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# Suicidal Thoughts and Behaviors Among First-Year College Students: Results From the WMH-ICS Project

Philippe Mortier, MD, PhD, Randy P. Auerbach, PhD, Jordi Alonso, MD, PhD, Jason Bantjes, PhD, Corina Benjet, PhD, Pim Cuijpers, MD, PhD, David D. Ebert, PhD, Jennifer Greif Green, PhD, Penelope Hasking, PhD, Matthew K. Nock, PhD, Siobhan O'Neill, PhD, Stephanie Pinder-Amaker, PhD, Nancy A. Sampson, BA, Gemma Vilagut, PhD, Alan M. Zaslavsky, PhD, Ronny Bruffaerts, PhD, Ronald C. Kessler, PhD, on behalf of the WHO WMH-ICS Collaborators

**Objective:** College entrance may be a strategically well-placed "point of capture" for detecting late adolescents with suicidal thoughts and behaviors (STB). However, a clear epidemiological picture of STB among incoming college students is lacking. We present the first cross-national data on prevalence as well as socio-demographic and college-related correlates for STB among first-year college students.

**Method:** Web-based self-report surveys were obtained from 13,984 first-year students (response rate 45.5%) across 19 colleges in 8 countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States).

**Results:** Lifetime prevalence of suicidal ideation, plans, and attempts was 32.7%, 17.5%, and 4.3%, respectively. The 12-month prevalence was 17.2%, 8.8%, and 1.0%, respectively. About three-fourths of STB cases had onset before the age of 16 years (Q3 = 15.8), with persistence figures in the range of 41% to 53%. About one-half (53.4%) of lifetime ideators transitioned to a suicide plan; 22.1% of lifetime planners transitioned to an attempt. Attempts among lifetime ideators without plan were less frequent (3.1%). Significant correlates of lifetime STB were cross-nationally consistent and generally modest in effect size (median adjusted odds ratio [aOR] = 1.7). Nonheterosexual orientation (aOR range 3.3−7.9) and heterosexual orientation with some same-sex attraction (aOR range 1.9−2.3) were the strongest correlates of STB, and of transitioning from ideation to plans and/or attempts (aOR range 1.6−6.1).

**Conclusion:** The distribution of STB in first-year students is widespread, and relatively independent of socio-demographic risk profile. Multivariate risk algorithms based on a high number of risk factors are indicated to efficiently link high-risk status with effective preventive interventions.

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Adolescence is a high-risk period for the onset of suicidal thoughts and behaviors (STB),[1] and about 21% to 50% of those with adolescent-onset STB continue to experience STB when transitioning into young adulthood.[2,3] This transition includes college entrance for approximately two-thirds of young people in developed countries.[4] Evidence suggests that there is high persistence of adolescent-onset STB into the college years,[5,6] and rates of STB among college students do not differ substantially from those among same-aged peers.[7] College entrance may therefore function as a strategically well-placed "point of capture" for detecting STB within the social geography of society.[8] Due to the availability of centralized student services, the college environment also may be particularly well suited to implement interventions for preventing the progression of STB.[9]

To efficiently allocate resources for these interventions, and to adequately plan health care needs on campus, it is crucial to provide policy makers and mental health professionals with a clear epidemiological picture of STB among first-year students. A recent systematic review of the literature[10] documented a substantial lack of representative data on college student STB worldwide, especially outside of North America and Asia. In addition, although college student samples are often used to test specific theory-driven hypotheses on STB,[11,12] there is a lack of understanding of how STB is concentrated in student populations according to basic correlates. Previous studies have suggested that basic correlates may include socio-demographic (e.g., gender,[13] age,[14] socio-economic status,[15] religion,[16] sexual orientation[17]) as well as college-related (e.g., living situation,[13] student job[14]) variables.

We address these shortcomings by presenting data on STB prevalence among first-year students from 19 colleges located in 8 countries worldwide. These data come from the initial round of surveys in the WHO World Mental Health Surveys International College Student Project (WMH-ICS),[18] a coordinated series of ongoing epidemiological needs assessment surveys designed to provide accurate information about adverse mental health outcomes among college students and to lay the groundwork for implementing and evaluating cost-effective preventive and clinical internet and mobile-based interventions. In contrast to the vast majority of previous college STB surveys,[10] the data presented here were obtained using census of the entering class, and the sample size is sufficiently large to investigate the full range of STB outcomes (i.e., ideation, plans, and attempts) and transitions (i.e., plans among ideators,

attempts among ideators with and without plans), as well as socio-demographic and college-related correlates of STB.

# METHOD

## 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 8 mostly high-income countries (Australia, Belgium, Germany, Mexico, Northern Ireland, South Africa, Spain, and the United States). Web-based self-report questionnaires were administered to representative samples (i.e., census) of first-year students in each college (7 private and 12 public) across these countries between October 2014 and February 2017. A total of 14,371 questionnaires were completed, with sample sizes ranging from 633 in Australia to 4,580 in Belgium. The weighted (by achieved sample size) mean response rate across surveys was 45.5%. An overview of the sample design in each country is provided in Table S1, available online. The sample for the analyses reported here was restricted to students identifying as male or female who were full-time students (N = 13,984). Students excluded from analyses included those with missing information on gender and full-time status (n = 35), those did not identify as male or female (n = 50), and those who reported part-time status (n = 302).

## Procedures

All first-year students in the colleges were invited to participate in a Web-based self-report health survey. The initial mode of contact varied across colleges, with the survey part of a health evaluation in some schools, as part of the registration process in others, and as a stand-alone survey delivered via student e-mail addresses in still others. In all cases other than in Mexico, potential respondents were invited to participate and initial nonrespondents were re-contacted through a series of personalized reminder e-mails containing unique electronic links to the survey. The situation was different in Mexico, where students were invited to participate in conjunction with mandatory activities, which varied from school to school (e.g., student health evaluations, tutoring sessions), with time set aside for completing the survey during the sessions. In the other countries, 10 universities implemented conditional incentives in the final stages of refusal conversion (e.g., a raffle for store credit coupons, movie passes). In addition, one site (Spain) used an "end-game strategy" in which a random sample of nonrespondents at the end of the normal recruitment period were offered incentives for participation. Respondents to these end-game interviews were given a weight equal to 1/p, where p represented the proportion of nonrespondents at the end of the normal recruitment period that was included in the end-game, to adjust for the undersampling of these difficult-to-recruit respondents. Informed consent was obtained before administering the questionnaires in all countries. Procedures for obtaining informed consent and protecting human participants were approved and monitored for compliance by the institutional review boards of the organizations coordinating the surveys in each country.

## Measures

*Suicidal Thoughts and Behaviors.* A modified version of the Columbia–Suicide Severity Rating Scale[19] was used to assess STB, including suicidal ideation ("Did you ever wish you were dead or would go to sleep and never wake up?" "Did you ever in your life have thoughts of killing yourself?"), suicide plans ("Did you ever think about how you might kill yourself [e.g., taking pills, shooting yourself] or work out a plan of how to kill yourself?"), and suicide attempts ("Have you ever made a suicide attempt [i.e., purposefully hurt yourself with at least some intent to die]?"). In addition, the time course of each STB outcome was assessed, that is, age of onset (AOO), numbers of lifetime years with STB, and number of months in the past 12 months with STB. STB transition rates were defined as the proportion of suicide planners among lifetime ideators, suicide attempters among lifetime ideators without plans (unplanned attempts), and suicide attempters among lifetime ideators with plans (planned attempts). We calculated STB persistence in 2 ways: the ratio of 12-month to lifetime prevalence; and proportional persistence, defined as the ratio of number of lifetime years with STB divided by number of years between AOO and age-at-interview (separately for ideation and plans). Persistence of suicide attempts was defined as the number of subsequent lifetime suicide attempts among individuals with any attempts.

*Socio-Demographic Correlates.* Gender was assessed by asking respondents whether they identified as male, female, transgender (male-to-female/female-to-male), or "other." Respondent age was categorized into 3 categories (18 years/19 years/20 or more years). Parental educational level was assessed for father and mother separately and was categorized into high (university graduate or more), medium (some postsecondary 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 at least one parent deceased" versus "parents married and both alive." Respondents were asked about the urbanicity of the place in which they were raised (categorized into 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 with whom they had had sex (if any) in the past 5 years. Respondents were categorized into the following categories: heterosexual with no same-sex attraction, heterosexual with some same-sex attraction, nonheterosexual without same-sex sexual intercourse, and nonheterosexual 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 4 approximately equal-sized groups) and what their most important reason was to go to college. Based on the results of a tetrachoric factor analysis (details available on request), the most important reason to go to college was categorized into extrinsic reasons (i.e., family wanted me to go/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/university or college hall of residence/shared house, apartment, or flat/private hall of residence/other) and if they either already worked or expected to work on a student job.

