

## Original Article

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# Childhood adversities and mental disorders in first-year college students: results from the World Mental Health International College Student Initiative

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## Abstract

**Background.** This study investigates associations of several dimensions of childhood adversities (CAs) with lifetime mental disorders, 12-month disorder persistence, and impairment among incoming college students.

**Methods.** Data come from the World Mental Health International College Student Initiative (WMH-ICS). Web-based surveys conducted in nine countries ( $n = 20\,427$ ) assessed lifetime and 12-month mental disorders, 12-month role impairment, and seven types of CAs occurring before the age of 18: parental psychopathology, emotional, physical, and sexual abuse, neglect, bullying victimization, and dating violence. Poisson regressions estimated associations using three dimensions of CA exposure: type, number, and frequency.

**Results.** Overall, 75.8% of students reported exposure to at least one CA. In multivariate regression models, lifetime onset and 12-month mood, anxiety, and substance use disorders were all associated with either the type, number, or frequency of CAs. In contrast, none of these associations was significant when predicting disorder persistence. Of the three CA dimensions examined, only frequency was associated with severe role impairment among students with 12-month disorders. Population-attributable risk simulations suggest that 18.7–57.5% of 12-month disorders and 16.3% of severe role impairment among those with disorders were associated with these CAs.

**Conclusion.** CAs are associated with an elevated risk of onset and impairment among 12-month cases of diverse mental disorders but are not involved in disorder persistence. Future research on the associations of CAs with psychopathology should include fine-grained assessments of CA exposure and attempt to trace out modifiable intervention targets linked to mechanisms of associations with lifetime psychopathology and burden of 12-month mental disorders.

## Introduction

Approximately one in five first-year college students is estimated to have experienced a mental disorder in the prior 12 months (Auerbach *et al.*, 2018). As college student mental health problems are associated with reduced academic achievement (Bruffaerts *et al.*, 2018; Wilks *et al.*, 2020), increased role impairment (Alonso *et al.*, 2018), and greater college attrition

(Arria *et al.*, 2013; Auerbach *et al.*, 2016), identifying factors associated with these issues is critical to inform future prevention efforts. Among the strongest candidate risk factors are childhood adversities (CAs). CA research has typically focused on household dysfunction (including having a parent with mental illness or substance abuse, domestic violence, incarceration, or divorce) and child maltreatment [emotional, physical and sexual abuse, and neglect; (e.g. Felitti *et al.*, 1998; Hughes *et al.*, 2017)]. CAs are common in the general population, with an estimated prevalence varying as a function of the number of CAs assessed (Kessler, Davis, & Kendler, 1997; Merrick, Ford, Ports, & Guinn, 2018). CAs cluster and often co-occur, with one-third of those having reported any adversity indicating the occurrence of two or more (Kessler *et al.*, 2010). CAs are also recognized as being robustly associated with a host of poor mental and physical health outcomes (e.g. Felitti *et al.*, 1998; Hughes *et al.*, 2017; Kessler *et al.*, 1997; Norman *et al.*, 2012; Petruccioli, Davis, & Berman, 2019), including mood (e.g. Chapman *et al.*, 2004), anxiety (e.g. Sareen *et al.*, 2013), and substance use (e.g. Dube, Anda, Felitti, Edwards, & Croft, 2002) disorders. Overall, it is estimated that 30% of mental disorders in adults would be averted if we were able either to prevent or block the psychopathological effects of CAs and their correlates (Kessler *et al.*, 2010).

The present study seeks to extend current knowledge regarding the association of CAs with mental disorders by addressing several gaps in the literature. First, although it has been suggested that including CAs that occur outside of the child's family environment improves the prediction of mental health outcomes (Finkelhor, Shattuck, Turner, & Hamby, 2013), most studies have relied on a limited set of CAs occurring within the family circle and have not included peer victimization (McLafferty, O'Neill, Murphy, Armour, & Bunting, 2018). Second, CA exposure is most often operationalized as a simple count reflecting the presence or absence of broad types of CAs (e.g. Felitti *et al.*, 1998). Fewer studies have taken into account the frequency of occurrence of CAs in addition to examining their type and accumulation, for instance by identifying chronic CAs (e.g. Benjet, Borges, & Medina-Mora, 2010). However, the frequency of exposure to adverse events is known to impact health outcomes (Molnar, Buka, & Kessler, 2001). Third, regarding the mental health outcomes considered, few studies have extended beyond the presence or absence of mental disorders to consider the course of disorders although CAs have been shown to be differentially associated with disorder onset and persistence (Kessler *et al.*, 1997). Furthermore, due to complex patterns of psychiatric comorbidity (Kessler *et al.*, 2010), addressing lifetime comorbidity across disorders is important to isolate the weight of CAs by considering other disorders with onsets prior to that of any outcome disorder being examined. Among college students, the majority of past-year cases (83.1%) have an onset that precedes college entry (Auerbach *et al.*, 2018), illustrating the pertinence of such adjustments. Lastly, despite the wealth of research on CAs, few studies have examined their association with disorder-related functional impairment (Klein, Shankman, & Rose, 2008; McLaughlin *et al.*, 2010b).

The present study examines the association of CAs with mental disorders and role impairment using data from the World Mental Health International College Student Initiative (WMH-ICS), a coordinated series of surveys conducted among first-year students in nine countries. The objectives of the study are to examine the association of CA type, number, and cumulative frequency with (1) lifetime mental disorders; (2) 12-month

mental disorders; (3) persistence of these disorders; (4) 12-month disorder-related severe functional impairment; and (5) to estimate population-attributable risks associated with CAs.

