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Childhood adversities and adult psychopathology in the WHO World Mental Health Surveys

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Background
Although significant associations of childhood adversities with adult mental disorders are widely documented, most studies focus on single childhood adversities predicting single disorders.

Aims
To examine joint associations of 12 childhood adversities with first onset of 20 DSM–IV disorders in World Mental Health (WMH) Surveys in 21 countries.

Method
Nationally or regionally representative surveys of 51 945 adults assessed childhood adversities and lifetime DSM–IV disorders with the WHO Composite International Diagnostic Interview (CIDI).

Results
Childhood adversities were highly prevalent and interrelated. Childhood adversities associated with maladaptive family functioning (e.g. parental mental illness, child abuse, neglect) were the strongest predictors of disorders. Co-occurring childhood adversities associated with maladaptive family functioning had significant subadditive predictive associations and little specificity across disorders. Childhood adversities account for 29.8% of all disorders across countries.

Conclusions
Childhood adversities have strong associations with all classes of disorders at all life-course stages in all groups of WMH countries. Long-term associations imply the existence of as-yet undetermined mediators.

Declaration of interest
R.C.K. has been a consultant for GlaxoSmithKline, Kaiser Permanente, Pfizer, Sanofi-Aventis, Shire Pharmaceuticals and Wyeth-Ayerst; has served on advisory boards for Eli Lilly & Company and Wyeth-Ayerst; and has had research support for his epidemiological studies from Bristol-Myers Squibb, Eli Lilly & Company, GlaxoSmithKline, Johnson & Johnson Pharmaceuticals, Ortho-McNeil Pharmaceuticals, Pfizer and Sanofi-Aventis.

Significant associations between retrospectively reported childhood adversities and adult mental disorders have been documented in numerous epidemiological studies.[1–6] Most of these studies, however, either considered only a single childhood adversity[7,8] or a composite measure that did not allow differential effects of multiple childhood adversities to be examined.[9] Only a few studies compared associations of childhood adversities with different types of mental disorders or examined changes in childhood adversities' effects over the life course.[10,11] Few studies examined cross-national variation in exposure[12,13] or effects[14,15] of childhood adversities. Furthermore, lack of comparability of measures across countries raises questions about accuracy of the few existing cross-national comparisons.[12] The present study addresses these problems by examining the prevalence and associations of retrospectively reported childhood adversities with first onset of a wide variety of mental disorders across the life course in epidemiological surveys in 21 countries in the World Health Organization (WHO) World Mental Health (WMH) Survey Initiative.[16]

Method

Sample

The WMH surveys were administered in nine countries classified by the World Bank as high income (Belgium, France, Germany, Israel, Italy, Japan, The Netherlands, Spain, USA), six high-middle income (Brazil, Bulgaria, Lebanon, Mexico, Romania, South Africa), and six low/lower-middle income (Colombia, India, Iraq, Nigeria, People's Republic of China, Ukraine)[17] (online Table DS1). A total of 51 945 adults (age 18 and older) participated in these surveys. Most featured nationally representative household samples. Two (Colombia and Mexico) were representative of urban areas, one of selected states (Nigeria) and the remaining four of selected metropolitan areas (Brazil, India, Japan, People's Republic of China). Informed consent was obtained before administering interviews. The samples that are not nationally representative all focus on urban areas. The institutional review board of the organisations that coordinated the surveys approved and monitored compliance with procedures for informed consent and protecting participants. Weights were used to adjust samples for differential probabilities of selection and to match the sample with population sociodemographic distributions. The weighted (by sample size) average response rate was 73.1% (range 45.9–98.8). Further details about WMH survey methodology are available elsewhere.[18]

Measures

Mental disorders

Mental disorders were assessed with the WHO Composite International Diagnostic Interview (CIDI) Version 3.0,[19] a fully-structured lay-administered interview that generated diagnoses for 20 commonly occurring mood disorders (major depressive disorder, dysthymic disorder, bipolar I disorder, bipolar II

disorder, subthreshold bipolar disorder), anxiety disorders (generalised anxiety disorder, panic disorder, agoraphobia without panic disorder, specific phobia, social phobia, post-traumatic stress disorder, separation anxiety disorder), behaviour disorders (attention-deficit hyperactivity disorder, oppositional–defiant disorder, conduct disorder, intermittent explosive disorder) and substance disorders (alcohol and drug misuse, alcohol and drug dependence with misuse). DSM–IV[20] criteria were used with diagnostic hierarchy rules (other than oppositional–defiant disorder, which was defined with or without conduct disorder, and substance misuse, which was defined with or without dependence) and organic exclusion rules. Masked clinical reappraisal interviews with the Structured Clinical Interview for DSM–IV (SCID)[21] in four WMH countries found generally good concordance between diagnoses based on the CIDI and SCID.[22] Age at onset of lifetime disorders was assessed retrospectively using a special question sequence shown experimentally to yield more plausible distributions than standard age at onset questions.[23]