## Statistical Analysis

All analyses were conducted with SAS version 9.4.[20] Data were weighted to adjust for differences between survey respondents and nonrespondents on whatever socio-demographic information was made available about the student body by university officials using poststratification weights.[21]

In addition, multiple imputation (MI) by chained equations[22] was used to adjust for within-survey item nonresponse, random internal subsampling of survey sections, and missing data due to skip logic errors that occurred in a few surveys. Prevalence estimates are reported as weighted within-country proportions, with associated MI-adjusted standard errors obtained through the Taylor series linearization method. It should be noted that STB prevalence estimates did not take into account right censoring of data points with regard to age; this was addressed by including age as a correlate in subsequent analyses. Estimates of AOO and of proportional persistence (i.e., the percentage of lifetime years with STB) are reported as median values with associated interquartile ranges. To obtain pooled estimates of prevalence, AOO, and proportional persistence across countries, each country was given an equal sum of weights. Projected AOO distributions up to age 25 years for each STB outcome were analyzed using time-to-event analyses (taking into account right censoring of data with regard to age).[23] To allow for accurate estimations of STB onset timings within a given lifetime year, we used the actuarial method for all time-to-event analyses, as this method assumes a constant conditional risk of STB onset during a given year of life across age.

Logistic regression analyses were used to identify correlates of lifetime STB. Regression coefficients and their MI-based standard errors were exponentiated to create odds ratios (OR) and associated 95% confidence intervals (CI). Initial models were pooled estimates across countries to examine both main effects and all possible 2-way interactions among correlates, with risk for Type I error adjusted for using the false discovery rate method ($Q = 0.05$).[24] We then examined between-country variation in associations by including correlate-by-country interactions in an adjusted interaction dummy coding scheme that kept the product of all country-specific ORs equal to 1. 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 2-sided MI-based tests with significance level $\alpha$ set at 0.05.

## RESULTS

### STB Prevalence, Age of Onset, and Persistence Rates

The final sample included 13,984 students (54.4% female; mean age = 19.33 years, SD = 0.59 year). Lifetime prevalence of ideation, plans, and attempts were 32.7%, 17.5%, and 4.3%, respectively (Table 1). Comparable 12-month estimates were 17.2%, 8.8%, and 1.0%, respectively. More than one-half (53.4%) of lifetime ideators made the transition to a suicide plan, with slightly more than one-fourth (26.8%) of lifetime ideators having a plan in the past 12 months. In addition, 22.1% of lifetime planners made the transition to an attempt, with 5.4% doing so in the past 12 months. Attempts among lifetime ideators without plan were less frequent (3.1%; 0.3% of lifetime ideators in the past 12 months).

The median AOO of lifetime suicidal ideation was 14.2 years, with roughly 75% of cases having an onset before the age of 16 years (Q3 = 15.8). The median AOO was slightly higher for suicide plans (14.6 years) and suicide attempts (15.1 years). Projected STB AOO curves up to age 25 years (Figure 1) show that risk for STB onset was relatively low before the age of 12 and then increased steeply up to age 17, with a moderate decline in slope across the age range 17 to 25 years.

The 12-month–to-lifetime prevalence ratios for suicidal ideation and plans were 50% to 53% (Table 1). Proportional persistence for these outcomes was 41% to 42%. For attempts and planned attempts, 12-month to lifetime ratios were 23% to 24%, whereas the ratio for unplanned attempts was 10.2%. The median number of attempts (among attempters; either planned or unplanned) was one, with more than 25% of lifetime attempters with a plan (Q3 = 2.2) and a lower proportion of lifetime attempters without a plan (Q3 = 1.6) making 2 or more attempts.

Between-country variation in suicidal ideation was considerable (lifetime range 15.2%–44.6%; 12-month range 7.0%–25.7%) (Table 2). The 12-month–to-lifetime prevalence ratios were more stable (range 42.8%–60.3%), as were proportional persistence (range 29.1%–54.3%) and median AOO (range 13.5–14.7 years).

**TABLE 1** Prevalence, Age of Onset, and Persistence of Suicidal Thoughts and Behaviors (STB) in the WHO World Mental Health Surveys International College Student Project (WMH-ICS) Surveys (N = 13,984)

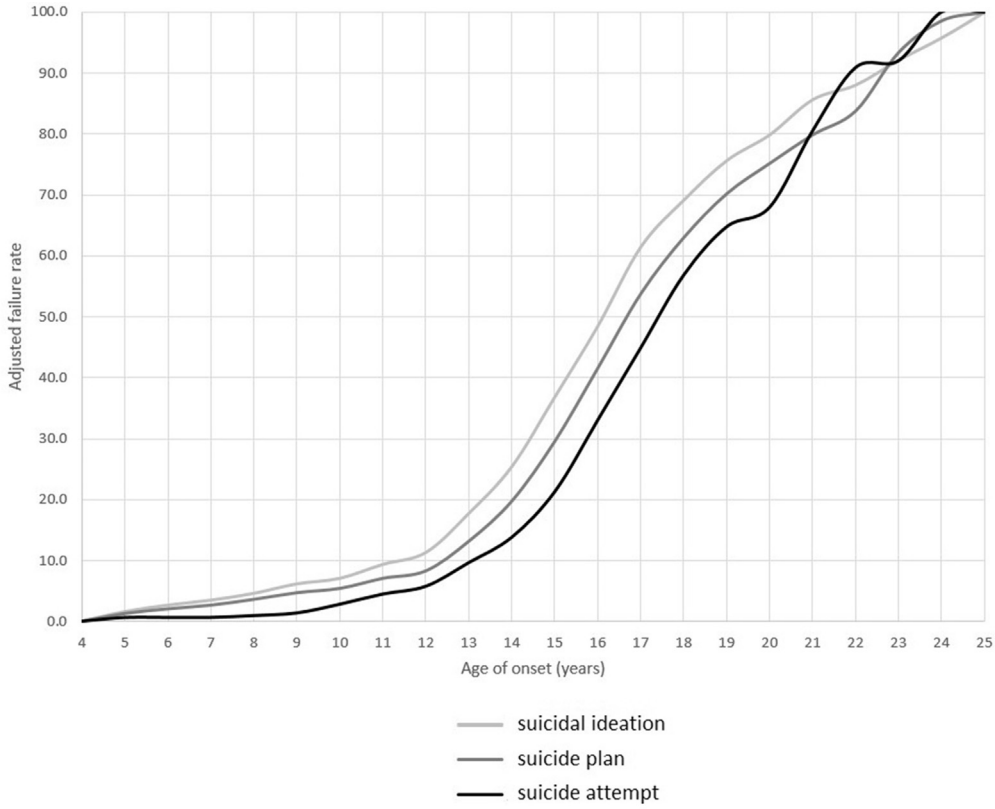
| | Lifetime % (95% CI) | 12-Month % (95% CI) | Age of Onset Median [IQR] | Persistence | | |
|---|---|---|---|---|---|---|
| | | | | 12-Month/Lifetime % (95% CI) | Proportional Persistence[a] Median [IQR] | Persistence[b] Median [IQR] |
| STB prevalence | | | | | | |
| Ideation | 32.7 (31.5–34.0) | 17.2 (16.2–18.2) | 14.2 [12.2–15.8] | 52.5 (50.2–54.9) | 41.2 [21.8–70.1] | / |
| Plan | 17.5 (16.5–18.5) | 8.8 (8.0–9.5) | 14.6 [12.8–16.1] | 50.2 (47.0–53.4) | 41.9 [21.8–70.7] | / |
| Attempt | 4.3 (3.8–4.9) | 1.0 (0.7–1.2) | 15.1 [13.5–16.6] | 22.8 (17.5–28.2) | / | 1.0 [1.0–2.1] |
| STB transition rates | | | | | | |
| Plan among lifetime ideators | 53.4 (51.1–55.6) | 26.8 (24.7–28.9) | 14.6 [12.8–16.1] | 50.2 (47.0–53.4) | 41.9 [21.8–70.7] | / |
| Attempt among lifetime ideators without plan | 3.1 (1.9–4.3) | 0.3 (0.0–0.7) | 14.2 [12.3–15.8] | 10.2 (0.0–21.2) | / | 1.0 [1.0–1.6] |
| Attempt among lifetime ideators with plan | 22.1 (19.5–24.7) | 5.4 (4.0–6.8) | 15.2 [13.6–16.6] | 24.4 (18.6–30.1) | / | 1.0 [1.0–2.2] |

*Note: To obtain pooled estimates of prevalence, age of onset, and (proportional) persistence across countries, each country was given an equal sum of weights. IQR = interquartile range.*

[a]*Proportional persistence of suicidal ideation and suicide plan is defined as the percentage of lifetime years with ideation or plan, among lifetime ideators or planners, respectively.*

[b]*Persistence of suicide attempts is defined as the actual number of lifetime suicide attempts among lifetime attempters.*

**FIGURE 1** Cumulative Age of Onset Distribution for Suicidal Thoughts and Behaviors (STB) in the WHO World Mental Health Surveys International College Student Project (WMH-ICS)