## Methods

### Procedure and sampling

Data come from WMH-ICS surveys administered in a convenience sample of 24 colleges across nine countries (Australia, Belgium, Germany, Hong Kong, Mexico, Northern Ireland, South Africa, Spain, and the USA). In each country, first-year students were invited to respond to a web-based survey. A brief overview of the country-specific sampling procedures is provided in online Supplementary Table S1. A total of 21 369 questionnaires were completed. The weighted (by achieved sample size) mean response rate across surveys was 45.6%. Participants were provided with a description of the study and informed consent was obtained prior to the completion of the survey. The authors assert that all procedures contributing to this work comply with the ethical standards of the relevant national and institutional committees on human experimentation and with the Helsinki Declaration of 1975, as revised in 2008. Details regarding country-specific ethics approval for the WMH-ICS Initiative countries are available online ([https://www.hcp.med.harvard.edu/wmh/ftpd/IRB\\_EthicsApproval\\_WMh-ICS.pdf](https://www.hcp.med.harvard.edu/wmh/ftpd/IRB_EthicsApproval_WMh-ICS.pdf)). The sample for the analyses reported here was restricted to students identifying as male or female who were at least 18 years old and full-time students ( $n = 20\,427$ ). Students excluded from analyses ( $n = 942$ ) were: (a) those who did not identify as male or female ( $n = 79$ ); (b) those who reported not being a full-time student ( $n = 413$ ); (c) those with missing information on gender or student status ( $n = 39$ ); or (d) those under 18 ( $n = 415$ ).

## Measures

### Mental disorders

The presence of six lifetime and 12-month Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) mental disorders was established using short validated self-report screening scales. Disorders included major depressive disorder (MDD), bipolar disorder (BD), generalized anxiety disorder (GAD), panic disorder (PD), alcohol use disorder (AUD), and drug use disorder (DUD). The assessment of five of the six disorders was based on the Composite International Diagnostic Interview Screening Scales (CIDI-SC; Kessler *et al.*, 2013b; Kessler & Üstün, 2004). The exception was the screen for AUD, which was based on the Alcohol Use Disorders Identification Test (AUDIT; Babor, Higgins-Biddle, Saunders, & Monteiro, 2001b). The CIDI-SC scales have been shown to have good concordance with blinded clinical diagnoses based on the Structured Clinical Interview for DSM-IV (First, Gibbon, Spitzer, Williams, & Benjamin, 1994), with an area under the curve (AUC) in the range 0.70–0.78 (Kessler *et al.*, 2013a, 2013b). The AUDIT scoring used to estimate the 12-month prevalence of AUD was either a total score of 16+ or a score 8–15 with 4+ on the AUDIT dependence questions (Babor, de la Fuente, Saunders, & Grant, 2001a), which has been shown to be concordant with clinical diagnoses (AUC = 0.78–0.91) (Reinert & Allen, 2002). Additional items taken from the CIDI were used to assess the age-of-onset of each disorder.

### Role impairment

Role impairment during the past 12 months was assessed using an adapted version of the Sheehan Disability Scale (Leon, Olsson, Portera, Farber, & Sheehan, 1997; Ormel et al., 2008). Four areas of functioning were considered: home management/chores ('cleaning, shopping, and working around the house, apartment or yard'), college-related and other work ('ability to work as well as most other people'), close personal relationships ('the ability to initiate and maintain close personal relationships'), and social life. A 0–10 visual analog scale was used to rate the degree of impairment experienced within each domain ranging from no interference (0), mild (1–3), moderate (4–6), severe (7–9), to very severe (10) interference. For analysis, severe role impairment was defined as having a score of 7 or above (Kessler & Üstün, 2004).

### Childhood adversities

CAs occurring prior to age 18 were assessed using items adapted from the Composite International Diagnostic Interview (CIDI 3.0) Childhood Section (Kessler & Üstün, 2004), the Adverse Childhood Experience Scale (Felitti et al., 1998), and the Bully Survey (Swearer & Cary, 2003). The 19 items assessed seven types of CAs: parental psychopathology (five items: serious emotional or mental health problems, serious alcohol or drug problems, attempted suicide or death by suicide, involvement in criminal activities, domestic violence), physical abuse (two items: family member hit so hard that it left bruises or marks, physical abuse), emotional abuse (two items: family member repeatedly said hurtful or insulting things, emotional abuse), sexual abuse (two items: family member touched or made them touch him/her in a sexual way against their will, sexual abuse), neglect (two items: chores that were too hard or dangerous for their age, seriously neglected at home), bullying victimization [four items: physical bullying (repeatedly punched, shoved, or physically hurt), verbal bullying (teased, called names), indirect bullying (purposefully ignored, excluded, having rumors spread behind their back), and cyberbullying (i.e. over the Internet or by text messaging)], and dating violence (two items: romantic relationship where partner repeatedly hit or hurt, or where partner repeatedly said hurtful or insulting things). Responses were reported on a five-point Likert scale ranging from: never (0), rarely (1), sometimes (2), often (3), to very often (4). For analysis, CAs were operationalized in three ways to examine the types of adversities, the number, and the cumulative frequency of CAs. First, a CA type was considered present whenever at least one item in the CA domain was reported to have occurred at least 'rarely'. Due to its high prevalence in the overall sample (60.7%) based on the latter definition, two indicators of bullying victimization were used to reflect experiencing low-frequency victimization ('rarely' to one single item) and high-frequency victimization (any item at least 'sometimes' or at least 'rarely' if two or more items were endorsed). The latter variable allowed us to examine exposure to each type of adversity (1) vs. no exposure (0). Second, the number of CAs was operationalized as eight dichotomous variables indicating the exact number of CA types out of the eight considered. Third, the frequency of occurrence of each of the eight types of CA was added to reflect the overall sum of the frequency of CA types ranging from 0 to 24, with 0–3 frequency range for each type of CA (0 reflecting both the absence of exposure and rare exposure if only one type of CA, 1: sometimes, 2: often, and 3: very often). The latter variable allowed us to examine the cumulative frequency of CAs beyond their presence or absence.