Childhood adversities

Twelve dichotomously scored childhood adversities occurring before age 18 were assessed, including three types of interpersonal loss (parental death, parental divorce, other separation from parents), four types of parental maladjustment (mental illness, substance misuse, criminality, violence), three types of maltreatment (physical abuse, sexual abuse, neglect) and two other childhood adversities (life-threatening respondent physical illness, family economic adversity). The measures of parental death, divorce and other loss (e.g. respondent foster care placement) include biological and non-biological parents. Parental criminality, family economic adversity and sexual abuse were assessed with questions used in previous epidemiological surveys.[11] Parental criminality was assessed with questions about property crime and imprisonment, and economic adversity with questions about whether the family often lacked enough money to pay for basic necessities of living.[10] Sexual abuse was assessed with questions about repeated fondling, attempted rape or rape.[24] Parental mental illness (major depression, generalised anxiety disorder, panic disorder, antisocial personality disorder) and substance misuse were assessed with the Family History Research Diagnostic Criteria Interview.[25,26] Family violence and physical abuse were assessed with a modified version of the Conflict Tactics Scale.[27] Neglect was assessed with questions used in child welfare research about frequency of not having adequate food, clothing or medical care, having inadequate supervision, and having to do age-inappropriate chores.[28] Finally, life-threatening childhood physical illness was assessed with a standard chronic conditions checklist.[29]

Several WMH countries omitted selected childhood adversities (sexual abuse in Iraq and Shenzhen; neglect in South Africa; parental divorce and neglect in the six Western European countries; neglect and parent psychopathology in Israel) based on concerns about respondent embarrassment. Rather than exclude this large subset of countries from analysis or exclude the missing childhood adversities from the countries where they were assessed, we included a separate dummy predictor variable to indicate whether each childhood adversity was assessed and multiple imputation[30] to impute individual-level missing values. Multiple imputation implicitly assumes that the correlates of the missing childhood adversities are the same as in the countries where the childhood adversities were and were not assessed. Although this assumption is unlikely to be completely accurate, it allows us to maximise the use of available childhood adversities data. Imprecision in imputations is likely to lead to underestimation of overall childhood adversities effects.

Analysis methods

Tetrachoric factor analysis was used to examine associations among the childhood adversities. Multivariate associations of childhood adversities with first onset of DSM–IV/CIDI disorders (based on retrospective age at onset reports) were estimated using discrete-time survival analysis with person-year as the unit of analysis[31] and a consolidated data file that stacked the 20 disorder-specific person-year files across the 21 countries and included dummy predictor variables that distinguished among these 420 data files. Each model controlled for respondent age at interview, gender and other prior DSM–IV/CIDI disorders. A number of different model specifications were examined. The Akaike information criterion (AIC)[32] was used to select the best model, which was then estimated in subsamples defined by life-course stage and class of disorders (mood, anxiety, behaviour and substance disorders). Survival coefficients and standard errors were exponentiated to create odds ratios and 95% confidence intervals.

The population-attributable risk proportion (PARP) was calculated using simulation methods for each class of disorders, life-course stage and group of countries. The PARP is the proportion of the cumulative predicted value of an outcome disorder explained statistically by specific predictors. If the odds ratios in the model are as a result of causal effects of the childhood adversities, PARP can be interpreted as the expected proportional reduction in outcome prevalence if childhood adversities were eradicated.[33] All significance tests were evaluated using 0.05-level two-sided tests. As the WMH data are both clustered and weighted, the design-based Taylor series method[34] implemented in the SUDAAN (version 8.0.1) software system on UNIX was used to estimate standard errors and to evaluate statistical significance.

Results

Prevalence and structure of childhood adversities

Similar proportions of respondents reported any childhood adversities in high- (38.4%), high-middle- (38.9%), and low-/lower-middle- (39.1%) income countries (Table 1). Parental death was the most common childhood adversity (11.0–14.8%). Other common childhood adversities included physical abuse (5.3–10.8%), family violence (4.2–7.8%) and parental mental illness (5.3–6.7%). Multiple childhood adversities were common among respondents with any childhood adversities (59.3–66.2%), with mean childhood adversities among respondents with two or more of 2.5–2.9.