*Note:* *Projected age of onset distributions are based on first-year students only, limiting the representativeness of the estimated distributions above age 18 to 19 years (i.e., the typical age of entering college).*

### Socio-Demographic and College-Related Correlates of Lifetime STB

Of the 11 correlates that we considered, 5 were consistently associated with all 3 STB outcomes (Table 3). The strongest correlate was sexual orientation, disaggregated into nonheterosexual orientation with same-sex sexual intercourse (adjusted odds ratio [aOR] range 4.2−7.9), nonheterosexual orientation without same-sex sexual intercourse (aOR range 3.3−4.3), and heterosexual orientation with some same-sex attraction (aOR range 1.9−2.3). This was followed by having a religion other than Christianity (aOR range 1.5−2.0), being female (aOR range 1.3−2.2), having parents not married or at least one parent deceased (aOR range 1.4−1.5), and being 20 years or older (aOR range 1.2−1.7). Sexual orientation was also the strongest correlate of transitioning from ideation to plan (aOR range 1.6−2.9), followed by having a religion other than Christianity, and being 19 or older (aOR range 1.2−1.5). Unplanned attempts among lifetime ideators were uniquely predicted by nonheterosexual orientation with same-sex sexual intercourse (aOR = 6.1) and by being 20 or older at matriculation (aOR = 2.5). Planned attempts among ideators, in contrast, were predicted by nonheterosexual orientation, being female, having been raised in a large city (aOR range 1.8−2.5), and by high parental education (versus medium parental education; aOR = 1.0/0.7 = 1.4).

Table 4 shows that the significant associations between STB and the correlates were quite consistent across countries, with only 32 of 192 correlate-by-country interactions (i.e., [24 correlates] × [8 countries]) being statistically significant.

## DISCUSSION

We presented the first data from a large cross-national sample on STB among incoming college freshmen. Many of the findings are consistent with those of studies in more general adolescent samples: that about one-third of respondents reported lifetime STB,[25] with a median age of onset of 14 years,[1,26] persistence in the range of 40% to 50%,[2,3,27] a substantial number of multiple attempters,[28] and higher rates of STB among females than among males.[25,29] An important exception, however, were STB transition rates, which differed substantially from rates in community-based samples of adolescents[1,30] as well as adults.[31] Specifically, the probability of transition from ideation to plan (i.e., 53.4%) was considerably higher than in general adolescent samples (generally around 33%), whereas the probability of transition from ideation to attempts was considerably lower both among planners (22.1% versus 53%−61%) and ideators without a plan (3.1% versus 14%−20%). If confirmed and not attributed to methodological differences, a lower ideation-to-action propensity in first-year students might be explained by higher levels of executive functioning, decision-making abilities,[32-34] or other factors associated both with differential selection into higher education and the propensity to make the transition to suicide attempts. This is in line with preliminary findings that

**TABLE 2** Prevalence, Age of Onset, and Proportional Persistence of Suicidal Ideation in the WHO World Mental Health Surveys International College Student Project (WMH-ICS), by Country

| | Sample Size | Lifetime | 12-Month | Age of Onset | Persistence | |
|---|---|---|---|---|---|---|
| | | | | | 12-Month/Lifetime | Proportional Persistence[a] |
| | N | % (95% CI) | % (95% CI) | Median [IQR] | % (95% CI) | Median [IQR] |
| All countries[b] | 13,984 | 32.7 (31.5–34.0) | 17.2 (16.2–18.2) | 14.2 [12.2–15.8] | 52.5 (50.2–54.9) | 41.2 [21.8–70.1] |
| Australia | 529 | 44.6 (40.0–49.2) | 25.7 (21.7–29.7) | 14.1 [8.8–16.3] | 57.5 (50.6–64.5) | 32.7 [14.3–67.2] |
| Belgium | 4,490 | 15.2 (14.1–16.2) | 7.0 (6.3–7.8) | 13.8 [11.2–15.5] | 46.2 (42.4–50.0) | 29.1 [15.8–53.6] |
| Germany | 652 | 37.1 (33.3–41.0) | 18.8 (15.7–21.9) | 14.2 [12.5–15.7] | 50.5 (44.1–57.0) | 40.8 [21.1–69.2] |
| Mexico | 4,190 | 23.0 (21.7–24.3) | 9.8 (8.9–10.8) | 14.5 [12.5–16.0] | 42.8 (39.6–46.1) | 28.3 [17.6–56.1] |
| Northern Ireland | 711 | 30.6 (27.2–34.0) | 18.5 (15.6–21.4) | 14.7 [13.2–15.9] | 60.3 (53.8–66.8) | 45.2 [23.4–72.3] |
| South Africa | 666 | 42.5 (38.6–46.4) | 24.3 (21.0–27.7) | 14.3 [12.5–15.9] | 57.2 (51.1–63.3) | 46.4 [25.7–74.9] |
| Spain | 2,046 | 33.0 (29.6–36.5) | 14.7 (12.3–17.2) | 14.5 [12.7–16.0] | 44.6 (38.5–50.7) | 37.1 [22.1–61.7] |
| USA | 700 | 35.9 (32.2–39.6) | 18.8 (15.9–21.8) | 13.5 [12.0–14.9] | 52.5 (46.1–58.8) | 54.3 [28.6–75.4] |
| *F*(ndf,ddf)[*p* value][c] | . | 69.37(7,97881)[<0.01][d] | 46.56(7,83419)[<0.01][d] | 12.11(7,405182)[<0.01][d] | | 16.21(7,41571)[<0.01][d] |

*Note*: ddf = denominator degrees of freedom; IQR = interquartile range; ndf = numerator degrees of freedom.

[a]Proportional persistence of suicidal ideation is defined as the percentage of lifetime years with ideation.

[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 based on multiple imputations.

[d]Significant findings.

more severe adolescent-onset STB, especially attempts, are related to cognitive deficits,[35-37] low school performance,[38] and, hence, a potentially lower probability of college entrance. Further supporting these possibilities, lifetime STB, especially unplanned attempts, were independently related to having an older age at matriculation, which could have been due to adverse mental health leading to delayed college entrance.[39]

Among the range of basic socio-demographic and college-related variables that we examined, nonheterosexual orientation was found to be common (~13%) and to be the strongest correlate of lifetime STB (aOR 3.3–7.9). Possibly due to a more fine-grained disaggregation of sexual orientation, the strength of these associations is higher than found in recent meta-analyses among young people, which documented pooled odds ratios of nonheterosexual orientation with STB in the range of 2.3 to 2.9.[40,41] We expand on prior findings in 3 additional ways. First, the association of nonheterosexual orientation with STB was consistent among entering students across 8 different countries. Second, we found a higher risk of transitioning from ideation to both planned and unplanned attempts among students with nonheterosexual orientation. Third, we also found that students identifying as heterosexual but indicating some same-sex attraction are at higher risk for STB, and for transitioning from ideation to a suicide plan. These are novel findings that complement previous evidence of higher risk of suicide in later life among sexual minorities.[42,43] As the college period is a time of increased identity exploration and consolidation,[44] these results also point to the importance of tackling developmentally relevant risk factors for STB transition on campus that include lesbian/gay/bisexual/transsexual (LGBT) discrimination and victimization,[45] internalized homophobia,[46] and parental intolerance and rejection in response to disclosure of nonheterosexual orientation.[47]

In line with previous studies,[31,48,49] lifetime STB prevalence varied considerably by country (15.2%–44.6%), whereas associations between basic correlates and lifetime STB were cross-nationally more consistent. It should be stressed that with odds ratios of basic correlates with STB in the range of 1.2–7.9 (median OR = 1.7), significant individual-level associations are generally modest. This points to the widespread distribution of STB in the first-year student population, relatively independent of socio-demographic risk profile. It follows that targeting the entire population of incoming students (i.e., universal prevention efforts[50]) may be a feasible approach. It also follows that the accurate detection of high-risk students for STB (e.g., through risk-screening projects) will depend on multivariate risk algorithms based on a high number of additional risk factors (e.g., mental disorders, childhood adversity).[51] High persistence of lifetime STB, as documented here, underscores the importance of including severity markers of pre-college onset STB in such algorithms.[5] Only then will centralized digital screening instruments at college entry allow colleges to efficiently link high-risk status with effective preventive interventions, such as Internet- and mobile-based approaches.[52] Such approaches allow colleges to offer low-threshold interventions, which are associated with lower barriers for help seeking and at the same time allow tailoring interventions to the specific individual risk profile of students (e.g., nonheterosexual students with additional risk for adverse mental health outcomes). Recent studies suggest that such approaches can not only be effective in preventing[53] and treating mental health disorders,[54] but also in increasing help seeking in suicidal college students and reducing suicidal ideation.[55]

Several limitations of the study deserve attention. First, the response rates were not optimal in all countries. Although it has been shown that the empirical relationship between response rate and nonresponse bias is weak,[56] recent findings warn of potential overestimation of STB when response rates are low.[10] Second, there is concern about nondisclosure of suicidality among young people,[57] which may have led to

