WMH survey is supported by the National Institute of Mental Health NIMH R01MH070884, the John D. and Catherine T. MacArthur Foundation, the Pfizer Foundation, the US Public Health Service (R13-MH066849, R01-MH069864, and R01 DA016558), the Fogarty International Center (FIRCA R03-TW006481), the Pan American Health Organization, Eli Lilly and Company, Ortho-McNeil Pharmaceutical, GlaxoSmithKline, and Bristol-Myers Squibb (RK). None of the funders had any role in the design, analysis, interpretation of results, or preparation of this paper.

We thank the staff of the WMH Data Collection and Data Analysis Coordination Centres for assistance with instrumentation, fieldwork, and consultation on data analysis. A complete list of all within-country and cross-national WMH publications can be found at: http://www.hcp.med.harvard.edu/wmh/.

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Table 1:

WMH-ICS sample characteristics

Country	Number of participating universities	Total size of the universities	Number of incoming freshmen eligible	Number of incoming freshmen participated	Response Rate	Survey Field Dates	Sampling & procedures
Australia	one public	~ 45,000	9,042	633	7.0%	2016	All incoming freshmen were invited to participate through e-mail. Five reminder emails were sent with personalized links to the survey. Conditional incentives were applied (movie passes).
Belgium	one public	~ 40,000	8,530	4,580	53.7%	2014–16	All incoming freshmen were invited for a psycho-medical check-up in the student mental health center. Surveys were completed in the waiting room. Students who did not show up for the psycho-medical check-up received up to eight reminder emails. Conditional incentives were applied (store credit coupons).
Germany	one public	~ 40,000	5,064	677	13.4%	2016–17	All incoming freshmen were invited to participate through e-mail. Six reminder emails were sent with personalized links to the survey. Conditional incentives were applied (store credit coupons).
Mexico	four private/two public	~ 28,000	5,293	4,199	79.3%	2016	All incoming freshmen were eligible for the survey. Initial contact differed by university: survey included in an obligatory health evaluation (1 university), as part of obligatory group tutoring sessions (1 university), or as part of required classes (2 universities) or teacher evaluations (2 universities). Two universities sent reminder emails (tutors sent out emails to their tutees; in a required class of personal development, reminders were sent out by faculty). No incentives were applied.
Northern- Ireland	one public	~ 25,000	4,359	739	17.0%	2015	All incoming freshmen due to register were invited to participate. Following registration, ID numbers and links to the survey were provided. Five reminder emails/text messages were sent with personalized links to the survey. A 6th reminder involved a researcher telephoning non-responders. All responders were entered into a number of draws to win an iPad.
South-Africa	one public	~ 30,000	5,338	686	12.9%	2015	All incoming freshmen were invited to participate through e-mail. Eight reminder emails and one text message were sent with personalized links to the survey. Conditional incentives were applied (5× R1000 draw).
Spain	five public	~ 96,000	16,332	2,118	13.0%	2014–15	All incoming freshmen were eligible for the survey. Initial contact differed by university (information stands, information sessions in classrooms, through the university's website). Four reminder emails were sent with personalized links to the survey. Conditional monetary incentives were applied. Additionally, an end-game strategy was implemented by selecting a random

J Abnorm Psychol. Author manuscript; available in PMC 2019 October 01.

Country	Number of participating universities	Total size of the universities	Number of incoming freshmen eligible	Number of incoming freshmen participated	Response Rate	Survey Field Dates	Sampling & procedures
							proportion of non-respondents and offering all of them a monetary incentive.
United States	three private	~ 21,800	4,382	739	16.9%	2015–16	All incoming freshmen were invited to participate through e-mail. Three reminder emails were sent with personalized links to the survey. Conditional incentives were applied (gift cards).
Total	12 public/7 private	~ 326,000	58,340	14,371	45.5*	2014–17	

Note.

*Weighted by achieved sample size

Table 2.