A total of 62 of the 66 tetrachoric correlations between pairs of childhood adversities (94%) were positive in high and low/lower-middle and 58 (88%) in high-middle-income countries. Medians and interquartile ranges (twenty-fifth to seventy-fifth percentiles) of correlations were 0.27 (0.14–0.35) in high, 0.20 (0.12–0.42) in high-middle and 0.17 (0.10–0.31) in low/lower-middle-income countries. Factor analysis found one consistently strong factor representing maladaptive family functioning (parental mental illness, substance misuse, criminal behaviour, domestic violence, physical and sexual abuse, neglect), with factor loadings of 0.44–1.0. The remaining childhood adversities were less highly intercorrelated.

Associations of childhood adversities with DSM–IV/CIDI disorders

All 12 childhood adversities were significantly associated with elevated risk of DSM–IV disorders in bivariate models pooled across all outcomes and countries, with odds ratios of 1.6–2.0

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Table 1 Prevalence of childhood adversities in World Mental Health (WMH) surveys carried out in high-, high-middle-, and low/lower-middle-income countries

	High-income countries ($n = 20\,652$)		High-middle-income countries ($n = 15\,240$)		Low-/lower-middle-income countries ($n = 16\,053$)		Total ($n = 51\,945$)	
	%	(s.e.)	%	(s.e.)	%	(s.e.)	%	(s.e.)
I. Interpersonal loss								
Parental death	11.0	(0.3)	11.9	(0.4)	14.8	(0.4)	12.5	(0.2)
Parental divorce	10.1	(0.3)	5.2	(0.3)	3.5	(0.2)	6.6	(0.2)
Other parental loss	4.0	(0.2)	4.0	(0.2)	7.4	(0.3)	5.1	(0.1)
II. Parental maladjustment								
Parental mental illness	5.3	(0.2)	6.7	(0.3)	6.7	(0.3)	6.2	(0.2)
Parental substance disorder	4.5	(0.2)	5.0	(0.3)	2.5	(0.2)	4.0	(0.1)
Parental criminal behaviour	3.4	(0.1)	3.1	(0.2)	2.2	(0.2)	2.9	(0.1)
Family violence	7.8	(0.3)	7.1	(0.3)	4.2	(0.2)	6.5	(0.1)
III. Maltreatment								
Physical abuse	5.3	(0.2)	10.8	(0.4)	9	(0.3)	8.0	(0.2)
Sexual abuse	2.4	(0.1)	0.6	(0.1)	1.5	(0.1)	1.6	(0.1)
Neglect	4.4	(0.2)	5.2	(0.2)	3.6	(0.2)	4.4	(0.1)
IV. Other childhood adversities								
Physical illness	3.9	(0.2)	2.4	(0.2)	2.6	(0.2)	3.1	(0.1)
Economic adversity	5.2	(0.2)	2.9	(0.2)	1.4	(0.2)	3.4	(0.1)
V. Total number of childhood adversities[a]								
Any	38.4	(0.5)	38.9	(0.6)	39.1	(0.6)	38.8	(0.4)
One/any	59.3	(0.7)	59.6	(0.8)	66.2	(0.9)	61.5	(0.5)
Two/any	22.5	(0.6)	24.6	(0.8)	21.8	(0.7)	22.9	(0.4)
Three/any	9.0	(0.4)	9.0	(0.5)	7.5	(0.5)	8.5	(0.3)
Four/any	5.0	(0.4)	4.1	(0.3)	3.1	(0.3)	4.1	(0.2)
Five or more/any	4.2	(0.2)	2.7	(0.3)	1.4	(0.2)	2.9	(0.2)

a. Prevalence estimates in the last five rows represent the proportions of all respondents with any childhood adversity who have exactly one, two, three, four, five or more. These five proportions sum to 100% in each column.

for childhood adversities associated with maladaptive family functioning and 1.1–1.5 for other childhood adversities. (Detailed results of this and other models described below are available from the authors on request.) Odds ratios were smaller in multivariate models that included all childhood adversities as predictors (1.1–1.6 childhood adversities associated with maladaptive family functioning; 1.1–1.3 for other childhood adversities). The 12 degree of freedom χ^2-test for the joint effects of all childhood adversities was significant ($\chi^2_{12} = 1536.6$, $P < 0.001$). A multivariate model that considered only number rather than type of childhood adversities showed generally increasing odds ratios from 1.5 for exactly one to 3.5–3.2 for six and for seven or more childhood adversities (compared with no childhood adversities). The χ^2-test for the joint effects of number-of-childhood adversities was statistically significant ($\chi^2_7 = 1345.8$, $P < 0.001$). A model that considered both types and numbers of childhood adversities had a better AIC, with both types ($\chi^2_{12} = 695.7$, $P < 0.001$) and number ($\chi^2_6 = 200.4$, $P < 0.001$) significant. More complex inherently non-linear models did not improve AIC further. However, fit was improved by distinguishing between number of childhood adversities associated with maladaptive family functioning and number of other childhood adversities.