**TABLE 3** Socio-Demographic and College-Related Correlates for Lifetime Suicidal Thoughts and Behaviors (STB) in the WHO World Mental Health Surveys International College Student Project (WMH-ICS) Surveys

| | Predictor Distribution[a] | Ideation | Plan | Attempt | Plan Among Ideators | Attempt Among Ideators Without Plan | Attempt Among Ideators With Plan |
|---|---|---|---|---|---|---|---|
| | % (SE) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) |
| Female gender | 54.4 (0.7) | 1.4 (1.3–1.6)[d] | 1.3 (1.2–1.5)[d] | 2.2 (1.7–2.9)[d] | 1.0 (0.8–1.2) | 1.2 (0.6–2.4) | 2.0 (1.4–2.7)[d] |
| Age | | | | | | | |
| 20 y or more | 22.1 (0.6) | 1.2 (1.0–1.4)[d] | 1.4 (1.2–1.7)[d] | 1.7 (1.3–2.3)[d] | 1.3 (1.1–1.7)[d] | 2.5 (1.1–5.7)[d] | 1.4 (1.0–2.0) |
| 19 y | 26.2 (0.6) | 1.0 (0.9–1.2) | 1.2 (1.0–1.4) | 1.3 (1.0–1.7) | 1.2 (1.0–1.5)[d] | 2.0 (1.0–4.1) | 1.1 (0.8–1.5) |
| 18 y[b] | 51.7 (0.6) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| *F*(ndf,ddf)[*p* value][c] | | 3.03(2,135706)[0.05] | 6.72(2,29880)[<0.01][d] | 7.52(2,46744)[<0.01][d] | 3.85(2,42841)[0.02][d] | 3.40(2,8749)[0.03][d] | 1.59(2,28505)[0.20] |
| Parental education | | | | | | | |
| Low | 18.4 (0.5) | 1.0 (0.8–1.1) | 0.9 (0.7–1.1) | 0.9 (0.6–1.2) | 0.9 (0.7–1.1) | 1.9 (0.8–4.5) | 0.8 (0.5–1.2) |
| Medium | 24.3 (0.6) | 0.9 (0.8–1.0) | 0.9 (0.7–1.0) | 0.7 (0.5–1.0)[d] | 1.0 (0.8–1.2) | 1.6 (0.7–3.8) | 0.7 (0.5–1.0)[d] |
| High | 57.3 (0.7) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| *F*(ndf,ddf)[*p* value][c] | | 1.68(2,465)[0.19] | 1.27(2,691)[0.28] | 2.45(2,1030)[0.09] | 0.35(2,446)[0.70] | 1.26(2,903)[0.28] | 2.40(2,681)[0.09] |
| Parents not married or at least one parent deceased | 25.8 (0.6) | 1.5 (1.3–1.6)[d] | 1.4 (1.2–1.7)[d] | 1.5 (1.2–2.0)[d] | 1.1 (0.9–1.3) | 1.0 (0.5–2.0) | 1.2 (0.9–1.7) |
| Place raised | | | | | | | |
| Rural area | 7.6 (0.4) | 1.0 (0.8–1.2) | 0.8 (0.6–1.2) | 1.2 (0.7–2.0) | 0.8 (0.5–1.1) | 0.7 (0.1–4.0) | 1.8 (0.9–3.7) |
| Suburbs | 17.1 (0.6) | 1.1 (0.9–1.4) | 1.1 (0.8–1.4) | 1.3 (0.8–2.0) | 1.0 (0.7–1.4) | 0.5 (0.1–2.1) | 1.6 (0.9–2.8) |
| Town/village | 20.5 (0.6) | 1.1 (1.0–1.3) | 1.0 (0.8–1.2) | 1.1 (0.8–1.7) | 0.9 (0.7–1.2) | 1.2 (0.4–3.4) | 1.1 (0.7–1.8) |
| Large city | 26.8 (0.6) | 1.0 (0.8–1.1) | 0.9 (0.7–1.1) | 1.4 (1.0–2.0)[d] | 0.9 (0.7–1.2) | 2.1 (0.9–4.7) | 1.8 (1.2–2.8)[d] |
| Small city | 28.0 (0.6) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| *F*(ndf,ddf)[*p* value][c] | | 1.14(4,359)[0.34] | 1.02(4,482)[0.40] | 1.09(4,483)[0.36] | 0.50(4,264)[0.73] | 1.58(4,4624)[0.18] | 2.35(4,345)[0.05] |
| Religion | | | | | | | |
| Another religion | 7.3 (0.4) | 1.5 (1.1–1.9)[d] | 1.7 (1.3–2.2)[d] | 2.0 (1.2–3.3)[d] | 1.5 (1.0–2.1)[d] | 1.6 (0.3–7.7) | 1.3 (0.7–2.4) |
| No religion | 30.8 (0.7) | 1.5 (1.3–1.7)[d] | 1.8 (1.5–2.1)[d] | 1.3 (1.0–1.7) | 1.5 (1.3–1.9)[d] | 1.2 (0.5–2.5) | 0.8 (0.5–1.1) |
| Christian | 61.9 (0.7) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| *F*(ndf,ddf)[*p* value][c] | | 23.63(2,1364)[<0.01][d] | 28.96(2,730)[<0.01][d] | 4.10(2,145)[0.02][d] | 9.65(2,1035)[<0.01][d] | 0.27(2,402)[0.76] | 2.29(2,202)[0.10] |
| Sexual orientation | | | | | | | |
| Nonheterosexual with same-sex sexual intercourse | 5.4 (0.3) | 4.2 (3.3–5.2)[d] | 5.6 (4.4–7.2)[d] | 7.9 (5.4–11.6)[d] | 2.9 (2.1–3.9)[d] | 6.1 (2.5–14.5)[d] | 2.5 (1.6–4.0)[d] |
| Nonheterosexual without same-sex sexual intercourse | 8.0 (0.4) | 3.3 (2.7–3.9)[d] | 4.3 (3.5–5.3)[d] | 4.3 (2.9–6.5)[d] | 2.4 (1.8–3.1)[d] | / | 1.9 (1.1–3.1)[d] |
| Heterosexual, some same-sex attraction | 14.1 (0.5) | 1.9 (1.6–2.2)[d] | 2.2 (1.9–2.7)[d] | 2.3 (1.7–3.2)[d] | 1.6 (1.3–2.0)[d] | 1.0 (0.3–3.2) | 1.3 (0.9–1.9) |
| Heterosexual, no same-sex attraction | 72.6 (0.6) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| *F*(ndf,ddf)[*p* value][c] | | 100.66(3,220)[<0.01][d] | 110.57(3,402)[<0.01][d] | 39.60(3,100)[<0.01][d] | 24.94(3,655)[<0.01][d] | 2.10(3,16)[0.14] | 5.32(3,146)[<0.01][d] |
| Current living situation | | | | | | | |
| Other | 1.6 (0.2) | 1.5 (0.9–2.3) | 1.1 (0.7–2.0) | 1.3 (0.5–3.5) | 0.8 (0.4–1.7) | 2.7 (0.5–15.8) | 0.6 (0.2–2.3) |

(*continued*)

**TABLE 3** Continued

| | Predictor Distribution[a] | Ideation | Plan | Attempt | Plan Among Ideators | Attempt Among Ideators Without Plan | Attempt Among Ideators With Plan |
|---|---|---|---|---|---|---|---|
| | % (SE) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) | aOR (95% CI) |
| Private hall of residence | 3.2 (0.3) | 1.0 (0.7–1.4) | 1.0 (0.7–1.5) | 1.6 (0.9–3.0) | 1.0 (0.6–1.7) | 2.1 (0.4–10.7) | 2.0 (0.9–4.4) |
| Shared house or apartment/flat | 11.1 (0.4) | 1.0 (0.8–1.2) | 0.9 (0.7–1.2) | 1.2 (0.8–1.7) | 0.9 (0.7–1.2) | 0.9 (0.3–2.9) | 1.5 (0.9–2.4) |
| University or college hall of residence | 27.8 (0.7) | 1.1 (0.9–1.3) | 1.1 (0.9–1.4) | 1.0 (0.7–1.6) | 1.1 (0.8–1.4) | 2.3 (0.6–8.3) | 0.8 (0.5–1.4) |
| Parents or other relative or own home | 56.3 (0.7) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| *F*(ndf,ddf)[*p* value][c] | | 0.75(4,200)[0.56] | 0.40(4,160)[0.81] | 0.59(4,135)[0.67] | 0.21(4,332)[0.93] | 0.68(4,158)[0.60] | 2.04(4,323)[0.09] |
| Expected to work on a student job | 72.4 (0.6) | 0.8 (0.7–0.9)[d] | 0.9 (0.7–1.0) | 1.0 (0.7–1.3) | 1.0 (0.8–1.3) | 1.0 (0.5–2.1) | 1.1 (0.8–1.6) |
| Self-reported ranking in high school | | | | | | | |
| Bottom 70% | 22.7 (0.6) | 1.2 (1.0–1.4)[d] | 1.1 (0.9–1.3) | 1.2 (0.8–1.7) | 0.9 (0.7–1.2) | 1.1 (0.4–2.6) | 1.1 (0.7–1.8) |
| Top 30% to 10% | 30.2 (0.6) | 1.0 (0.9–1.1) | 0.9 (0.8–1.1) | 1.0 (0.7–1.4) | 0.9 (0.7–1.1) | 0.5 (0.2–1.5) | 1.1 (0.7–1.7) |
| Top 10% to 5% | 22.3 (0.6) | 1.0 (0.9–1.2) | 0.9 (0.8–1.2) | 1.0 (0.7–1.4) | 0.9 (0.7–1.2) | 1.1 (0.4–2.9) | 1.0 (0.6–1.6) |
| Top 5% | 24.8 (0.6) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| *F*(ndf,ddf)[*p* value][c] | | 2.72(3,327)[0.04][d] | 0.83(3,312)[0.48] | 0.64(3,812)[0.59] | 0.54(3,2489)[0.65] | 0.78(3,1033)[0.51] | 0.20(3,1057)[0.90] |
| Most important reason to go to college extrinsic | 10.6 (0.5) | 1.1 (0.9–1.4) | 1.2 (0.9–1.5) | 1.5 (1.0–2.2)[d] | 1.1 (0.9–1.5) | 1.2 (0.4–3.9) | 1.3 (0.8–2.1) |