Prevalence, age of onset, and proportional persistence of any mental disorder in the WMH-ICS by country

	Sample Size	Lifetime % (95%CI)	12-Month % (95%CI)	12-Month/ Lifetime % (95%CI)	Age of Onset Median (95%CI) [IQR]	Proportional Persistence[a] Median (95%CI) [IQR]
All countries[b]	13,984	35.3 (34.1–36.6)	31.4 (30.2–32.6)	89.0 (87.6–90.4)	14.2 (14.1–14.4) [12.0–15.9]	65.0 (62.5–67.5) [41.2–80.3]
Australia	529	48.3 (43.7–52.9)	43.3 (38.7–47.9)	89.7 (85.7–93.7)	14.5 (13.8–15.1) [12.2–16.5]	69.4 (62.9–75.9) [45.3–83.9]
Belgium	4,490	22.4 (21.2–23.7)	19.1 (17.9–20.2)	85.0 (82.5–87.4)	14.2 (14.0–14.5) [11.7–15.8]	60.9 (56.6–65.2) [34.5–78.5]
Germany	652	41.1 (37.1–45.1)	36.2 (32.3–40.0)	88.0 (83.9–92.1)	13.9 (13.3–14.4) [11.4–15.9]	60.8 (55.0–66.6) [40.2–78.3]
Mexico	4,190	27.0 (25.6–28.5)	23.7 (22.3–25.2)	87.8 (85.8–89.9)	14.3 (14.0–14.6) [11.5–15.7]	50.3 (46.6–54.1) [28.7–75.5]
Northern-Ireland	711	39.1 (35.5–42.8)	36.9 (33.2–40.5)	94.2 (91.4–97.0)	14.4 (13.9–14.9) [12.1–16.0]	67.6 (60.9–74.3) [44.0–80.4]
South-Africa	666	36.1 (32.2–39.9)	32.2 (28.5–36.0)	89.3 (84.8–93.9)	14.3 (13.6–14.9) [11.6–15.8]	70.3 (63.9–76.6) [42.8–83.2]
Spain	2,046	39.8 (36.2–43.5)	33.2 (29.7–36.6)	83.3 (78.7–87.9)	14.6 (14.3–14.9) [13.0–16.1]	58.9 (50.9–66.9) [31.7–77.0]
USA	700	28.7 (25.3–32.2)	27.0 (23.6–30.3)	93.9 (90.2–97.5)	13.6 (13.1–14.0) [11.7–15.4]	72.2 (68.1–76.3) [48.9–84.9]
F(ndf,ddf)[p-value][c]	.	42.93(7,201814)[<0.01]*	38.49(7,144393)[<0.01]*		5.90(7,6978)[<0.01]*	11.26(7,692)[<0.01]*

Note. Age of onset of any mental disorder was defined as the minimum age of onset across disorders; for proportional persistence, this was the maximum proportional persistence across disorders. 95%CI = 95% confidence interval; IQR = interquartile range. Significant findings are marked with an asterisk *; $\alpha = 0.05$.

[a] Proportional persistence of mental disorder is defined as the percentage of lifetime years with mental disorder symptoms from age-of-onset to age at the completion of the survey.

[b] To obtain pooled estimates of prevalence, age of onset, and proportional persistence across countries, each country was given an equal sum of weights.

[c] F-test to evaluate significant between-country difference in estimates. ndf = numerator degrees of freedom; ddf = denominator degrees of freedom.

Table 3.

Prevalence, age of onset, and proportional persistence of mental disorders in the WMH-ICS surveys (n = 13,984)