Results of this final model are strikingly consistent across country groups (Table 2). Odds ratios of childhood adversities associated with maladaptive family functioning are consistently positive and significant (1.3–2.4). Odds ratios of other childhood adversities are generally smaller (0.9–1.5) and less consistently significant. Odds ratios of number of childhood adversities associated with maladaptive family functioning are consistently negative, mostly significant, and inversely related to number of such adversities (0.4–0.9 for two to three, 0.2–0.5 for four to five and 0.0–0.3 for six to seven adversities). This negative pattern means that the increasing odds of disorder onset with increasing number of childhood adversities associated with maladaptive family functioning occurs at a significantly decreasing rate as the number of these adversities increases. The odds ratio associated with number of other childhood adversities is less consistent in sign and significance.

Differential associations of childhood adversities with class of disorder and life-course stage

Disaggregation showed that childhood adversities significantly predict first onset of all classes of disorder in all groups of countries. Childhood adversities associated with maladaptive family functioning had consistently higher odds ratios (inter-quartile range, IQR = 1.4–2.0) than other childhood adversities (IQR = 1.1–1.3) across classes and groups. Odds ratios associated with the number of maladaptive family functioning childhood adversities were consistently and significantly negative across classes and groups (0.3–1.0 for two to three, 0.1–0.6 for four to five, 0.0–0.4 for six to seven adversities). Odds ratios associated with number of other childhood adversities were less consistent in sign and significance.

Similar results were found for models estimated by life-course stage. As coefficients were quite comparable across the different groups of countries (detailed results are available from the authors on request), we focus on results pooled across all countries (Table 3). Type of childhood adversity had significant and almost entirely positive odds ratios at each life-course stage, including childhood (ages 4–12), adolescence (ages 13–19), young adulthood (ages 20–29) and later adulthood (ages 30+) ($\chi^2_{12} = 197.8$–407.5, $P < 0.001$). Odds ratios associated with childhood adversities associated with maladaptive family functioning were generally higher than those associated with other childhood adversities (IQRs of 1.5–1.9 and 1.1–1.3 respectively) and relatively consistent across life-course stage. Odds ratios associated with number of

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Table 2 Multivariate associations (odds ratios) between childhood adversities and the subsequent first onset of DSM–IV/CIDI disorders based on the final multivariate model[a]