*Note*: *All models adjusted for the predictors shown in the rows, and for country membership. We additionally tested all possible 2-way interactions between predictors shown in the rows; none were significant after adjusting for false discovery rate (Q = 0.05);* $\alpha = 0.05$. *aOR = adjusted odds ratio; ddf = denominator degrees of freedom; ndf = numerator degrees of freedom; SE = standard error.*

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

[b]*Both 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.*

[c]*F test to evaluate joint significance of categorical predictor levels based on multiple imputations.*

[d]*Significant findings.*

**TABLE 4** Socio-Demographic and College-Specific Factors for Lifetime Suicidal Thoughts and Behaviors (STB) in the WHO World Mental Health Surveys International College Student Project (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) |
| Female gender | 1.3 (1.2–1.5)[b] | 0.6 (0.5–0.9)[b] | 0.8 (0.7–1.0)[b] | 0.9 (0.7–1.3) | 1.4 (1.2–1.7)[b] | 1.4 (1.0–1.9)[b] | 1.1 (0.8–1.5) | 0.9 (0.8–1.2) | 0.9 (0.7–1.3) |
| Age | | | | | | | | | |
| 20 y or more | 1.2 (1.0–1.5)[b] | 1.6 (1.0–2.4)[b] | 1.6 (1.1–2.2)[b] | 0.6 (0.4–0.9)[b] | 0.8 (0.7–1.1) | 1.2 (0.8–1.8) | 0.8 (0.5–1.3) | 0.7 (0.5–1.0)[b] | 1.1 (0.4–3.1) |
| 19 y | 0.9 (0.8–1.1) | 0.9 (0.5–1.4) | 1.5 (1.2–1.9)[b] | 1.0 (0.7–1.5) | 1.2 (0.9–1.4) | 0.8 (0.5–1.2) | 0.8 (0.5–1.1) | 1.0 (0.8–1.3) | 1.1 (0.8–1.6) |
| 18 y[a] | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| Parental education | | | | | | | | | |
| Low | 1.0 (0.8–1.2) | 1.1 (0.6–2.0) | 1.1 (0.8–1.5) | 0.9 (0.6–1.3) | 0.9 (0.7–1.2) | 1.0 (0.6–1.4) | 1.6 (1.0–2.8) | 1.0 (0.7–1.3) | 0.7 (0.3–1.6) |
| Medium | 0.9 (0.7–1.0)[b] | 1.0 (0.6–1.9) | 1.0 (0.8–1.4) | 1.2 (0.8–1.8) | 1.0 (0.8–1.3) | 0.9 (0.6–1.3) | 1.1 (0.7–1.6) | 1.1 (0.8–1.3) | 0.7 (0.4–1.2) |
| High | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| Parents not married or at least one parent deceased | 1.4 (1.3–1.6)[b] | 1.1 (0.6–1.9) | 1.0 (0.8–1.3) | 1.0 (0.7–1.4) | 1.0 (0.8–1.2) | 1.5 (1.0–2.1)[b] | 0.8 (0.6–1.1) | 1.2 (1.0–1.6) | 0.6 (0.4–0.9)[b] |
| Place raised | | | | | | | | | |
| Rural area | 1.0 (0.7–1.3) | 0.9 (0.3–3.0) | 1.2 (0.7–2.1) | 0.8 (0.4–1.5) | 1.1 (0.7–1.7) | 0.7 (0.4–1.3) | 1.6 (0.7–3.7) | 1.5 (0.7–3.0) | 0.6 (0.2–1.7) |
| Suburbs | 1.0 (0.8–1.2) | 1.2 (0.6–2.6) | 1.4 (0.9–2.2) | 0.7 (0.4–1.2) | 1.2 (0.7–1.9) | 0.7 (0.4–1.3) | 1.7 (0.9–3.1) | 0.6 (0.4–1.0) | 1.1 (0.7–1.7) |
| Town/village | 1.1 (0.9–1.4) | 1.2 (0.6–2.5) | 1.2 (0.8–1.7) | 0.7 (0.5–1.1) | 1.0 (0.7–1.4) | 0.9 (0.5–1.5) | 1.0 (0.3–3.1) | 1.0 (0.8–1.4) | 1.1 (0.6–2.0) |
| Large city | 0.9 (0.7–1.1) | 1.3 (0.7–2.3) | 1.2 (0.9–1.6) | 0.7 (0.4–1.1) | 1.0 (0.8–1.3) | 0.6 (0.3–1.4) | 1.3 (0.7–2.4) | 1.5 (1.1–1.9)[b] | 0.7 (0.5–1.2) |
| Small city | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| Religion | | | | | | | | | |
| Another religion | 1.4 (1.0–1.8)[b] | 1.2 (0.5–2.7) | 1.3 (0.8–2.1) | 0.8 (0.4–1.5) | 1.2 (0.8–1.9) | 0.6 (0.2–2.3) | 1.1 (0.6–2.0) | 1.6 (0.8–3.0) | 0.6 (0.4–1.1) |
| No religion | 1.5 (1.3–1.7)[b] | 1.1 (0.7–1.7) | 1.1 (0.8–1.3) | 1.3 (0.9–1.9) | 1.1 (0.9–1.4) | 1.1 (0.8–1.6) | 0.7 (0.5–1.1) | 0.8 (0.7–1.0) | 0.9 (0.6–1.3) |
| Christian | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| Sexual orientation | | | | | | | | | |
| Nonheterosexual with same-sex sexual intercourse | 5.1 (3.9–6.8)[b] | 1.4 (0.6–3.3) | 1.0 (0.6–1.8) | 1.2 (0.5–2.7) | 0.5 (0.3–0.7)[b] | 1.5 (0.7–3.3) | 1.0 (0.3–3.1) | 0.6 (0.4–1.0) | 1.2 (0.6–2.4) |
| Nonheterosexual without same-sex sexual intercourse | 3.6 (2.8–4.5)[b] | 1.2 (0.5–2.8) | 1.1 (0.7–1.6) | 0.9 (0.5–1.5) | 0.6 (0.4–0.8)[b] | 0.9 (0.5–1.8) | 1.4 (0.6–3.4) | 1.0 (0.7–1.7) | 1.2 (0.7–1.9) |
| Heterosexual, some same-sex attraction | 2.1 (1.8–2.5)[b] | 0.8 (0.5–1.5) | 1.0 (0.7–1.4) | 1.1 (0.8–1.7) | 1.0 (0.7–1.2) | 2.4 (1.4–4.1)[b] | 0.9 (0.5–1.8) | 0.7 (0.5–0.9)[b] | 0.7 (0.5–1.1) |
| Heterosexual, no same-sex attraction | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| Current living situation | | | | | | | | | |
| Other | 1.5 (0.8–3.0) | 1.3 (0.3–5.9) | 1.0 (0.4–2.7) | 0.4 (0.1–1.2) | 0.7 (0.3–1.9) | 1.0 (0.3–3.6) | 0.6 (0.0–10.4) | 1.2 (0.5–2.7) | 4.0 (0.2–78.1) |
| Private hall of residence | 1.2 (0.7–1.9) | 0.9 (0.3–3.0) | 1.0 (0.4–2.2) | 0.8 (0.4–1.7) | 0.7 (0.4–1.3) | 1.9 (0.5–7.1) | 0.8 (0.2–3.2) | 0.9 (0.3–2.2) | 1.5 (0.2–13.1) |
| Shared house or apartment/flat | 0.9 (0.5–1.5) | 1.2 (0.5–3.0) | 1.2 (0.7–2.3) | 1.2 (0.6–2.4) | 1.1 (0.6–1.9) | 1.2 (0.6–2.5) | 1.2 (0.4–3.4) | 1.2 (0.7–2.2) | 0.3 (0.0–10.0) |
| University or college hall of residence | 1.1 (0.8–1.5) | 0.8 (0.4–1.6) | 1.1 (0.7–1.7) | 0.9 (0.5–1.5) | 0.8 (0.4–1.6) | 1.1 (0.7–1.8) | 1.1 (0.6–1.8) | 0.8 (0.5–1.3) | 1.6 (0.3–10.2) |
| Parents or other relative or own home | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |

(*continued*)

**TABLE 4** Continued

| | 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) |
| Expected to work on a student job | 0.8 (0.7–1.0)[b] | 1.1 (0.6–1.8) | 1.0 (0.8–1.3) | 0.6 (0.5–0.9)[b] | 1.2 (0.9–1.4) | 1.4 (0.9–2.1) | 1.0 (0.6–1.6) | 0.7 (0.6–0.9)[b] | 1.4 (1.0–1.9) |
| Self-reported ranking in high school | | | | | | | | | |
| Bottom 70% | 1.2 (1.0–1.4) | 1.0 (0.6–1.9) | 1.0 (0.8–1.5) | 0.6 (0.4–1.0)[b] | 0.8 (0.7–1.1) | 0.8 (0.5–1.4) | 0.8 (0.5–1.4) | 1.9 (1.4–2.5)[b] | 1.4 (0.8–2.5) |
| Top 30% to 10% | 0.9 (0.8–1.1) | 0.9 (0.5–1.6) | 1.2 (0.9–1.7) | 0.8 (0.5–1.3) | 1.0 (0.8–1.2) | 1.0 (0.6–1.8) | 0.7 (0.5–1.1) | 1.4 (1.1–1.9)[b] | 1.0 (0.7–1.5) |
| Top 10% to 5% | 1.0 (0.8–1.1) | 1.3 (0.7–2.3) | 1.1 (0.8–1.5) | 0.9 (0.5–1.5) | 1.0 (0.7–1.2) | 0.8 (0.4–1.5) | 0.6 (0.4–1.0)[b] | 1.5 (1.1–2.1)[b] | 1.0 (0.7–1.5) |
| Top 5% | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) | (Reference) |
| Most important reason to go to college extrinsic | 1.1 (0.8–1.3) | 1.1 (0.5–2.5) | 1.2 (0.8–1.8) | 1.1 (0.6–1.9) | 1.1 (0.9–1.5) | 1.0 (0.5–2.0) | 1.1 (0.6–2.1) | 0.6 (0.4–1.2) | 0.8 (0.4–1.6) |

***Note**: Each row shows a separate logistic regression model with any lifetime STB 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. For example, the country-specific effect for "Non-heterosexual with same-sex sexual intercourse" (vs. "Heterosexual, no same-sex attraction") in Mexico can be obtained by multiplying aOR = 5.1 (the overall effect) by aOR = 0.6 (the country-specific deviation), i.e., aOR = 2.6. α = 0.05. aOR = adjusted odds ratio; CI = confidence interval; SE = standard error.*

[a]*Both 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]*Significant findings.*

underestimation of STB. It should be noted, however, that computerized self-report screening measures might be related with higher rates of self-disclosure,[58-60] as opposed to face-to-face interviews or telephone interviews. Third, variability in prevalence rates across countries was considerable, which may limit the generalizability of our pooled estimates toward other populations of first-year students. Possible explanations for between-country variability in STB estimates include study methodological differences,[61] true differences in prevalence according to geographical location,[62] socio-demographic differences,[1] differences in exposure to STB risk factors,[63] and differences in college-specific factors.[64] Future studies including a high number of colleges could use multi-level modeling approaches to better quantify and predict between-college variability in STB prevalence, and should recruit random samples of colleges (as opposed to the convenience sample of colleges in this study) to enable more robust conclusions on cross-national variability of results. Fourth, this study is limited to the use of cross-sectional data, adjusting for a limited range of basic socio-demographic and college-related correlates. Future studies should use longitudinal designs to replicate our findings, and include additional risk domains (e.g., mental disorder, childhood adversity) to investigate STB during college. Fifth, the implementation of multiple imputation to address missing data comes at the cost of a reduced number of variable levels that can be included in both imputation and analysis models. This precluded a more fine-grained analysis of STB outcomes (e.g., passive versus active suicidal ideation) and STB correlates (e.g., parental marital status versus parental loss). Future studies on larger samples should address this issue.

In conclusion, our findings strongly support the view that college entrance may be a suitable period to detect risk for STB among young people. Campus outreach could target first-year students with non-heterosexual orientation, as this subgroup had considerable elevated risk for lifetime STB, including an increased likelihood to act on suicidal ideation and planning. However, the widespread prevalence of STB among first-year students supports—above all—the need for developing individualized risk profiles for STB among first-year students so as to obtain more effective prevention interventions. In addition, lifetime STB transition rates among the full sample of first-year students point to the fact that prevention interventions should be part of a broader policy in early life, targeting lower college entrance rates related to severe adolescent-onset STB.

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Dr. Mortier is with the Research Group Psychiatry, KU Leuven University, Leuven, Belgium. Dr. Auerbach is with Harvard Medical School, Boston, and the Center for Depression, Anxiety and Stress Research, McLean Hospital, Belmont, MA. Dr. Alonso is with the Health Services Research Unit, Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain; Pompeu Fabra University (UPF), Barcelona, Spain; and CIBER en Epidemiología y Salud Pública (CIBERESP), Madrid, Spain. Dr. Bantjes is with Stellenbosch University, South Africa. Dr. Benjet is with National Institute of Psychiatry Ramón de la Fuente Muñiz, Mexico City, Mexico. Dr. Cuijpers is with the Amsterdam Public Health Research Institute, Vrije Universiteit Amsterdam, Amsterdam, the Netherlands. Dr. Ebert is with the Clinical Psychology and Psychotherapy Friedrich-Alexander University Erlangen Nuremberg, Erlangen, Germany. Dr. Greif Green is with the School of Education, Boston University, Boston, MA. Dr. Hasking is with the School of Psychology, Curtin University, Perth, Australia. Dr. Nock is with Harvard University, Cambridge, MA. Dr. O'Neill is with the School of Biomedical Sciences, Ulster University, Derry-Londonderry, Northern Ireland. Dr. Pinder-Amaker is with Harvard Medical School, Boston, and McLean Hospital, Belmont, MA. Ms. Sampson is with Harvard Medical School, Boston, MA. Dr. Vilagut is with the Health Services Research Unit, Hospital del Mar Medical Research Institute (IMIM), Barcelona, Spain; Pompeu Fabra University (UPF), Barcelona, Spain; and CIBER en Epidemiología y Salud Pública (CIBERESP), Madrid, Spain. Dr. Zaslavsky is with Harvard Medical School,

Boston, MA. Dr. Bruffaerts is with Universitair Psychiatrisch Centrum - Katholieke Universiteit Leuven (UPC-KUL), Campus Gasthuisberg, Leuven, Belgium. Dr. Kessler is with Harvard Medical School, Boston, MA.