	Lifetime Prevalence % (95%CI)	12-Month Prevalence % (95%CI)	12-Month Prevalence among Lifetime Cases % (95%CI)	Age of Onset Median (95%CI) [IQR]	Proportional Persistence[a] Median (95%CI) [IQR]
Type of disorder					
Major depressive episode	21.2 (20.2–22.3)	18.5 (17.5–19.5)	87.1 (85.2–89.0)	14.3 (14.1–14.5) [12.4–15.9]	62.4 (59.1–65.7) [37.7–79.0]
Generalized anxiety disorder	18.6 (17.6–19.6)	16.7 (15.7–17.7)	90.0 (88.2–91.8)	14.6 (14.3–14.9) [12.2–16.3]	65.0 (61.4–68.6) [41.5–80.9]
Panic disorder	5.0 (4.4–5.6)	4.5 (3.9–5.1)	90.1 (85.5–94.6)	14.6 (14.0–15.2) [12.1–16.5]	68.0 (61.4–74.7) [45.3–83.6]
Broad mania	3.5 (3.0–3.9)	3.1 (2.6–3.5)	88.6 (84.9–92.2)	15.0 (14.6–15.4) [13.6–16.6]	72.8 (69.2–76.5) [55.5–88.1]
Alcohol use disorder	6.8 (6.1–7.5)	6.3 (5.7–7.0)	92.8 (90.2–95.3)	15.6 (15.4–15.9) [14.3–16.9]	73.3 (70.1–76.6) [49.4–91.4]
Substance use disorder	5.1 (4.5–5.7)	3.0 (2.6–3.5)	59.8 (53.4–66.1)	16.2 (15.8–16.5) [14.9–17.7]	45.9 (39.2–52.7) [26.3–73.5]
Any mental disorder	35.3 (34.1–36.6)	31.4 (30.2–32.6)	89.0 (87.6–90.4)	14.2 (14.1–14.4) [12.0–15.9]	65.0 (62.5–67.5) [41.2–80.3]

Note. To obtain pooled estimates of prevalence, age of onset, and proportional persistence across countries, each country was given an equal sum of weights. For any mental disorder, age of onset was defined as the minimum age of onset across disorders; for proportional persistence, this was the maximum proportional persistence across disorders. 95%CI = 95% confidence interval; IQR = interquartile range.

[a]Proportional persistence of mental disorder is defined as the percentage of lifetime years with mental disorder symptoms from age-of-onset to age at the completion of the survey.

Table 4.

Socio-demographic and college-related predictors for any mental disorder in the WMH-ICS surveys

	Predictor Distribution[a] %(SE)	Lifetime aOR (95%CI)	12-Month aOR (95%CI)	12-Month/Lifetime aOR (95%CI)	Proportional Persistence[b] aPRR (95%CI)
Being female	54.4 (0.7)	**1.4 (1.2–1.5)***	**1.4 (1.3–1.6)***	**1.5 (1.2–1.9)***	1.0 (1.0–1.0)
Age					
18[c]	51.7 (0.6)	(ref)	(ref)	(ref)	(ref)
19	26.2 (0.6)	**1.3 (1.1–1.4)***	**1.2 (1.1–1.4)***	0.9 (0.6–1.2)	1.0 (0.9–1.0)
20+	22.1 (0.6)	**1.5 (1.3–1.7)***	**1.3 (1.2–1.5)***	**0.6 (0.4–0.8)***	**0.9 (0.8–0.9)***
F(ndf,ddf)[p-value][d]		20.89(2,25240)[<0.01]*	10.19(2,16785)[<0.01]*	6.42(2,3714)[<0.01]*	21.62(2,993)[<0.01]*
Parental education					
High	57.3 (0.7)	(ref)	(ref)	(ref)	(ref)
Medium	24.3 (0.6)	1.0 (0.9–1.1)	1.0 (0.9–1.2)	1.3 (0.9–1.8)	1.0 (0.9–1.0)
Low	18.4 (0.5)	0.9 (0.8–1.1)	0.9 (0.8–1.1)	1.1 (0.8–1.5)	1.0 (0.9–1.0)
F(ndf,ddf)[p-value][d]		0.61(2,294)[0.54]	0.98(2,556)[0.37]	1.18(2,256)[0.31]	0.37(2,98)[0.69]
Parents not married or parent(s) deceased	25.8 (0.6)	**1.3 (1.2–1.5)***	**1.3 (1.2–1.5)***	1.2 (0.9–1.6)	1.0 (1.0–1.1)
Place Raised[e]					
Small city	28.0 (0.6)	(ref)	(ref)	(ref)	(ref)
Large city	26.8 (0.6)	1.0 (0.9–1.1)	1.0 (0.9–1.2)	1.3 (0.9–1.8)	1.0 (1.0–1.1)
Town/village	20.5 (0.6)	1.0 (0.9–1.2)	1.0 (0.8–1.1)	0.8 (0.6–1.2)	1.0 (1.0–1.1)
Suburbs	17.1 (0.6)	1.0 (0.8–1.2)	1.0 (0.8–1.2)	1.2 (0.7–2.1)	1.0 (1.0–1.1)
Rural area	7.6 (0.4)	1.1 (0.9–1.3)	1.1 (0.9–1.4)	1.4 (0.8–2.6)	1.0 (1.0–1.1)
F(ndf,ddf)[p-value][d]		0.34(4,686)[0.85]	0.41(4,379)[0.80]	1.62(4,384)[0.17]	0.56(4,390)[0.69]
Religion					
Christian	61.9 (0.7)	(ref)	(ref)	(ref)	(ref)
No religion	30.8 (0.7)	**1.4 (1.2–1.6)***	**1.3 (1.1–1.4)***	**0.7 (0.5–0.9)***	1.0 (1.0–1.0)
Another religion	7.3 (0.4)	1.2 (0.9–1.5)	1.1 (0.9–1.4)	0.7 (0.4–1.1)	1.0 (0.9–1.1)
F(ndf,ddf)[p-value][d]		12.85(2,316)[<0.01]*	5.83(2,333)[<0.01]*	4.16(2,823)[0.02]*	0.19(2,544)[0.82]

