Associations between childhood trauma and adolescent psychiatric disorders in Brazil: a longitudinal, population-based birth cohort study

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Summary

Background The mental health consequences of exposure to childhood trauma have been little studied among adolescents in low-income and-middle-income countries (LMICs), despite a relatively high burden of trauma in LMIC populations. We investigated associations between trauma and adolescent psychiatric disorders in the 2004 Pelotas Birth Cohort, Brazil.

Methods In the 2004 Pelotas Birth Cohort, current psychiatric diagnoses (anxiety, mood, attention–hyperactivity, and conduct–oppositional disorders) were assessed at age 15 years (caregiver-report Development and Well-being Assessment), and age 18 years (self-report Mini-International Neuropsychiatric Interview). Lifetime cumulative trauma was assessed via caregiver report up to age 11 years and combined self-report and caregiver-report thereafter. Exposure to 12 trauma types were assessed (serious accident, fire, other disaster, attack or threat, physical abuse, sexual abuse, witnessed domestic violence, witnessed attack, witnessed accident, heard about attack, heard about accident, and parental death). Due to the high prevalence of trauma exposure in the sample, the number of different types of trauma exposure reported was extracted as a proxy for cumulative trauma load. We assessed both cross-sectional and longitudinal associations between cumulative trauma load and psychiatric disorders during adolescence using logistic regression, adjusting for confounders and pre-existing child psychopathology at 48 months. We also computed population attributable fractions (PAFs) for trauma–mental health associations at age 18 years.

Findings 4229 adolescents (51·9% male, 48·1% female) were included in logistic regression analyses based on imputed data. Trauma exposure affected 81·2% of adolescents by age 18 years. At age 15 years, the odds of any disorder (adjusted odds ratio [aOR] 1·19 [95% CI 1·03–1·38]), anxiety disorders (1·45 [1·21–1·75]), and conduct–oppositional disorders (1·60 [1·13–2·27]) increased for each category increase in cumulative trauma, but mood and attention–hyperactivity disorders were not related to cumulative trauma. At age 18 years, the odds of any disorder (1·34 [1·24–1·44]), anxiety disorders (1·23 [1·13–1·34]), mood disorders (1·33 [1·22–1·46]), attention–hyperactivity disorders (1·24 [1·09–1·41]), and conduct–oppositional disorders (1·59 [1·36–1·86]) all increased for each category increase in cumulative trauma. In longitudinal analyses, each category increase in cumulative trauma by age 11 years was associated with an increased odds of any disorder (aOR 1·26 [95% CI 1·11–1·44]), anxiety disorders (1·27 [1·04–1·56]), and conduct–oppositional disorders (1·43 [1·04–1·97]) at 15 years; and trauma up to age 15 years was associated with increased odds of any disorder (1·32 [1·21–1·45]), anxiety disorders (1·27 [1·14–1·40]), mood disorders (1·26 [1·12–1·41]), and conduct–oppositional disorders (1·52 [1·24–1·87]) at age 18 years. Trauma up to age 11 years was not predictive of disorders at age 18 years, and there were no longitudinal associations between trauma and attention–hyperactivity disorders. PAF estimates indicated that trauma exposure accounted for 30·6% (95% CI 21·2–38·7) of psychiatric disorders at age 18 years.

Interpretation Increasing exposure to trauma is associated with mental disorders among Brazilian adolescents. Given the high prevalence of trauma in LMIC populations, strategies to reduce exposure, identify those at greatest risk of mental disorders following trauma, and mitigate the consequences are crucial.

Funding Wellcome Trust, WHO, National Support Program for Centers of Excellence, Brazilian National Research Council, Brazilian Ministry of Health, Children's Pastorate, São Paulo Research Foundation, Rio Grande do Sul Research Foundation, L'Oréal-Unesco-ABC Program for Women in Science in Brazil-2020, All for Health Institute, University of Bath, Economic and Social Sciences Research Council.