### Covariates

Sociodemographics considered in the present study included gender, parental education level (parent with the highest education: secondary school or less, some college, college graduate or more), and country. In addition, because the contribution of CA exposure to each outcome being considered may be influenced by the presence of prior mental disorders, the presence of lifetime disorders with prior onsets was determined using classes of disorders obtained through latent class analysis (LCA; Magidson & Vermunt, 2004). The Lo-Mendell-Rubin adjusted likelihood ratio test was used to select the best model among those estimated with different assumed numbers of latent classes. Once the final model was selected, survey respondents with a given disorder profile were assigned to the class with the highest probability of membership for purposes of subsequent analysis.

### Data analysis

Data were weighted using post-stratification weights (Groves & Couper, 1998) to adjust for differences between survey respondents and non-respondents on sociodemographic information made available by university officials regarding the student body. Multiple imputation by chained equations was used to adjust for within-survey item non-response, random internal subsampling of survey sections, and missing data due to skip logic errors that occurred in certain surveys.

Poisson regression models with robust error variance (Chen, Qian, Shi, & Franklin, 2018; Zou, 2004) were then used to estimate risk ratios (RRs) for binary mental health outcomes: lifetime disorders, 12-month disorders, 12-month disorders among those with a prior history of disorder (persistent disorders), and severe role impairment. Exponentiated Poisson regression coefficients were reported as RRs with 95% confidence intervals. All significance tests for coefficients were evaluated using 0.05-level two-sided tests.

We began with bivariate models separately to examine the unadjusted association of each type of CA, number of CAs, and overall frequency of CA occurrence with each outcome. Second, we estimated multivariate models in which the three dimensions of CA exposure were considered jointly to predict each outcome. Multivariate associations of CA types have been examined in several prior CA studies (Benjet et al., 2010; Green et al., 2010; Kessler et al., 1997, 2010), in all of which unadjusted associations have been found to attenuate due to the strong associations that exist among different CAs.

Dummy variables for the number of CAs in a model that also includes dummies for CA types can be thought of as global interaction terms evaluating the extent to which joint associations deviate from the multiplicative assumptions in the relative-risk model. This can be illustrated by considering the scenario in which the RR of respondents with only CA 'A' (i.e. with this as their only CA) compared to those with no CAs is 1.2 and the RR among respondents with only CA 'B' compared to those with no CAs is 1.3. In the absence of an interaction, it can be assumed from this model that the RR of respondents with only CAs 'A' and 'B' (i.e. with both of these but none of the other CAs) would be 1.56 (i.e.  $1.2 \times 1.3$ ). This assumption can be tested by including a dummy variable in the model for having both CA 'A' and CA 'B'. If it turns out that the unadjusted RR is exactly as expected (i.e.  $RR = 1.56$ ), then the adjusted RR for having both CAs in the multivariate model will be 1.0 (i.e. exactly as expected by the multiplicative model). However, if the unadjusted RR was

instead, 1.4 for example, the adjusted RR would be 0.9, which equals the ratio of the observed unadjusted RR to the unadjusted RR predicted by the multiplicative model (i.e.  $1.4/1.56 = 0.9$ ). Coefficients associated with dummy variables for multivariate clusters of 3 or more CAs have the same type of interpretation, but generalized to higher-order interactions. In the present study, we would not have enough statistical power to assess each of these 247 (i.e.  $2^8 - 9$ ) interactions in our sample given the rarity of many logically possible combinations. For this reason, we estimated a more parsimonious model, which assumes that a single multiplier can be applied to each of the 28 (i.e.  $8 \times 7/2$ ) bivariate CA clusters, another single multiplier to each of the 56 (i.e.  $8 \times 7 \times 6/1 \times 2 \times 3$ ) three-CA clusters, and a third single multiplier to each of the 163 (i.e.  $247 - 28 - 56$ ) CA clusters involving between four and eight CAs. A much larger sample would be necessary to avoid simplifying assumptions of this nature, and therefore the present estimates should be considered as approximations.

Another set of considerations comes into play when evaluating the RR associated with the term for CA frequency. Rather than including a separate term of this kind for each of the eight CAs in the model, we made the simplifying assumption that frequency had a linear multiplier effect of the base RR of the CAs. When a respondent is exposed to only a single CA, the RR for that CA in the model including the frequency variable can be interpreted as the hypothetical RR of the CA among people who experienced it but whose frequency of exposure is 0. The RR of exposure to that CA is then assumed to increase as the product of that base RR with the RR of the frequency variable. It is noteworthy that this interpretation can lead to the RR estimates of some CAs being less than 1.0, in some cases significantly so, but this does not have a substantive interpretation concerning the risk of the designated outcome.

The multivariate models predicting lifetime disorder onset and persistent disorders also adjusted for the presence of lifetime disorders with prior onsets using latent classes of disorders. The multivariate models predicting severe role impairment were conducted among those with a disorder in the prior 12 months. The model included the type, number, and frequency of CAs, type of 12-month disorder, and a dichotomous variable reflecting the presence of three or more 12-month disorders. Lastly, population-attributable risk proportions (PARPs) were calculated based on respondents' predicted probabilities estimated by the multivariate regression equations. In this context, PARPs first provided estimates of the proportions of 12-month mental disorders that were associated with the occurrence of all types of CAs, adjusting for the number and frequency of CAs. Second, PARPs estimated the proportion of severe role impairment associated with CAs using the same covariates to which 12-month disorders, and the presence of three or more 12-month disorders were added. All models adjusted for gender, parental education, and country.