	High-income countries ($n = 20\,652$)			High-middle-income countries ($n = 15\,240$)			Low-/lower-middle-income countries ($n = 16\,053$)			Total ($n = 51\,945$)		
	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2
I. Maladaptive family functioning[b]			289.2*			152.6*			244.2*			585.8*
Parental mental illness	1.9*	(1.7–2.1)		1.9*	(1.7–2.1)		2.4*	(2.2–2.7)		2.0*	(1.9–2.2)	
Parental substance misuse	1.8*	(1.6–2.0)		1.4*	(1.2–1.6)		1.6*	(1.3–1.9)		1.6*	(1.5–1.7)	
Parental criminality	1.6*	(1.4–1.8)		1.6*	(1.3–1.8)		1.7*	(1.4–2.1)		1.6*	(1.4–1.7)	
Family violence	1.7*	(1.5–1.9)		1.6*	(1.4–1.8)		1.6*	(1.3–1.9)		1.6*	(1.5–1.8)	
Physical abuse	1.9*	(1.7–2.1)		1.6*	(1.4–1.9)		2.0*	(1.7–2.3)		1.8*	(1.7–2.0)	
Sexual abuse	1.9*	(1.7–2.2)		1.7*	(1.4–2.1)		1.5*	(1.2–1.9)		1.8*	(1.6–2.0)	
Neglect	1.6*	(1.4–1.8)		1.3*	(1.1–1.5)		1.7*	(1.4–2.0)		1.5*	(1.4–1.6)	
II. Other childhood adversities[c]			365.5*			35.8 *			32.8*			104.7*
Parental death	1.1	(1.0–1.2)		1.1*	(1.0–1.3)		1.0	(0.9–1.2)		1.1*	(1.0–1.2)	
Parental divorce	1.1	(1.0–1.2)		1.3*	(1.1–1.4)		1.2*	(1.1–1.4)		1.1*	(1.0–1.2)	
Other parental loss	1.4*	(1.3–1.5)		1.3*	(1.1–1.6)		1.3*	(1.1–1.5)		1.4*	(1.2–1.5)	
Serious physical illness	1.4*	(1.2–1.5)		1.5*	(1.3–1.9)		1.4*	(1.2–1.7)		1.4*	(1.3–1.5)	
Family economic adversity	1.2*	(1.1–1.4)		1.2	(0.9–1.5)		0.9	(0.7–1.2)		1.2*	(1.0–1.3)	
III. Number of maladaptive family functioning childhood adversities[d]			124.9*			42.1*			115.0*			193.9*
Zero to one	–			–			–			–		
Two	0.6*	(0.6–0.8)		0.9	(0.8–1.0)		0.7*	(0.6–0.9)		0.7*	(0.7–0.8)	
Three	0.4*	(0.4–0.6)		0.7*	(0.5–0.9)		0.4*	(0.3–0.6)		0.5*	(0.4–0.6)	
Four	0.3*	(0.2–0.4)		0.5*	(0.3–0.7)		0.3*	(0.2–0.4)		0.3*	(0.3–0.4)	
Five	0.2*	(0.1–0.3)		0.3*	(0.2–0.5)		0.2*	(0.1–0.3)		0.2*	(0.2–0.3)	
Six	0.1*	(0.1–0.2)		0.2*	(0.1–0.4)		0.2*	(0.1–0.4)		0.1*	(0.1–0.2)	
Seven	0.0*	(0.0–0.1)		0.2*	(0.0–0.8)		0.0*	(0.0–0.1)		0.0*	(0.0–0.1)	
IV. Number of other childhood adversities[e]			14.7*			2.0			0.3			14.3*
Zero to one	–			–			–			–		
Two	0.8*	(0.7–0.9)		0.9	(0.7–1.1)		1.0	(0.8–1.2)		0.8*	(0.8–0.9)	
Three	0.7*	(0.6–0.9)		1.0	(0.6–1.8)		1.0	(0.5–1.8)		0.8*	(0.6–0.9)	
Four+	0.8	(0.6–1.2)		0.9	(0.6–1.3)		1.1	(0.4–3.5)		0.8	(0.6–1.1)	

a. The model is a discrete-time survival model in a logistic regression framework with person-year as the unit of analysis to predict first onset of each of the 20 DSM–IV/CIDI disorders included in the analysis separately in each of three groups of countries. Age at onset was assessed using retrospective reports. Controls were included in the model for respondent age at interview, person-year, country, and type of disorder. The 19 type-of-disorder controls were included because the separate person-year data files for each of the 20 disorders were pooled, thereby forcing the slopes to be constant across disorders within each group of countries. As noted in the text, this assumption was subsequently relaxed and the model was estimated separately for each of four classes of disorders (mood, anxiety, behaviour and substance disorders) and then for each of the 20 separate disorders. Broad consistency of coefficients across these disaggregated models supports the validity of interpreting results pooled across all 20 disorders. The model is significant overall in each of the three groups of countries and overall ($\chi^2_{21} = 534.4–1853.7$, $P < 0.001$). The sample sizes reported are the numbers of respondents who contributed at least one person-year to the data file in each group of countries. The numbers of person-years in the analysis were 18 800 397 for high-income countries, 12 608 715 for high-middle-income countries, 12 193 251 for low/lower-middle-income countries and 43 602 363 for all countries combined. These person-years represent the combination of 20 separate person-year data files, each with a sample size equal to the combined number of years of life of all respondents up to and including their age at onset of the focal disorder for respondents who experienced the disorder and age at interview for respondents who never experienced the disorder. Because of the sample sizes being enormous, a random 5% of observations with a negative score on the outcome were used in the analysis, each such case being assigned a weight of 20 (i.e. 1/.05) to represent the undersampling.
b. For χ^2 d.f. = 7.
c. For χ^2 d.f. = 5.
d. For χ^2 d.f. = 6.
e. For χ^2 d.f. = 3.
*Significant at the 0.05 level, two-sided test.

maladaptive family functioning childhood adversities were consistently negative, significant ($\chi^2_6 = 35.3–119.8$, $P < 0.001$), inversely related to number of such adversities (0.4–0.8 for two to three, 0.2–0.4 for four to five and 0.0–0.2 for six to seven adversities) and relatively consistent across life-course stage.