Introduction

Childhood trauma, defined as direct or vicarious exposure to actual or threatened death, serious injury, or sexual violence (DSM-5, ICD-11), is strongly linked to psychopathology, with recent meta-analytical evidence showing the odds of psychiatric disorders to be almost

Lancet Glob Health 2025; 13: e309–18

For the Portuguese translation of the abstract see Online for appendix 1

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Research in context

Evidence before this study

Research has shown strong associations between childhood trauma and psychopathology in adulthood. However, little research has been done with children and adolescents, particularly in low-income and middle-income countries (LMICs), despite the fact that most of the world's children live in LMICs and rates of trauma exposure are higher in LMICs than in high-income countries. We conducted a literature search on PubMed on April 27, 2023, to identify population-based studies investigating associations between childhood trauma and transdiagnostic psychopathology using the following search strategy: (((child*[Title/Abstract] OR adolescen*[Title/Abstract] OR child[MeSH Terms] OR adolescent[MeSH Terms]) AND (adversit*[Title/Abstract] OR trauma[Title/Abstract])) OR "adverse childhood"[Title/Abstract] OR ((interpersonal[Title/Abstract] OR non-interpersonal[Title/Abstract]) AND (adversit*[Title/Abstract] OR trauma[Title/Abstract]))) AND ("psychiatric disorder*"[Title/Abstract] OR psychopathology[Title/Abstract]). No restrictions were placed on language or publication date. We identified 25 relevant studies; 16 were cross-sectional and nine had prospective longitudinal designs. Of these, ten studies focused on children and adolescents, including six longitudinal studies. Only eight studies in total were conducted in LMICs, of which just two focused on samples of children and adolescents, and only one had a longitudinal design. In general, these studies evidence associations between childhood trauma exposure and increased odds of transdiagnostic mental health problems throughout the lifespan.

Added value of this study

We used data from the 2004 Pelotas Birth Cohort to expand the existing evidence base. We found a high prevalence of trauma exposure in adolescents, with 77·5% exposed to trauma by age 15 years, and 81·2% by age 18 years. We found strong evidence of concurrent associations between cumulative trauma load and psychiatric disorders at ages 15 years and 18 years; we also found evidence of longitudinal associations between trauma up to age 11 years and disorders at age 15 years, and trauma up to age 15 years and disorders at age 18 years. Although the overall pattern was consistent with transdiagnostic rather than disorder-specific effects, the most robust pattern of associations emerged for conduct–oppositional and anxiety disorders, with effects for mood disorders emerging only at age 18 years, and little evidence of associations with attention–hyperactivity disorders. We examined population attributable fractions, with these analyses indicating that exposure to childhood trauma explained at least 30·6% of psychiatric disorders at age 18 years. Finally, the use of adolescent informants in our study highlighted the importance of including adolescents' own reports of trauma exposure when capturing experiences relevant to mental health, but also the need to consider potential informant bias when the same individual reports on both exposure and outcome.

Implications of all the available evidence

Our findings suggest that childhood trauma is an important risk factor for anxiety, mood, and conduct–oppositional disorders in adolescence, supporting previous findings largely from high-income countries. Moreover, more than 80% of adolescents in this LMIC cohort had been exposed to trauma by age 18 years, more than double what has been observed in similar cohorts in high-income countries. Taken together, the evidence indicates an urgent need for targeted prevention and intervention programmes to reduce the substantial burden of childhood trauma in LMICs, where proportionally more children experience trauma and trauma tends to be more severe. We also highlight the possible influence of varying informant reports on the results and a continued need to build causal evidence. Further elucidation of factors that might mediate or moderate trauma–mental health associations among young people in LMICs is particularly crucial to informing prevention and intervention efforts.

three times higher among those exposed to childhood trauma than in unexposed individuals.[1] However, existing epidemiological evidence has key limitations, including a focus on adults and correspondingly little evidence from youth samples.[2–4] Previous studies also rely on cross-sectional data or retrospective reports of childhood trauma from a single informant,[2,3,5] limiting causal inferences. Young people in low-income and middle-income countries (LMICs) are also under-represented in these studies,[6,7] even though most of the world's children live in LMICs[8] and the prevalence of trauma exposure is higher in LMICs than in high-income countries.[9]

In a recent study based on the 2004 Pelotas Birth Cohort in Brazil, we reported that 34% of children were exposed to trauma by age 11 years.[6] We identified cross-sectional associations between trauma and mental health problems at ages 6 years and 11 years, with associations being present by age 11 years across anxiety, mood, attention–hyperactivity, and conduct–oppositional disorders, even after adjusting for previous mental health problems. We also identified longitudinal associations between trauma up to age 6 years and psychiatric disorders at age 11 years across multiple diagnostic classes, consistent with transdiagnostic effects of childhood trauma on risk for psychiatric disorders.