## Results

### Variable distributions

The sample included 20 427 students (54.7% female; 81.9% were 18 or 19 years old) (online Supplementary Table S2). Over half of the students had at least one parent with a high level of education (55.8%).

Overall, 75.8% of students reported exposure to at least one CA (Table 1). The most prevalent types of CAs were parental

**Table 1.** Prevalence of childhood adversities by type, number, and frequency of childhood adversities ( $n = 20\,427$ )

	Prevalence of childhood adversities
	% (s.e.)
Type of childhood adversity	
Parental psychopathology	38.5 (0.4)
Physical abuse	15.5 (0.3)
Emotional abuse	26.4 (0.3)
Sexual abuse	2.5 (0.1)
Neglect	9.6 (0.2)
High-frequency bully victimization	30.6 (0.4)
Low-frequency bully victimization	29.9 (0.4)
Dating violence	9.9 (0.2)
Number of types of adversities	
0	24.2 (0.4)
1	31.2 (0.4)
2	20.6 (0.3)
3	12.1 (0.3)
4 or more	11.9 (0.2)
Median frequency of adversities (range 0-24)	1.46 (0.02)

s.e., Standard error.

Note: The data are weighted and the SEs are design-corrected.

psychopathology (38.5%), followed by high-frequency (30.6%) and low-frequency (29.9%) bullying victimization, emotional abuse (26.4%), and physical abuse (15.5%). A total of 11.9% of the sample reported four or more types of adversities while 31.2% reported only one (online Supplementary Table S3 for CA distribution by country). The median frequency of CAs was 1.46 in the overall sample.

The lifetime prevalence of any mental disorder was 31.3%, the most commonly reported disorders being MDD (15.8%) and GAD (14.9%) (online Supplementary Tables S4 and S5 for disorder distribution). Twelve-month prevalence showed a similar pattern with 27.6% of the sample having any disorder, 13.4% having MDD, and 13.1% having GAD. The great majority (87.4%) of those with a lifetime history of disorder met the criteria for a disorder within the past 12 months. Among those with any 12-month disorder, one-third had severe role impairment (33.5%). Severe role impairment was most frequent for PD (45.9%) and least frequent for AUD (24.8%).

### Associations of CAs with mental disorders in the past 12 months

In bivariate analyses, CA type, number, and frequency were positively and significantly associated with each 12-month disorder (online Supplementary Table S6). In multivariate regression models (Table 2 and online Supplementary Table S7), overall the type and frequency of CAs were significantly associated with each 12-month disorder examined, except for frequency which was not significant in its association with AUD. In contrast, the

**Table 2.** Multivariate associations between childhood adversities and 12-month disorders ( $n = 20\,427$ )

	12-month disorders					
	MDD	BD	GAD	PD	AUD	DUD
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR(95%CI)	RR(95%CI)
Type of childhood adversity						
Parental psychopathology	1.09 (0.95–1.24)	1.08 (0.83–1.39)	1.07 (0.93–1.22)	1.00 (0.77–1.30)	1.16 (0.97–1.39)	1.67 (1.19–2.35)*
Physical abuse	0.88 (0.77–1.01)	1.26 (0.99–1.60)	0.89 (0.78–1.02)	0.99 (0.76–1.28)	1.33 (1.09–1.62)*	1.55 (1.12–2.16)*
Emotional abuse	1.33 (1.15–1.54)*	1.31 (0.98–1.74)	1.12 (0.97–1.30)	1.27 (0.96–1.68)	1.06 (0.86–1.32)	1.78 (1.22–2.59)*
Sexual abuse	1.04 (0.86–1.26)	0.80 (0.58–1.10)	0.90 (0.75–1.08)	0.89 (0.62–1.27)	1.15 (0.86–1.53)	1.36 (0.91–2.03)
Neglect	1.09 (0.96–1.25)	1.27 (1.02–1.59)*	1.02 (0.89–1.16)	1.01 (0.77–1.33)	1.19 (0.97–1.45)	1.64 (1.20–2.25)*
High-frequency bully victimization	1.55 (1.35–1.77)*	1.72 (1.31–2.27)*	1.59 (1.38–1.82)*	1.55 (1.16–2.07)*	0.80 (0.66–0.97)*	1.15 (0.80–1.66)
Low-frequency bully victimization	1.21 (1.06–1.37)*	1.44 (1.10–1.89)*	1.24 (1.09–1.42)*	1.20 (0.90–1.60)	0.92 (0.78–1.09)	1.41 (1.00–1.99)
Dating violence	1.01 (0.88–1.15)	1.48 (1.19–1.83)*	1.18 (1.04–1.33)*	1.22 (0.97–1.53)	1.75 (1.45–2.11)*	2.16 (1.62–2.89)*
Number of adversities						
0–1	ref	ref	ref	ref	ref	ref
2	1.00 (0.84–1.18)	0.99 (0.71–1.39)	1.05 (0.89–1.24)	1.10 (0.79–1.52)	1.08 (0.86–1.36)	0.73 (0.47–1.14)
3	1.00 (0.78–1.29)	0.86 (0.54–1.37)	0.94 (0.73–1.20)	0.90 (0.56–1.45)	1.04 (0.73–1.47)	0.56 (0.30–1.02)
4+	0.71 (0.49–1.04)	0.69 (0.35–1.37)	0.76 (0.53–1.10)	0.62 (0.31–1.24)	0.91 (0.54–1.55)	0.35 (0.14–0.87)*
Frequency of adversities	1.16 (1.12–1.20)*	1.24 (1.17–1.31)*	1.20 (1.16–1.24)*	1.25 (1.18–1.33)*	1.04 (0.99–1.10)	1.13 (1.04–1.23)*

Note: \*significant at the .05 level, two-sided test. All models adjusted for country, gender, parental education (high v. low, medium v. low). While 0 was used as a reference for the number of CAs in bivariate models, as the type of CAs already reflected the presence of 0 or 1 CA, the reference used to examine the number of CAs was 0 or 1 in multivariate models. MDD, major depressive disorder; BD, Bipolar disorder; GAD, generalized anxiety disorder; PD, Panic disorder; AUD, Alcohol use disorder; DUD, Drug use disorder; RR, Risk ratio; CI, Confidence interval; CA, Childhood adversity.

number of CAs was significantly associated only with MDD ( $F_3 = 5.88$ ,  $p < 0.0001$ ) and GAD ( $F_3 = 3.36$ ,  $p < 0.0001$ ). The association of CA type with increased likelihood of 12-month disorders varied as a function of the disorder examined, with the highest risk being associated with dating violence (RR = 2.16 for DUD, RR = 1.75 for AUD).