Population-attributable risk proportions

Population-attributable risk proportions suggest that eradication of childhood adversities would lead to a 22.9% reduction in mood disorders, 31.0% in anxiety disorders, 41.6% in behaviour disorders, 27.5% in substance disorders and 29.8% of all disorders (Table 4). The higher PARP for behaviour disorders than other disorders exists in all three groups of countries, as is the generally lowest PARP for mood disorders. These differences are partly as a result of PARPs for most disorders being highest in childhood and to a much higher proportion of behaviour disorders than other disorders beginning in childhood.[35,36] When we focus exclusively on childhood-onset cases, PARPs for behaviour disorders (50.3–59.0%) are comparable with those for mood (53.8–64.9%) and substance (51.2–65.0%) disorders. Population-attributable risk proportions for mood and behaviour disorders decrease with age in all groups of countries, whereas PARPS remain rather stable after childhood for substance disorders and show less evidence of variation across the age range for anxiety disorders.

Discussion

Limitations

The results are limited by variation across surveys in language of interview, survey auspice, response rates, field procedures, sample

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Table 3 Multivariate associations (odds ratios) between childhood adversities and the subsequent first onset of DSM–IV/CIDI disorders in each of four life-course stages based on the final multivariate model[a]

	Childhood, age 4–12 (n = 51 945)			Adolescence, age 13–19 (n = 51 945)			Young adulthood, age 20–29 (n = 41 426)			Later adulthood, age 30+ (n = 38 692)		
	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2	OR	(95% CI)	χ^2
I. Maladaptive family functioning[b]			314.2*			205.8*			236.9*			163.2*
Parental mental illness	2.4*	(2.1–2.6)		1.9*	(1.7–2.2)		2.1*	(1.8–2.3)		1.9*	(1.7–2.2)	
Parental substance misuse	1.6*	(1.4–1.9)		1.6*	(1.4–1.8)		1.8*	(1.5–2.2)		1.6*	(1.4–1.9)	
Parental criminality	1.5*	(1.3–1.8)		1.5*	(1.3–1.8)		1.7*	(1.4–2.0)		1.4*	(1.1–1.7)	
Family violence	1.7*	(1.5–1.9)		1.5*	(1.3–1.8)		1.7*	(1.5–1.9)		1.7*	(1.4–2.0)	
Physical abuse	2.0*	(1.8–2.2)		2.0*	(1.8–2.2)		1.8*	(1.6–2.1)		1.7*	(1.5–1.9)	
Sexual abuse	2.1*	(1.8–2.5)		1.7*	(1.4–2.0)		1.7*	(1.4–2.1)		1.4*	(1.2–1.7)	
Neglect	1.5*	(1.4–1.8)		1.5*	(1.3–1.7)		1.7*	(1.5–2.0)		1.4*	(1.2–1.6)	
II. Other childhood adversities[c]			63.7*			45.7*			30.1*			22.5*
Parental death	1.1*	(1.0–1.2)		1.2*	(1.1–1.3)		1.0	(0.9–1.1)		1.1*	(1.0–1.3)	
Parental divorce	1.1	(1.0–1.2)		1.2*	(1.0–1.3)		1.1	(1.0–1.3)		1.0	(0.9–1.2)	
Other parental loss	1.3*	(1.2–1.5)		1.3*	(1.2–1.5)		1.5*	(1.3–1.74)		1.3*	(1.2–1.6)	
Serious physical illness	1.5*	(1.4–1.7)		1.4*	(1.2–1.6)		1.4*	(1.1–1.7)		1.2*	(1.0–1.4)	
Family economic adversity	1.3*	(1.1–1.5)		1.0	(0.9–1.2)		1.1	(0.9–1.4)		1.2	(1.0–1.4)	
III. Number of maladaptive family functioning childhood adversities[d]			75.5*			119.8*			71.3*			35.3*
Zero to one	–			–			–			–		
Two	0.8*	(0.7–0.9)		0.8*	(0.6–0.9)		0.7*	(0.6–0.8)		0.7*	(0.6–0.8)	
Three	0.6*	(0.4–0.7)		0.5*	(0.4–0.7)		0.4*	(0.3–0.5)		0.5*	(0.4–0.7)	
Four	0.4*	(0.3–0.5)		0.3*	(0.2–0.5)		0.2*	(0.2–0.4)		0.3*	(0.2–0.5)	
Five	0.3*	(0.2–0.4)		0.2*	(0.1–0.3)		0.2*	(0.1–0.3)		0.3*	(0.2–0.6)	
Six	0.2*	(0.1–0.3)		0.1*	(0.0–0.1)		0.1*	(0.0–0.2)		0.2*	(0.1–0.4)	
Seven	0.1*	(0.0–0.2)		0.0*	(0.0–0.1)		0.0*	(0.0–0.1)		0.1*	(0.0–0.3)	
IV. Number of other childhood adversities[e]			5.7			10.1*			9.7*			3.6
Zero to one	–			–			–			–		
Two	0.8	(0.8–1.0)		0.8*	(0.7–0.9)		0.8*	(0.6–1.0)		0.8	(0.6–1.0)	
Three	0.8	(0.6–1.1)		0.8	(0.5–1.1)		0.6*	(0.4–0.9)		0.8	(0.5–1.3)	
Four+	1.2	(0.6–2.0)		0.5*	(0.2–1.0)		0.3*	(0.1–0.8)		0.6	(0.2–1.6)	