	Predictor Distribution[a] %(SE)	Lifetime aOR (95%CI)	12-Month aOR (95%CI)	12-Month/Lifetime aOR (95%CI)	Proportional Persistence[b] aPRR (95%CI)
Sexual Orientation					
Heterosexual - no same-sex attraction	72.6 (0.6)	(ref)	(ref)	(ref)	(ref)
Heterosexual - some same-sex attraction	14.1 (0.5)	**1.8 (1.5–2.1)***	**1.7 (1.5–2.0)***	1.1 (0.8–1.6)	1.0 (1.0–1.1)
Non-heterosexual without same-sex sexual intercourse	8.0 (0.4)	**2.6 (2.1–3.3)***	**2.6 (2.1–3.4)***	1.6 (1.0–2.5)	**1.1 (1.0–1.1)***
Non-heterosexual with same-sex sexual intercourse[f]	5.4 (0.3)	**2.8 (2.3–3.6)***	**2.9 (2.3–3.6)***	**1.7 (1.1–2.8)***	1.1 (1.0–1.1)
F(ndf,ddf)[p-value][d]		43.82(3,61)[<0.01]*	42.98(3,60)[<0.01]*	2.29(3,198)[0.08]	2.13(3,118)[0.10]
Current Living situation					
Parents or other relative or own home	56.3 (0.7)	(ref)	(ref)	(ref)	(ref)
University or college hall of residence	27.8 (0.7)	1.1 (0.9–1.3)	1.2 (1.0–1.4)	**1.6 (1.1–2.5)***	1.0 (1.0–1.1)
Shared house or apartment/flat	11.1 (0.4)	1.0 (0.9–1.2)	1.1 (0.9–1.3)	1.4 (0.9–2.0)	1.0 (1.0–1.1)
Private hall of residence	3.2 (0.3)	1.0 (0.8–1.3)	1.1 (0.8–1.4)	1.4 (0.7–2.9)	1.0 (0.9–1.1)
Other	1.6 (0.2)	0.9 (0.6–1.3)	0.8 (0.5–1.2)	0.6 (0.3–1.4)	0.9 (0.8–1.1)
F(ndf,ddf)[p-value][d]		0.44(4,174)[0.78]	1.37(4,131)[0.25]	2.44(4,433)[0.05]*	0.96(4,306)[0.43]
Expected to work a student job	72.4 (0.6)	1.0 (0.9–1.1)	1.0 (0.9–1.1)	0.9 (0.7–1.2)	1.0 (0.9–1.0)
Self-reported ranking in high school					
Top 5%	24.8 (0.6)	(ref)	(ref)	(ref)	(ref)
Top 10 to 5%	22.3 (0.6)	1.1 (1.0–1.3)	1.2 (1.0–1.4)	1.3 (0.9–1.9)	1.0 (1.0–1.1)
Top 30 to 10%	30.2 (0.6)	**1.3 (1.1–1.4)***	**1.3 (1.1–1.5)***	1.2 (0.9–1.7)	1.0 (1.0–1.1)
Bottom 70%	22.7 (0.6)	**1.5 (1.3–1.7)***	**1.5 (1.3–1.8)***	1.3 (0.9–1.8)	1.0 (1.0–1.1)
F(ndf,ddf)[p-value][d]		10.53(3,958)[<0.01]*	10.16(3,605)[<0.01]*	0.88(3,706)[0.45]	0.34(3,438)[0.80]
Most important reason to go to college extrinsic	10.6 (0.5)	**1.2 (1.0–1.4)***	1.2 (1.0–1.4)	0.9 (0.6–1.4)	1.0 (1.0–1.1)