#### Associations of CAs with lifetime mental disorders

The association of CA dimensions with lifetime mental disorders using the overall data array is reported in Table 3. In bivariate analyses, the type, number, and frequency of CAs were positively and significantly associated with the risk of each lifetime disorder (online Supplementary Table S8). Multivariate models adjusted for all lifetime disorders that were present prior to the year of onset of each outcome disorder using latent classes of disorders (online Supplementary Table S9 for description of latent classes). In these analyses, CA type overall remained significantly associated with each lifetime disorder examined except for PD ( $F_8 = 1.52$ ,  $p = 0.156$ ), as did CA frequency, except for AUD (RR = 1.03) (see online Supplementary Table S10 for the  $F$ -tests). The number of CAs was, however, not significantly associated with the risk of lifetime disorders, except for MDD ( $F_3 = 6.62$ ,  $p < 0.0001$ ) and PD ( $F_3 = 3.39$ ,  $p < 0.0001$ ). Individual CA types were differentially associated with the likelihood of lifetime disorders. Parental psychopathology was associated with MDD (RR = 1.16), AUD (RR = 1.27), and DUD (RR = 1.49); emotional abuse was associated with MDD (RR = 1.41); sexual abuse

was associated with AUD (RR = 1.32) and DUD (RR = 1.62); and dating violence was associated with GAD (RR = 1.16), BD (RR = 1.43), DUD (RR = 1.77), and AUD (RR = 1.93). Physical abuse was associated with a lower risk of GAD (RR = 0.85), though it was associated with an increased risk of BD (RR = 1.31), DUD (RR = 1.35), and AUD (RR = 1.44). High-frequency bullying victimization was also negatively associated with AUD (RR = 0.78) while it was positively associated with other disorders including MDD (RR = 1.65) and GAD (RR = 1.50). However, these significant negative associations lost their significance in less parsimonious multivariate models that included interaction terms between CA frequency and type (see online Supplementary Table S11). No significant country-specific interactions were found to influence the observed associations with outcomes.

#### Associations of CAs with persistent mental disorders

Bivariate analyses considering the persistence of disorders among lifetime cases (online Supplementary Table S12) showed no association of CA type, number, or frequency with any disorder outcome, with the exception of a modest association between CA frequency and persistence of MDD (RR = 1.01). In multivariate analyses among those with a prior history of disorder and adjusting for other lifetime comorbid disorders with onsets prior to that of the outcome disorder, CAs were not associated with disorders in the prior 12 months, whether it will be

**Table 3.** Multivariate associations between childhood adversities and lifetime mental disorders ( $n = 20\,427$ )

	Lifetime disorders					
	MDD	BD	GAD	PD	AUD	DUD
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Type of childhood adversity						
Parental psychopathology	1.16 (1.03–1.31)*	1.13 (0.88–1.45)	0.98 (0.86–1.11)	0.96 (0.75–1.24)	1.27 (1.07–1.51)*	1.49 (1.15–1.93)*
Physical abuse	0.94 (0.83–1.06)	1.31 (1.03–1.66)*	0.85 (0.75–0.97)*	0.98 (0.76–1.28)	1.44 (1.19–1.74)*	1.35 (1.05–1.73)*
Emotional abuse	1.41 (1.24–1.61)*	1.32 (1.00–1.75)	1.01 (0.88–1.17)	1.10 (0.83–1.46)	1.10 (0.90–1.36)	1.29 (0.98–1.71)
Sexual abuse	1.06 (0.90–1.26)	0.77 (0.57–1.05)	0.92 (0.77–1.10)	0.81 (0.57–1.16)	1.32 (1.01–1.71)*	1.62 (1.19–2.20)*
Neglect	1.17 (1.04–1.32)*	1.26 (1.01–1.57)*	0.92 (0.81–1.05)	0.96 (0.73–1.26)	1.29 (1.07–1.57)*	1.54 (1.21–1.96)*
High frequency bully victimization	1.65 (1.46–1.86)*	1.50 (1.15–1.96)*	1.50 (1.32–1.71)*	1.44 (1.08–1.92)*	0.78 (0.65–0.94)*	1.07 (0.81–1.42)
Low frequency bully victimization	1.24 (1.11–1.40)*	1.33 (1.02–1.72)*	1.17 (1.03–1.32)*	1.17 (0.89–1.55)	0.93 (0.80–1.09)	1.23 (0.95–1.60)
Dating violence	1.09 (0.97–1.22)	1.43 (1.16–1.77)*	1.16 (1.03–1.30)*	1.16 (0.93–1.45)	1.93 (1.62–2.31)*	1.77 (1.41–2.22)*
Number of adversities						
0-1	ref	ref	ref	ref	ref	ref
2	0.92 (0.79–1.07)	0.98 (0.71–1.35)	1.12 (0.96–1.31)	1.22 (0.89–1.68)	0.98 (0.79–1.22)	0.96 (0.69–1.35)
3	0.83 (0.66–1.04)	0.84 (0.53–1.33)	1.04 (0.82–1.31)	1.05 (0.66–1.68)	0.89 (0.64–1.24)	0.81 (0.52–1.27)
4+	0.58 (0.41–0.81)*	0.72 (0.37–1.39)	0.94 (0.66–1.33)	0.74 (0.37–1.47)	0.68 (0.41–1.13)	0.62 (0.32–1.22)
Frequency of adversities	1.19 (1.15–1.22)*	1.15 (1.09–1.22)*	1.18 (1.14–1.22)*	1.19 (1.12–1.27)*	1.03 (0.98–1.08)	1.08 (1.01–1.15)*