a. The model is a discrete-time survival model in a logistic regression framework with person-year as the unit of analysis to predict first onset of each of the 20 DSM–IV/CIDI disorders included in the analysis pooled across all countries in each of four sets of person-years that define life-course stages. Age at onset was assessed using retrospective reports. Controls were included in the model for respondent age at interview, person-year, country, and type of disorder. The 19 type-of-disorder controls were included because the separate person-year data files for each of the 20 disorders were pooled, thereby forcing the slopes to be constant across disorders within each age range. As noted in the text, this assumption was subsequently relaxed and the model was estimated separately for each of four classes of disorders (mood, anxiety, behaviour and substance disorders) and then for each of the 20 separate disorders. Broad consistency of coefficients across these disaggregated models supports the validity of interpreting results pooled across all 20 disorders. The model is significant in each life-course stage (χ^2_{21} = 328.5–1162.6, P < 0.001). The sample sizes reported are the numbers of respondents who contributed at least one person-year to the data file at each of the life-course stages. The numbers decrease with age as some respondents were younger than 20 and even more younger than 30 at the time of interview. The numbers of person-years in the analysis were 9 817 605 for childhood, 7 617 351 for adolescence, 9 459 051 for young adulthood and 16 708 356 for later adulthood. These person-years represent the combination of 20 separate person-year data files, each with a sample size equal to the combined number of years of life of all respondents in the age ranges of the life-course stages described in the column headings, where the upper end of the records are the age at onset of the focal disorder for respondents who experienced the disorder and age at interview for respondents who never experienced the disorder. Because of the sample sizes being enormous, a random 5% of observations with a negative score on the outcome were used in the analysis, each such case being assigned a weight of 20 (i.e. 1/0.05) to represent the undersampling.
b. For χ^2 d.f. = 7.
c. For χ^2 d.f. = 5.
d. For χ^2 d.f. = 6.
e. For χ^2 d.f. = 3.
*Significant at the 0.05 level, two-sided test.

frames (most notably, underrepresentation of rural areas in low- and middle-income countries) and omission of some childhood adversities in some countries. These inconsistencies could increase variation in estimates. However, we estimated models separately by country using only the childhood adversities assessed in that country and found good consistency of results. (Detailed results are available from the authors on request.)

Another limitation is that the WMH surveys did not assess psychosis, which has been found in other research to be significantly related to childhood adversities.[37–39] Disorder assessment was also limited by focusing exclusively on DSM–IV cases. The DSM categories might not capture the full relevant range of psychopathology in the countries studied. An additional limitation related to measurement is that childhood adversities and disorders were assessed retrospectively. Retrospective recall bias is likely to be conservative, leading to underreporting of both childhood adversities[40] and disorders.[41] Long-term prospective study is needed to resolve this problem using available prospective data-sets.[1,42–44] Some interesting preliminary work of this sort has already begun.[45]

Analyses were limited by not examining patterns separately for men and women or across other important subsamples and by not controlling all unmeasured common causes of childhood adversities and disorders that could induce the associations observed here in the absence of causal effects of childhood adversities. Special caution is needed in interpreting the PARPs because of this limitation, as the actual effects of eradicating childhood adversities could be much lower than those estimated by the PARPs.

Within the context of these limitations, the WMH results are consistent with previous studies in suggesting that substantial proportions of children are exposed to childhood adversities.