Note. All models adjusted for the predictors shown in the rows, and for country membership. Models for 12-month prevalence among lifetime cases, and models for proportional persistence additionally adjusted for age of onset of disorder. We additionally tested all possible two-way interactions between predictors shown in the rows; none were significant after adjusting for false discovery rate (Q = 0.05). Significant findings are indicated in bold and marked with an asterisk *; α = 0.05. aOR = adjusted odds ratio; aPRR = adjusted persistence rate ratio; CI = confidence interval; SE = standard error.

[a]To obtain pooled estimates of predictor distributions across countries, each country was given an equal sum of weights.

[b]Proportional persistence of mental disorder is defined as the percentage of lifetime years with mental disorder symptoms from age-of-onset to age at the completion of the survey.

[c]16 and 17 year old respondents (n = 2 [<0.01%], and n = 307 [0.8%], respectively) were classified in the 18 year old respondent group for all analyses.

[d] F-test to evaluate joint significance of categorical predictor levels. ndf = numerator degrees of freedom; ddf = denominator degrees of freedom.

[e] For places raised, small city was selected as a reference category because it represented the largest group.

[f] Non-heterosexual orientation and/or same-sex sexual intercourse

Table 5.

Socio-demographic and college-specific predictors for any lifetime mental disorder in the WMH-ICS surveys: Country Effect vs. Overall Effect