MDD, Major depressive disorder; BD, Bipolar disorder; GAD, Generalized anxiety disorder; PD, Panic disorder; AUD, Alcohol use disorder; DUD, Drug use disorder; RR, Risk ratio; CI, Confidence interval; CA, Childhood adversity.

Note: \*significant at the .05 level, two-sided test. All models adjusted for country, gender, parental education (high v. low, medium v. low), and lifetime disorders latent classes. While 0 was used as a reference for the number of CAs in bivariate models, as the type of CAs already reflected the presence of 0 or 1 CA, the reference used to examine the number of CAs was 0 or 1 in multivariate models.

the type, number, or frequency of CAs (online Supplementary Table S13).

### Associations of CAs with severe role impairment

In bivariate analyses, CA type, number, and frequency were positively and significantly associated with severe role impairment overall as well as in each domain among respondents with one or more 12-month disorders (online Supplementary Table S14). In multivariate models, severe role impairment was significantly associated with the frequency of CAs but not with the number or type of CA (Table 4 and online Supplementary Table S15). Twelve-month mental disorder types, in comparison, were strongly associated with overall role impairment ( $F_6 = 18.60$ ,  $p < 0.0001$ ) with significant RRs ranging from 1.28 for PD to 1.67 for BD.

### Population-attributable risk proportion of disorders associated with CAs

PARP estimates were calculated to determine the proportion of 12-month disorders and severe role impairment (Table 5) that were associated with CAs. Estimates ranging from 18.7% of AUD to 57.5% of BD and 16.3% of severe role impairment were associated with CAs.

### Discussion

The study addresses several gaps in prior CA research by investigating the association of several dimensions of a wide range of CAs with mental disorders and related impairment in a large cross-national sample of college students. Furthermore, the study addresses lifetime comorbidity patterns by examining the association of CAs with disorder onset and course while taking into account disorders with an earlier age of onset. The main findings are that (1) CAs are independently associated with risk of lifetime-to-date occurrence of many different mental disorders adjusting for comorbid disorders with earlier ages of onset, (2) whereas CAs are strong predictors of lifetime onset of these disorders, CAs are not associated with the persistence of these disorders, (3) 16% of the severe role impairment found among students with 12-month disorders is associated with CAs, and (4) the frequency of CAs across types is the most consistently significant aspect of CAs that predicts the onset of the mental disorders considered here as compared to which of the types or the number of CAs that are involved in accounting for exposure.

These results are broadly consistent with past studies in the general population documenting associations of CAs with lifetime and recent mental disorders (e.g. Chapman et al., 2004; Kessler et al., 2010; Lindert et al., 2014), as well as with the non-specificity of these associations across types of disorders, supporting the notion that CAs are associated with broad vulnerability to psychopathology (Green et al., 2010; Haidl et al., 2021; Kessler et al.,

**Table 4.** Multivariate associations between childhood adversities and severe role impairment among those with a 12-month disorder ( $n = 5703$ )

Type of childhood adversity	Severe role impairment				
	Home management	Work	Relationships	Social life	Any severe impairment
	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)	RR (95%CI)
Parental psychopathology	1.12 (0.82–1.53)	1.07 (0.84–1.34)	1.07 (0.87–1.31)	1.04 (0.85–1.27)	1.01 (0.86–1.19)
Physical abuse	1.10 (0.83–1.46)	0.99 (0.80–1.23)	0.96 (0.79–1.17)	0.98 (0.81–1.18)	0.99 (0.85–1.15)
Emotional abuse	1.11 (0.79–1.56)	1.08 (0.84–1.39)	1.03 (0.82–1.28)	0.98 (0.79–1.22)	1.01 (0.85–1.20)
Sexual abuse	1.11 (0.78–1.57)	1.05 (0.79–1.40)	1.03 (0.80–1.34)	0.99 (0.77–1.29)	1.03 (0.85–1.26)
Neglect	1.06 (0.81–1.38)	1.01 (0.82–1.24)	1.11 (0.92–1.34)	1.07 (0.89–1.29)	1.01 (0.87–1.16)
High-frequency bully victimization	0.89 (0.64–1.23)	0.94 (0.74–1.19)	1.08 (0.87–1.34)	1.06 (0.86–1.32)	1.00 (0.85–1.18)
Low-frequency bully victimization	1.07 (0.76–1.50)	0.97 (0.76–1.23)	1.05 (0.84–1.31)	0.99 (0.79–1.23)	0.99 (0.84–1.18)
Dating violence	1.12 (0.86–1.45)	1.08 (0.89–1.32)	1.06 (0.88–1.27)	1.15 (0.96–1.37)	1.03 (0.89–1.18)
Number of adversities					
0–1	ref	ref	ref	ref	ref
2	1.02 (0.68–1.54)	1.04 (0.77–1.39)	0.96 (0.74–1.25)	1.07 (0.83–1.39)	1.06 (0.87–1.31)
3	0.72 (0.40–1.30)	1.07 (0.70–1.63)	0.88 (0.60–1.28)	0.98 (0.68–1.43)	1.01 (0.75–1.36)
4+	0.65 (0.29–1.49)	1.02 (0.55–1.88)	0.63 (0.36–1.11)	0.85 (0.49–1.48)	0.96 (0.62–1.48)
Frequency of adversities	1.15 (1.07–1.23)*	1.06 (1.01–1.12)*	1.13 (1.08–1.18)*	1.08 (1.03–1.13)*	1.08 (1.04–1.12)*

RR, Risk ratio; CI, Confidence interval; CA, Childhood adversity.