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Table 4 Population attributable risk proportions (PARPs) of childhood adversities predicting lifetime DSM–IV/CIDI disorders by type of disorder and life-course stage[a]

	Childhood, age 4–12	Adolescence, age 13–19	Early adulthood, age 20–29	Later adulthood, age 30+	Total
I. High-income countries					
Mood disorders	57.1	28.8	19.1	13.6	19.7
Anxiety disorders	34.1	29.7	29.6	22.6	30.0
Behaviour disorders	50.3	36.4	–[b]	–[b]	43.6
Substance disorders	62.4	24.2	25.8	32.4	22.8
All disorders	41.2	30.9	25.3	19.1	28.7
II. High-middle-income countries					
Mood disorders	64.9	32.1	26.9	13.5	23.5
Anxiety disorders	31.5	28.4	41.3	25.6	30.0
Behaviour disorders	59.0	40.9	25.3	–[b]	46.7
Substance disorders	65.0	24.1	29.6	44.2	28.8
All disorders	40.0	30.0	32.1	24.3	30.0
III. Low-/lower-middle-income countries					
Mood disorders	53.8	34.7	30.4	19.6	25.6
Anxiety disorders	31.4	28.1	34.0	40.3	29.2
Behaviour disorders	53.7	42.9	19.8	–[b]	43.7
Substance disorders	51.2	32.9	27.7	27.8	29.2
All disorders	33.3	34.7	30.2	27.8	29.9
IV. Total					
Mood disorders	59.5	32.6	24.2	13.6	22.9
Anxiety disorders	31.1	30.3	36.7	28.3	31.0
Behaviour disorders	49.6	36.2	17.4	–[b]	41.6
Substance disorders	62.3	30.0	28.9	34.2	27.5
All disorders	38.2	32.3	29.0	21.8	29.8

a. The PARPs were calculated using simulation methods to generate individual-level predicted probabilities of the outcome disorders twice from the coefficients in final model, where these coefficients were estimated separately for each cell of the table. The first time the calculations were made using all the coefficients in the model and the second time assuming that the coefficients associated with the childhood adversities were all zero. One minus the ratio of the predicted prevalence estimates in the two specifications was then used to calculate PARP.
b. Too few onsets occurred at this life-course stage to estimate PARP.

Consistency of WMH exposure rates with those reported in previous studies is difficult to assess precisely, as measurement approaches across studies differ and cannot be compared directly.[46] World Mental Health survey respondent reports of parental divorce, the childhood adversity most often found in government statistics, are generally consistent with official estimates.[47] World Mental Health survey respondent reports of other childhood adversities such as physical and sexual abuse[48] and parental violence,[49] however, are lower than in some other surveys. This suggests that WMH estimates might be conservative.

Although early studies on associations between a single childhood adversity and a single mental disorder implied the existence of specificity of effects,[50,51] little evidence of specificity was found in the WMH data. The implication is that causal pathways linking childhood adversities to disorders are quite general. Although several recent comparative studies found more evidence for specificity among children and adolescents,[52–54] those studies focused on prevalent cases, whereas the current analysis focused on first lifetime onsets.

Implications and future research

We showed that childhood adversities often co-occur and that clusters of childhood adversities associated with maladaptive family functioning are linked with the highest risk of mental disorders. We also found generally subadditive effects of multiple childhood adversities associated with maladaptive family functioning. This has important implications for intervention because it means prevention or amelioration of only a single childhood adversity among individuals exposed to many is unlikely to have important effects. Early intervention to reduce exposure to all childhood adversities (e.g. multisystem family therapy, foster care placement) and later intervention to address long-term adult maladaptive psychological and behavioural consequences of having been exposed to childhood adversities would seem to hold the most promise in light of these results.

Intervention, of course, requires detection. Screening of youngsters in routine medical settings would seem the easiest approach to detection of severe childhood adversities (e.g. physical/sexual abuse and neglect). Although children are often reluctant to admit these childhood adversities and health professionals are often reluctant to ask, promising approaches have been developed to increase the success of detection based on health worker questioning.[55] Although it is less clear whether retrospective detection of childhood adversities in adulthood would have value, the WMH data show that history of childhood adversities predicts disorder onset in adulthood. This is much more striking than showing that childhood adversities continue to be associated with adult prevalence,[56,57] and suggests that retrospective detection might help find adults in need of interventions to address the long-term emotional and behavioural consequences of childhood adversities that contribute to their ongoing elevated risk on new onsets.[58]

There is nothing in our retrospective WMH results that addresses the number of hypotheses that could be advanced to explain the patterns documented here.[57,59,60] Our results are nonetheless important, in providing empirical justification for further analyses to explore such hypotheses to identify mediators, modifiers and developmental sequences that might be fruitful targets for preventive interventions.[61] It would also be useful to examine these associations in an epidemiological sample that had a genetically informative design to investigate the extent to which exposure and reactivity to childhood adversities are under genetic control. Consistent with other recent research,[38] it would

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also be useful to study genetic influences on inter-generational continuity of childhood adversities exposure. A new WMH initiative is collecting saliva samples from respondents in close to a dozen different WMH surveys in order to allow genetic studies of this sort to be carried out.

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