	Overall Effect	Australia	Belgium	Germany	Mexico	Northern Ireland	South Africa	Spain	USA
	aOR (95%CI)	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**
Being female	**1.4 (1.3–1.6)***	0.9 (0.6–1.2)	0.9 (0.7–1.0)	1.1 (0.8–1.4)	1.0 (0.9–1.2)	0.9 (0.7–1.3)	1.1 (0.8–1.5)	1.0 (0.8–1.2)	1.1 (0.8–1.6)
Age									
18[a]	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
19	**1.1 (1.0–1.3)***	0.9 (0.6–1.4)	**1.4 (1.1–1.7)***	1.1 (0.8–1.7)	1.1 (0.9–1.4)	0.9 (0.6–1.3)	0.9 (0.6–1.2)	1.1 (0.8–1.3)	0.7 (0.5–1.1)
20+	**1.4 (1.2–1.8)***	1.0 (0.6–1.5)	**1.8 (1.3–2.6)***	1.1 (0.7–1.7)	1.1 (0.8–1.4)	1.2 (0.8–1.7)	1.0 (0.6–1.6)	**0.6 (0.4–0.8)***	0.7 (0.2–2.1)
Parental education									
High	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
Medium	1.0 (0.9–1.2)	1.1 (0.6–1.9)	1.1 (0.9–1.5)	1.0 (0.7–1.4)	0.9 (0.7–1.1)	0.8 (0.6–1.2)	1.0 (0.6–1.5)	1.0 (0.8–1.3)	1.1 (0.7–1.9)
Low	1.0 (0.8–1.2)	0.9 (0.5–1.6)	1.1 (0.8–1.5)	1.0 (0.7–1.4)	**0.7 (0.5–0.9)***	1.0 (0.7–1.4)	1.5 (0.9–2.5)	1.1 (0.8–1.4)	1.0 (0.5–2.2)
Parents not married or parent(s) deceased	**1.4 (1.2–1.6)***	1.0 (0.6–1.8)	1.0 (0.8–1.3)	1.2 (0.8–1.6)	0.8 (0.7–1.0)	1.1 (0.8–1.5)	1.0 (0.7–1.4)	0.9 (0.7–1.2)	1.0 (0.7–1.4)
Place raised[b]									
Small city	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
Large city	1.1 (0.9–1.3)	1.0 (0.4–2.1)	0.9 (0.7–1.2)	0.8 (0.5–1.3)	0.8 (0.6–1.0)	1.3 (0.7–2.6)	1.5 (0.8–2.8)	1.1 (0.8–1.5)	0.8 (0.5–1.4)
Town/village	1.0 (0.8–1.3)	1.2 (0.6–2.6)	1.1 (0.8–1.6)	1.1 (0.7–1.7)	0.8 (0.6–1.1)	0.8 (0.4–1.3)	0.8 (0.2–2.7)	0.9 (0.7–1.3)	1.6 (0.8–3.0)
Suburbs	1.0 (0.8–1.2)	1.2 (0.7–2.3)	1.1 (0.7–1.6)	0.7 (0.4–1.3)	0.7 (0.4–1.2)	0.8 (0.4–1.4)	1.5 (0.8–2.9)	0.8 (0.5–1.3)	1.6 (1.0–2.6)
Rural area	1.2 (0.9–1.6)	1.1 (0.4–2.9)	1.0 (0.6–1.6)	0.6 (0.3–1.1)	0.8 (0.5–1.2)	0.8 (0.4–1.5)	1.7 (0.7–3.8)	0.8 (0.4–1.5)	1.9 (0.7–4.7)
Religion									
Christian	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
No religion	**1.4 (1.2–1.6)***	1.3 (0.8–2.1)	1.1 (0.9–1.3)	1.1 (0.7–1.5)	1.2 (0.9–1.4)	0.9 (0.6–1.3)	0.9 (0.6–1.4)	**0.8 (0.6–1.0)***	0.9 (0.6–1.3)
Another religion	1.2 (0.9–1.5)	1.3 (0.7–2.6)	1.2 (0.8–1.9)	0.8 (0.4–1.4)	1.4 (0.9–2.1)	2.3 (0.7–7.6)	1.1 (0.6–2.0)	**0.3 (0.2–0.7)***	0.7 (0.4–1.2)
Sexual orientation									
Heterosexual - no same-sex attraction	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
Heterosexual - some same-sex attraction	**2.0 (1.7–2.4)***	1.1 (0.6–2.2)	0.9 (0.7–1.3)	1.1 (0.7–1.6)	0.9 (0.7–1.2)	**2.3 (1.3–4.2)***	0.9 (0.5–1.7)	**0.6 (0.5–0.8)***	0.8 (0.5–1.1)