Note: \*significant at the .05 level, two-sided test. All models adjusted for country, gender, parental education (high v. low, medium v. low), type of 12-month disorder, and presence of three or more disorders. While 0 was used as a reference for the number of CAs in bivariate models, as the type of CAs already reflected the presence of 0 or 1 CA, the reference used to examine the number of CAs was 0 or 1 in multivariate models.

**Table 5.** Population-attributable risk proportion (PARP) estimates of disorders and impairment associated with childhood adversities

	PARP (s.e.)
12-month disorders <sup>a</sup>	
MDD	0.393 (0.014)
BD	0.575 (0.017)
GAD	0.430 (0.016)
PD	0.487 (0.027)
AUD	0.187 (0.033)
DUD	0.498 (0.029)
Severe role impairment <sup>b</sup>	
Home management	0.273 (0.047)
Work	0.178 (0.039)
Relationships	0.226 (0.028)
Social life	0.189 (0.033)
Any severe impairment	0.163 (0.023)

PARP, Population-attributable risk proportion; s.e., Standard error; MDD, Major depressive disorder; BD, Bipolar disorder; GAD, Generalized anxiety disorder; PD, Panic disorder; AUD, Alcohol use disorder; DUD, Drug use disorder.

<sup>a</sup>Model predictors: country, gender, parental education, childhood adversity, number of adversities, and frequency of adversities.

<sup>b</sup>Model predictors: country, gender, parental education, childhood adversity, number of adversities, and frequency of adversities, 12-month disorders, presence of three or more 12-month disorders.

2010; Lindert et al., 2014). Furthermore, in the current study, it is estimated that either eliminating or blocking the effects of CAs or the causal factors underlying them that might account for their associations with the mental disorders considered here could potentially avoid nearly half of 12-month mood, anxiety, and DUDs found in college students and, among those with disorders, 16.3% of the severe role impairment found among these students. These estimates of PARP are consistent with those estimated in general population samples of adults (Afifi et al., 2008; Green et al., 2010; Kessler et al., 2010). Regarding individual types of CAs, while bivariate associations with lifetime disorders were ubiquitously positive and significant, a differential pattern emerged in multivariate models. As expected, these positive associations were attenuated in multivariate analyses (Kessler et al., 1997). While positive associations between CAs with lifetime disorders were observed (e.g. sexual abuse was associated with AUD and DUD), the reverse was also observed whereby physical abuse was associated with lower risk of GAD, and high-frequency bullying victimization with AUD. These negative associations should be interpreted with caution as they were obtained in a parsimonious model that did not include all possible interactions between the variables of interest. A less parsimonious multivariate model that took into account the interactions between CA type and frequency showed that these main effects became non-significant.

The finding that CAs are not associated with mental disorder persistence is in line with prior work (Kessler et al., 1997). The findings are further consistent with evidence showing that while maladaptive family functioning CAs were moderately yet

significantly associated with disorder persistence among older adults, this association was largely attenuated when examined in early adulthood, ages 18–29 (McLaughlin *et al.*, 2010a). The findings contrast, however, with research showing an association of CAs with the persistence of psychopathology, such as with mood disorders (Lippard & Nemeroff, 2020) or psychotic experiences (Trotta, Murray, & Fisher, 2015). Taken together, the results support the general need to address the prior history of mental illness when investigating CAs. Doing so and distinguishing onset from persistence may advance knowledge regarding the mechanisms through which CAs are involved in mental disorders experienced by young adults.

Despite the large amount of research that has accumulated concerning the association of CAs and psychopathology, only a small number of studies have specifically examined disorder-related functional impairment (Klein *et al.*, 2008; McLaughlin *et al.*, 2010b). In the present investigation, the frequency of CAs was significantly associated with role impairment, albeit mildly, and no association was observed for CA type or number of types. These findings contrast with past observations that two types of CAs were found to be associated with greater functional impairment among adults with depressive disorders (Klein *et al.*, 2008). The findings further contrast with analyses controlling for lifetime comorbidity, in which CA type and number of types were found to affect disorder-related functional impairment in general population adults, findings that held true when focusing on 18–29 year olds (McLaughlin *et al.*, 2010b). In the present analyses, severe role impairment was mostly driven by the type of 12-month disorder present, consistent with known variations in disorder-related role impairment (Kessler, Chiu, Demler, Merikangas, & Walters, 2005). Future studies documenting CA exposure more exhaustively may help provide a better understanding of their role in functional impairment in the life course.

Taken together these findings support the notion that primary prevention geared toward reducing the occurrence of CAs may significantly reduce the risk of mental disorders. Such efforts are challenging and require multidisciplinary networks involving the community, families, schools, and primary care (Biglan, Van Ryzin, & Hawkins, 2017). Early intervention mitigating the development of psychopathology in youths in the context of existing CA exposure is also warranted. In this line of research, there has been increasing interest regarding the effects of key moderators such as cognitive flexibility and emotional regulation which could be targets for such interventions. Both factors have been shown to be involved in the developmental trajectories of youth exposed to CAs (McLaughlin, 2016; Messman-Moore & Bhuptani, 2017; Op den Kelder, Van den Akker, Geurts, Lindauer, & Overbeek, 2018), and the use of dialectic behavior therapy for PTSD among persons exposed to CAs illustrates their key role (Bohus *et al.*, 2020). Lastly, despite the availability of resources, only a minority of college students with mental health needs seek professional help (Bruffaerts *et al.*, 2019), pointing to the need to address the perceived barriers associated with service use (Horwitz *et al.*, 2020).