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WHO WMH-ICS Collaborators: Australia: Mark Boyes, PhD, School of Psychology, Curtin University; Glenn Kiekens, MSc, School of Psychology, Curtin University and RG Adult Psychiatry KU Leuven, Belgium; Germany: Harald Baumeister, PhD, University of Ulm; Fanny Kaehlke, MSc, Matthias Berking, PhD, Friedrich-Alexander University Erlangen Nuremberg; Mexico: Adrián Abrego Ramírez, PhD, Universidad Politécnica de Aguascalientes; Guilherme Borges, PhD, Instituto Nacional de Psiquiatría Ramón de la Fuente; Anabell Covarrubias Díaz, PhD, Universidad La Salle Noroeste; Ma. Socorro Durán, MPsych, Universidad De La Salle Bajío; Rogaciano González González, PhD, Universidad De La Salle Bajío, campus Salamanca; Raúl A. Gutiérrez-García, PhD, Universidad De La Salle Bajío, campus Salamanca; Alicia Edith Hermosillo de la Torre, PhD, Universidad Autónoma de Aguascalientes; Kalina Isela Martinez Martínez, PhD, Universidad Autónoma de Aguascalientes, Departamento de Psicología, Centro Ciencias Sociales y Humanidades; María Elena Medina-Mora, PhD, Instituto Nacional de Psiquiatría Ramón de la Fuente; Humberto Mejía Zarazúa, PhD, Universidad La Salle Pachuca; Gustavo Pérez Tarango, MPsych, Universidad De La Salle Bajío; María Alicia Zavala Berbena, PhD, Universidad De La Salle Bajío; Northern Ireland: Siobhan O'Neill, PhD, Psychology Research Institute, Ulster University; Tony Bjourson, PhD, School of Biomedial Sciences, Ulster University; South Africa: Christine Lochner, PhD, Janine Roos, Hons B Cur, and Lian Taljaard, MSc, MRC Unit on Risk & Resilience in Mental Disorders, Department of Psychiatry, Stellenbosch University; Wylene Saal, MSc, Department of Psychology, Stellenbosch University; Dan Stein, MD, PhD, Department of Psychiatry and MRC Unit on Risk and Resilience in Mental Disorders, University of Cape Town; Spain: The UNIVERSAL study group also includes Itxaso Alayo, BSc, IMIM (Hospital del Mar Medical Research Institute) and CIBER en Epidemiología y Salud Pública (CIBERESP), Spain; José Almenara, MD, PhD, Cadiz University; Laura Ballester, BS, IMIM (Hospital del Mar Medical Research Institute) and CIBER en Epidemiología y Salud Pública (CIBERESP), Spain; Gabriela Barbaglia, MD, PhD, Pompeu Fabra University; Maria Jesús Blasco, MSc, Pompeu Fabra University; Pere Castellví, PhD, IMIM (Hospital del Mar Medical Research Institute); Ana Isabel Cebrià, PhD, Parc Taulí Hospital Universitari; Enrique Echeburúa, MD, PhD, Basque Country University; Andrea Gabilondo, MD, PhD, Osakidetza-Basque Health Service; Carlos García-Forero, PhD, CIBER en Epidemiología y Salud Pública (CIBERESP), Spain; Álvaro Iruin, MD, PhD, Hospital Universitario Donostia- Osakidetza; Carolina Lagares, PhD, Cadiz University; Andrea Miranda-Mendizábal, MD, MPH, Pompeu Fabra University; Oleguer Parès-Badell, MD, MPH, Pompeu Fabra University; María Teresa Pérez-Vázquez, PhD, Miguel Hernández University; José Antonio Piqueras, PhD, Miguel Hernández University; Miquel Roca, MD, PhD, Illes Balears University; Jesús Rodríguez-Marín, PhD, Miguel Hernández University; Margalida Gili, PhD, Illes Balears University; Victoria Soto-Sanz, BSc, Miguel Hernández University; Margarida Vives, PhD, Illes Balears University.

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Correspondence to Philippe Mortier, MD, Research Group Psychiatry, Department of Neurosciences, KU Leuven University, Herestraat 49, Leuven, Belgium; e-mail: philippe.mortier@upckuleuven.be

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## REFERENCES

1. Nock MK, Green JG, Hwang I, *et al*. Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: results from the National Comorbidity Survey Replication Adolescent Supplement. JAMA Psychiatry. 2013;70:300-310.
2. Steinhausen HC, Bosiger R, Metzke CW. Stability, correlates, and outcome of adolescent suicidal risk. J Child Psychol Psychiatry. 2006;47:713-722.
3. Thompson M, Kuruwita C, Foster EM. Transitions in suicide risk in a nationally representative sample of adolescents. J Adolesc Health. 2009;44:458-463.
4. Organisation for Economic Co-operation and Development (OECD). Education at a Glance 2012: OECD Indicators. 2012. Available at: https://www.oecd.org/edu/EAG%202012_e-book_EN_200912.pdf. Accessed September 27, 2017.
5. Mortier P, Kiekens G, Auerbach RP, *et al*. A risk algorithm for the persistence of suicidal thoughts and behaviors during college. J Clin Psychiatry. 2017;78:e828-e836.
6. Wilcox HC, Arria AM, Caldeira KM, Vincent KB, Pinchevsky GM, O'Grady KE. Prevalence and predictors of persistent suicide ideation, plans, and attempts during college. J Affect Disord. 2010;127:287-294.
7. Han B, Compton WM, Eisenberg D, Milazzo-Sayre L, McKeon R, Hughes A. Prevalence and mental health treatment of suicidal ideation and behavior among college students aged 18-25 years and their non-college-attending peers in the United States. J Clin Psychiatry. 2016;77:815-824.
8. Caine ED. Forging an agenda for suicide prevention in the United States. Am J Public Health. 2013;103:822-829.
9. Harrod CS, Goss CW, Stallones L, DiGuiseppi C. Interventions for primary prevention of suicide in university and other post-secondary educational settings. Cochrane Database Syst Rev. 2014;10:CD009439.
10. Mortier P, Cuijpers P, Kiekens G, *et al*. The prevalence of suicidal thoughts and behaviours among college students: a meta-analysis. Psychol Med. 2017 Aug 14;1-12; https://doi.org/10.1017/S0033291717002215 [Epub ahead of print].
11. Dueweke AR, Schwartz-Mette RA. Social-cognitive and social-behavioral correlates of suicide risk in college students: contributions from tnterpersonal theories of suicide and depression. Arch Suicide Res. 2017 Apr 19;1-17. https://doi.org/10.1080/13811118.2017.1319310 [Epub ahead of print].