	Overall Effect	Australia	Belgium	Germany	Mexico	Northern Ireland	South Africa	Spain	USA
	aOR (95%CI)	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**	**aOR (95%CI)**
Non-heterosexual without same-sex sexual intercourse	**2.8 (2.2–3.7)***	1.8 (0.7–4.3)	1.2 (0.8–1.7)	1.1 (0.6–2.0)	**0.7 (0.5–0.9)***	0.9 (0.4–1.7)	1.2 (0.6–2.5)	0.7 (0.5–1.2)	0.9 (0.5–1.4)
Non-heterosexual with same-sex sexual intercourse	**3.4 (2.6–4.5)***	1.7 (0.7–3.7)	1.1 (0.6–1.7)	1.3 (0.6–2.8)	**0.6 (0.4–0.9)***	1.2 (0.6–2.6)	1.2 (0.4–3.3)	**0.5 (0.3–0.7)***	1.1 (0.6–2.1)
Current living situation									
Parents or other relative or own home	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
University or college hall of residence	1.4 (0.9–2.2)	0.8 (0.4–1.7)	0.8 (0.5–1.2)	0.8 (0.4–1.4)	0.5 (0.2–1.2)	0.9 (0.5–1.5)	0.8 (0.4–1.4)	0.7 (0.4–1.3)	7.6 (0.5–107.8)
Shared house or apartment/flat	1.1 (0.6–2.0)	1.0 (0.4–2.6)	1.0 (0.5–1.9)	0.9 (0.4–1.8)	1.0 (0.5–1.8)	1.0 (0.5–2.0)	0.8 (0.3–2.3)	0.9 (0.5–1.8)	1.7 (0.0–85.4)
Private hall of residence	1.5 (0.9–2.6)	0.5 (0.2–1.6)	0.7 (0.3–1.5)	0.9 (0.4–1.9)	0.6 (0.3–1.1)	2.4 (0.6–9.7)	0.8 (0.2–3.5)	0.5 (0.2–1.4)	5.1 (0.3–97.9)
Other	1.1 (0.5–2.3)	1.0 (0.2–4.5)	1.0 (0.3–2.8)	1.3 (0.4–4.2)	0.5 (0.2–1.6)	0.8 (0.2–3.5)	0.7 (0.1–8.5)	0.8 (0.3–2.1)	3.4 (0.0–237.7)
Expected to work a student job	1.0 (0.9–1.1)	1.0 (0.5–1.8)	1.0 (0.8–1.3)	1.0 (0.7–1.4)	1.1 (0.9–1.4)	0.9 (0.6–1.3)	1.1 (0.7–1.8)	1.0 (0.8–1.2)	1.0 (0.7–1.4)
Self-reported high school ranking									
Top 5%	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)	(ref)
Top 10 to 5%	1.1 (1.0–1.3)	1.5 (0.8–2.7)	1.0 (0.7–1.4)	1.1 (0.6–1.8)	0.9 (0.7–1.1)	0.8 (0.5–1.5)	1.0 (0.6–1.5)	1.2 (0.9–1.6)	0.7 (0.5–1.1)
Top 30 to 10%	**1.2 (1.1–1.4)***	1.1 (0.7–1.9)	1.1 (0.8–1.5)	1.0 (0.7–1.7)	1.1 (0.8–1.3)	0.9 (0.5–1.5)	1.2 (0.8–1.7)	0.9 (0.7–1.2)	0.8 (0.5–1.2)
Bottom 70%	**1.5 (1.2–1.8)***	1.3 (0.7–2.3)	1.1 (0.9–1.5)	1.2 (0.8–1.9)	1.0 (0.8–1.3)	0.8 (0.4–1.3)	1.2 (0.7–2.1)	0.8 (0.6–1.1)	0.7 (0.4–1.2)
Most important reason to go to college extrinsic	**1.4 (1.1–1.7)***	0.8 (0.4–1.6)	0.8 (0.6–1.2)	1.0 (0.6–1.7)	0.8 (0.6–1.0)	1.5 (0.8–2.8)	0.9 (0.5–1.8)	**1.8 (1.0–3.1)***	0.8 (0.4–1.5)

Note. Each row shows a separate logistic regression model with any lifetime mental disorder as the outcome variable, adjusting for all other predictor variables (rows), country membership, and predictor-by-country interaction dummies. The second column shows the overall adjusted predictor variable effect; the country columns show to what extent the country-specific adjusted predictor variable effect deviates from the overall adjusted predictor variable effect. Significant findings are indicated in bold and marked with an asterisk *; $\alpha = 0.05$; aOR = adjusted odds ratio; CI = confidence interval; SE = standard error.

[a] 16 and 17 year old respondents ($n = 2$ [<0.01%], and $n = 307$ [0.8%], respectively) were classified in the 18 year old respondent group for all analyses.

[b] For places raised, small city was selected as a reference category because it represented the largest group.