Investigating the contribution of exposure to adverse childhood experiences to mental health outcomes presents challenges. Importantly, the present study extends prior work by jointly examining several dimensions of a broad range of CAs including the type, the number, and the cumulated frequency of occurrence. The findings show that the frequency of exposure to CAs is the dimension most consistently associated with psychopathology outcomes. This finding is important as the majority of studies

in this area have restricted the measurement of CAs to the mere presence or absence of any given CA to obtain a score reflecting exposure to a limited set of adversities (e.g. Anda *et al.*, 2002; Felitti *et al.*, 1998), a practice that has been questioned as it assumes that each CA is equivalent in its association with mental health outcomes (McLaughlin & Sheridan, 2016). In addition, the chronic nature of CA exposure needs to be addressed, as evidence shows that the chronicity of sexual abuse is associated with increased odds of mood and anxiety disorders (Molnar *et al.*, 2001).

The joint examination of three facets of CAs also extends prior work by limiting the risk of overestimating the impact of any given type of CA on psychopathology when focusing on a small number of individual adversities (Dong *et al.*, 2004; Kessler *et al.*, 1997). Although the cross-sectional nature of the data precludes causal inferences, the impact of chronic exposure may be consistent with the evidence of the long-lasting deleterious effects and neurobiological changes associated with exposure to chronic stress (Lupien, Juster, Raymond, & Marin, 2018). While identifying processes implicated in the biological, cognitive, and emotional impact of CAs extends beyond the scope of the present study, our findings strongly suggest that future investigations of CAs should extend beyond the presence or absence of a limited set of CAs to include detailed assessments of the chronicity of exposure to provide a finer grained assessment of the mechanisms involved in the onset and course of mental illness. Such assessments may contribute to a better understanding of reciprocal associations between psychopathology and CAs and to identifying key moderating factors (Lacey & Minnis, 2020; McLaughlin & Sheridan, 2016).

### Limitations

The findings should be interpreted in light of several limitations. First, retrospective recall of CAs may be subject to bias (Hardt & Rutter, 2004; Wilsnack, Wonderlich, Kristjanson, Vogeltanz-Holm, & Wilsnack, 2002). Similarly, recall of lifetime mental disorders may lead to underreporting (Simon & VonKorff, 1995), although the young age of participants is likely to have limited this bias. Second, CAs were reported as having occurred prior to age 18, however the age at exposure was not determined. Doing so in future studies may be particularly important as evidence suggests that earlier age of exposure is associated with increased symptomatology in adulthood (Kaplow & Widom, 2007). Therefore, due to the absence of specific timing of exposure, it remains possible that in some cases, mental disorders may have contributed to CAs rather than the reverse. The cross-sectional design, however, precluded the investigation of such reciprocal associations. Third, while the list of CAs examined in the present study extended beyond the typically studied family environment CAs by adding two categories reflecting peer victimization, the list is not exhaustive. Additional parameters such as low socioeconomic status, discrimination, community violence exposure, peer rejection, and academic performance have been suggested for inclusion in measures of CAs (Finkelhor *et al.*, 2013; Hartas, 2019). Fourth, our analysis of the effects of CAs on functional impairment was limited to cases meeting criteria for 12-month disorders. By doing so, we likely underestimated the association of CAs with impairment related to lifetime disorders. Lastly, the survey response rate was relatively low in some countries, thereby limiting the generalizability of the findings.



## Conclusions

A high prevalence and co-occurrence of CAs was found among incoming college students. CAs were confirmed to be associated with the risk of lifetime-to-date occurrence of a broad range of mental disorders adjusting for comorbid disorders with earlier ages of onset. No consistent specificity was found with regard to the association of CAs with specific mental disorders. Taken together, the present findings confirm that CAs may largely contribute to mental disorders found in college students, with an estimated 18.7–57.5% of 12-month disorders potentially avertable in the absence of CAs. CAs were not, however, associated with the persistence of disorders with an onset preceding college entrance. Thus, the analyses further extend research on CAs by providing a better understanding of the timing of the association of CA exposure with psychopathology and highlighting the need to address the course of illness when investigating the associations of CAs with mental health outcomes. Importantly, the present study points to the need to consider the frequency of CA exposure, as it was found to be the most consistent CA dimension associated with mental health outcomes. Lastly, it is time for research in this area to move beyond dichotomous exposure and to acknowledge a more complex nature of exposure to CAs. Such efforts may enlighten research focused on identifying the biological, psychological, and neurocognitive mechanisms through which CAs contribute to mental health throughout the lifespan and may contribute to identifying prevention targets and to testing appropriate interventions in order to lower the burden associated with mental health problems.

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**Conflict of interest.** Dr Auerbach serves on the scientific advisory board for Ksana Health. In the past 3 years, Dr Kessler was a consultant for Datastat, Inc., Holmusk, RallyPoint Networks, Inc., and Sage Therapeutics; he has stock options in Mirah, PYM, and Roga Sciences. Dr Ebert reports to have received consultancy fees or served on the scientific advisory board of several companies such as Minddistrict, Sanofi, Lantern, Schön Kliniken, German health insurance companies (BARMER and Techniker Krankenkasse), and chambers of psychotherapists. Ebert is a shareholder of the 'Institute for Online Health Trainings', a company aiming to transfer scientific knowledge related to digital mental health to be applied in routine health care. Dr Stein has received research grants and/or honoraria from Johnson & Johnson, Lundbeck, Servier, and Takeda. None of the other coauthors report any conflicts of interest.

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