12. Wolford-Clevenger C, Elmquist J, Brem M, Zapor H, Stuart GL. Dating violence victimization, interpersonal needs, and suicidal ideation among college students. Crisis. 2016;37:51-58.
13. Eisenberg D, Gollust SE, Golberstein E, Hefner JL. Prevalence and correlates of depression, anxiety, and suicidality among university students. Am J Orthopsychiatry. 2007;77:534-542.
14. Gillman JL, Kim HS, Alder SC, Durrant LH. Assessing the risk factors for suicidal thoughts at a nontraditional commuter school. J Am Coll Health. 2006;55:17-26.
15. Lee HS, Kim S, Choi I, Lee KU. Prevalence and risk factors associated with suicide ideation and attempts in Korean college students. Psychiatry Investig. 2008;5:86-93.
16. Foo XY, Mohd Alwi MN, Ismail SIF, Ibrahim N, Jamil Osman Z. Religious commitment, attitudes toward suicide, and suicidal behaviors among college students of different ethnic and religious groups in Malaysia. J Relig Health. 2014;53:731-746.
17. Reed E, Prado G, Matsumoto A, Amaro H. Alcohol and drug use and related consequences among gay, lesbian and bisexual college students: role of experiencing violence, feeling safe on campus, and perceived stress. Addict Behav. 2010;35: 168-171.
18. WHO World Mental Health Surveys International College Student Project (WMH-ICS). 2015. Available at: https://www.hcp.med.harvard.edu/wmh/college_student_survey.php. Accessed September 27, 2017.
19. Posner K, Brown GK, Stanley B, *et al*. The Columbia–Suicide Severity Rating Scale: initial validity and internal consistency findings from three multisite studies with adolescents and adults. Am J Psychiatry. 2011;168:1266-1277.
20. SAS/STAT(R) Software [computer program]. Cary, NC: SAS Institute; 2010.
21. Groves RM, Couper MP. Nonresponse in household interview surveys. New York: Wiley; 1998.
22. van Buuren S. Flexible imputation of missing data. Boca Raton, FL: CRC Press (Taylor & Francis); 2012.
23. Collett D. Modeling Survival Data in Medical Research. London, UK: Chapman & Hall; 1994.
24. Benjamini Y, Hochberg Y. Controlling the false discovery rate: a practical and powerful approach to multiple testing. J R Stat Soc. 1995;57:289-300.
25. Evans E, Hawton K, Rodham K, Deeks J. The prevalence of suicidal phenomena in adolescents: a systematic review of population-based studies. Suicide Life Threat Behav. 2005;35:239-250.
26. Glenn CR, Lanzillo EC, Esposito EC, Santee AC, Nock MK, Auerbach RP. Examining the course of suicidal and nonsuicidal self-injurious thoughts and behaviors in outpatient and inpatient adolescents. J Abnorm Child Psychol. 2017;45:971-983.
27. Rueter MA, Holm KE, McGeorge CR, Conger RD. Adolescent suicidal ideation subgroups and their association with suicidal plans and attempts in young adulthood. Suicide Life Threat Behav. 2008;38:564-575.
28. Peyre H, Hoertel N, Stordeur C, *et al*. Contributing factors and mental health outcomes of first suicide attempt during childhood and adolescence: results from a nationally representative study. J Clin Psychiatry. 2017;78:e622-e630.
29. McKinnon B, Gariepy G, Sentenac M, Elgar FJ. Adolescent suicidal behaviours in 32 low- and middle-income countries. Bull World Health Organ. 2016;94:340-350F.
30. Borges G, Benjet C, Medina-Mora ME, Orozco R, Nock M. Suicide ideation, plan, and attempt in the Mexican Adolescent Mental Health Survey. J Am Acad Child Adolesc Psychiatry. 2008;47:41-52.
31. Nock MK, Borges G, Bromet EJ, *et al*. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. Br J Psychiatry. 2008;192:98-105.
32. Saffer BY, Klonsky ED. The relationship of self-reported executive functioning to suicide ideation and attempts: findings from a large U.S.-based online sample. Arch Suicide Res. 2017;21:577-594.
33. Gujral S, Ogbagaber S, Dombrovski AY, Butters MA, Karp JF, Szanto K. Course of cognitive impairment following attempted suicide in older adults. Int J Geriatr Psychiatry. 2016;31:592-600.
34. Szanto K, Bruine de Bruin W, Parker AM, Hallquist MN, Vanyukov PM, Dombrovski AY. Decision-making competence and attempted suicide. J Clin Psychiatry. 2015;76:e1590-e1597.
35. Horesh N. Self-report vs. computerized measures of impulsivity as a correlate of suicidal behavior. Crisis. 2001;22:27-31.
36. Dour HJ, Cha CB, Nock MK. Evidence for an emotion-cognition interaction in the statistical prediction of suicide attempts. Behav Res Ther. 2011;49:294-298.
37. Sheftall AH, Davidson DJ, McBee-Strayer SM, *et al*. Decision-making in adolescents with suicidal ideation: a case-control study. Psychiatry Res. 2015;228:928-931.
38. Kosidou K, Dalman C, Fredlund P, Magnusson C. School performance and the risk of suicidal thoughts in young adults: population-based study. PLoS One. 2014;9: e109958.
39. Auerbach RP, Alonso J, Axinn WG, *et al*. Mental disorders among college students in the World Health Organization World Mental Health Surveys. Psychol Med. 2016;46: 2955-2970.
40. Marshal MP, Dietz LJ, Friedman MS, *et al*. Suicidality and depression disparities between sexual minority and heterosexual youth: a meta-analytic review. J Adolesc Health. 2011;49:115-123.
41. Miranda-Mendizabal A, Castellvi P, Pares-Badell O, *et al*. Sexual orientation and suicidal behaviour in adolescents and young adults: systematic review and meta-analysis. Br J Psychiatry. 2017;211:77-87.
42. Mathy RM, Cochran SD, Olsen J, Mays VM. The association between relationship markers of sexual orientation and suicide: Denmark, 1990-2001. Soc Psychiatry Psychiatr Epidemiol. 2011;46:111-117.
43. Hatzenbuehler ML, Bellatorre A, Lee Y, Finch BK, Muennig P, Fiscella K. Structural stigma and all-cause mortality in sexual minority populations. Soc Sci Med. 2014; 103:33-41.
44. Arnett JJ. Emerging Adulthood. The Winding Road From the Late Teens Through the Twenties. Second ed. New York: Oxford University Press; 2015.
45. Tetreault PA, Fette R, Meidlinger PC, Hope D. Perceptions of campus climate by sexual minorities. J Homosex. 2013;60:947-964.
46. Warriner K, Nagoshi CT, Nagoshi JL. Correlates of homophobia, transphobia, and internalized homophobia in gay or lesbian and heterosexual samples. J Homosex. 2013; 60:1297-1314.
47. Heatherington L, Lavner JA. Coming to terms with coming out: review and recommendations for family systems-focused research. J Fam Psychol. 2008;22:329-343.
48. Kessler RC, Bromet EJ. The epidemiology of depression across cultures. Annu Rev Public Health. 2013;34:119-138.
49. Helzer JE, Canino GJ, Yeh EK, *et al*. Alcoholism—North America and Asia. A comparison of population surveys with the Diagnostic Interview Schedule. Arch Gen Psychiatry. 1990;47:313-319.
50. Weisz JR, Sandler IN, Durlak JA, *et al*. Promoting and protecting youth mental health through evidence-based prevention and treatment. Am Psychol. 2005;60:628-648.
51. Mortier P, Demyttenaere K, Auerbach RP, *et al*. First onset of suicidal thoughts and behaviours in college. J Affect Disord. 2016;207:291-299.
52. Ebert DD, Cuijpers P, Muñoz RF, Baumeister H. Prevention of mental health disorders using Internet and mobile-based interventions: a narrative review and recommendations for future research. Front Psychiatry. 2017;10(8):116.
53. Buntrock C, Ebert DD, Lehr D, *et al*. Effect of a Web-based guided self-help intervention for prevention of major depression in adults with subthreshold depression: a randomized clinical trial. JAMA. 2016;315:1854-1863.
54. Josephine K, Josefine L, Philipp D, David E, Harald B. Internet- and mobile-based depression interventions for people with diagnosed depression: a systematic review and meta-analysis. J Affect Disord. 2017;223:28-40.
55. van Hout BA, Al MJ, Gordon GS, Rutten FF. Costs, effects and C/E-ratios alongside a clinical trial. Health Econ. 1994;3:309-319.
56. Groves RM. Nonresponse rates and nonresponse bias in household surveys. Public Opin Q. 2006;70:646-675.
57. De Luca S, Yan Y, Lytle M, Brownson C. The associations of race/ethnicity and suicidal ideation among college students: a latent class analysis examining precipitating events and disclosure patterns. Suicide Life Threat Behav. 2014;44:444-456.
58. Kurth AE, Martin DP, Golden MR, *et al*. A comparison between audio computer-assisted self-interviews and clinician interviews for obtaining the sexual history. Sex Transm Dis. 2004;31:719-726.
59. Viguera AC, Milano N, Laurel R, *et al*. Comparison of electronic screening for suicidal risk with the Patient Health Questionnaire Item 9 and the Columbia Suicide Severity Rating Scale in an outpatient psychiatric clinic. Psychosomatics. 2015;56:460-469.
60. Hankin A, Haley L, Baugher A, Colbert K, Houry D. Kiosk versus in-person screening for alcohol and drug use in the emergency department: patient preferences and disclosure. West J Emerg Med. 2015;16:220-228.
61. Barendregt JJ, Doi SA, Lee YY, *et al*. Meta-analysis of prevalence. J Epidemiol Community Health. 2013;67:974-978.
62. Marusic A. History and geography of suicide: could genetic risk factors account for the variation in suicide rates? Am J Med Genet C Semin Med Genet. 2005; 133C:43-47.
63. Kraemer HC, Gardner C, Brooks JOI, Yesavage JA. Advantages of excluding underpowered studies in meta-analysis: inclusionist versus exclusionist viewpoints. Psychol Methods. 1998;3:23-31.
64. Eisenberg D, Hunt J, Speer N. Mental health in American colleges and universities: variation across student subgroups and across campuses. J Nerv Ment Dis. 2013; 201:60-67.

**TABLE S1** WHO World Mental Health Surveys International College Student Project (WMH-ICS) Sample Characteristics

| Country | Number of Participating Colleges | Total Size of Colleges | Number of First-Year Students Who Were Eligible | Number of First-Year Students Who Participated | Response Rate | Survey Field Dates | Sampling and Procedures |
|---|---|---|---|---|---|---|---|
| Australia | 1 Public | ~ 45,000 | 9,042 | 633 | 7.0% | 2016 | All first-year students were invited to participate through e-mail. Five reminder e-mails were sent with personalized links to the survey. Conditional incentives were applied (movie passes). |
| Belgium | 1 Public | ~ 40,000 | 8,530 | 4,580 | 53.7% | 2014–2016 | All first-year students 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 8 reminder e-mails. Conditional incentives were applied (store credit coupons). |
| Germany | 1 Public | ~ 40,000 | 5,064 | 677 | 13.4% | 2016–2017 | All first-year students were invited to participate through e-mail. Six reminder e-mails were sent with personalized links to the survey. Conditional incentives were applied (store credit coupons). |
| Mexico | 4 Private/2 public | ~ 28,000 | 5,293 | 4,199 | 79.3% | 2016 | All first-year students were eligible for the survey. Initial contact differed by college: survey included in an obligatory health evaluation (1 college), as part of obligatory group tutoring sessions (1 college), or as part of required classes (2 colleges) or teacher evaluations (2 colleges). Two colleges sent reminder e-mails (tutors sent out e-mails to their tutees; in a required class of personal development, reminders were sent out by faculty). No incentives were applied. |
| Northern Ireland | 1 Public | ~ 25,000 | 4,359 | 739 | 17.0% | 2015 | All first-year students due to register were invited to participate. Following registration, identification numbers and links to the survey were provided. Five reminder e-mails/text messages were sent with personalized links to the survey. A sixth reminder involved a researcher telephoning nonresponders. All responders were entered into a number of draws to win an iPad. |
| South Africa | 1 Public | ~ 30,000 | 5,338 | 686 | 12.9% | 2015 | All first-year students were invited to participate through e-mail. Eight reminder e-mails and one text message were sent with personalized links to the survey. Conditional incentives were applied (5x R1000 draw). |
| Spain | 5 Public | ~ 96,000 | 16,332 | 2,118 | 13.0% | 2014–2015 | All first-year students were eligible for the survey. Initial contact differed by college (information stands, information sessions in classrooms, through the college's website). Four reminder e-mails were sent with personalized links to the survey. Conditional monetary incentives were applied. Additionally, an end-game strategy was implemented by selecting a random proportion of nonrespondents and offering all of them a monetary incentive. |
| United States | 3 Private | ~ 21,800 | 4,382 | 739 | 16.9% | 2015–2016 | All first-year students were invited to participate through e-mail. Three reminder e-mails 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%[a] | 2014-2017 | |

*Note:*
[a]*Weighted by achieved sample size.*