Adolescence is a key period of risk for both trauma exposure and the emergence of mental disorders. Compared with children, adolescents (aged 12–19 years) are more likely to be exposed to specific types of traumas (eg, community violence),[10] and there are marked increases in anxiety, mood, and substance use disorders during this developmental period.[11] At age 11 years, 13% of the 2004 Pelotas Birth Cohort had at least one psychiatric disorder,[6] and, in an earlier cohort in

Pelotas that commenced in 1993, 19% of the cohort had at least one psychiatric disorder at age 22 years.[12] Given the increasing burden of mental disorders among young people globally,[13] greater understanding of the determinants of psychiatric disorders is essential, particularly in LMICs, where the provision and uptake of mental health services is limited.[14]

We therefore assessed rates of trauma exposure and psychiatric disorders in Brazilian adolescents at ages 15 years and 18 years, and investigated cross-sectional and longitudinal trauma–disorder associations using data from the 2004 Pelotas Birth Cohort. Building on findings that childhood adversities account for approximately 28% of psychiatric disorders in US adolescents,[5] we computed population attributable fractions (PAFs) to estimate the proportion of adolescent psychiatric disorders explained by trauma exposure in this LMIC sample. We also extended our previous findings, which were based solely on caregiver reports of trauma and mental health, by using reports from both caregivers and adolescents at later ages.

Methods

Study design and participants

The 2004 Pelotas Birth Cohort Study is an ongoing population-based cohort that recruited children born in 2004 to mothers resident in Pelotas, Brazil.[15] All hospitals with maternity wards were visited daily. All livebirths were eligible for enrolment, and 99·2% of eligible infants were enrolled in the study. Children were assessed at birth, 3, 12, 24, and 48 months, then at 6, 11, 15, and 18 years. Retention was around 90% at each follow-up up to age 11 years; approximately 50% at age 15 years due to the interruption of data collection during the COVID-19 pandemic; and around 80% at age 18 years (figure). Assessments were approved by relevant ethics boards at the Universidade Federal de Pelotas and the Universidade de São Paulo, and cohort participants and caregivers provided written informed assent or consent as appropriate at every assessment. More details on the study setting are described in appendix 2 (p 1).

Procedures

Primary caregivers (97% of whom were the child's mother) completed clinical interviews (Development and Well-being Assessment [DAWBA])[16] at ages 6, 11, and 15 years, and adolescents completed clinical interviews (Mini-International Neuropsychiatric Interview [MINI])[17] at age 18 years. Child lifetime trauma exposure up to ages 6, 11, 15, and 18 years was assessed using the post-traumatic stress disorder subsections of the DAWBA or MINI, as well as additional self-report questionnaire items at ages 15 and 18 years (figure; appendix 2 pp 1, 6–7). At ages 11, 15, and 18 years, trauma exposure was derived from both previous and current reports using all available information—ie, trauma up to age 18 years was captured by adolescent self-reports at age 18 years and previous reports of trauma exposure at ages 6, 11, and 15 years (appendix 2 pp 1–2). A high prevalence of trauma in the sample reduced the utility of focusing analyses on a binary trauma variable (present *vs* absent). Therefore, we extracted the number of different types of trauma exposure reported as a proxy for cumulative trauma load, coded as 0, 1, 2, and 3 or more exposures due to low frequencies at the upper extreme (appendix 2 p 8). Likelihood ratio tests supported a linear relationship between cumulative trauma and the log-odds of each psychiatric disorder; therefore, we treated cumulative trauma as a numeric exposure, with odds ratios representing the increase in odds for a one category increase in cumulative trauma (appendix 2 p 2). 12 trauma types were assessed: serious accident, fire, other disaster, attack or threat, physical abuse, sexual abuse, witnessed domestic violence, witnessed attack, witnessed accident, heard about attack, heard about accident, and parental death.

We assessed current psychiatric disorders at age 15 years using the parent-report DAWBA, and at age 18 years via the self-report MINI (figure). The DAWBA and MINI are well validated and widely used interview tools designed for assessing DSM-IV, DSM-5, and ICD-10 psychiatric diagnoses in those aged 5–16 years (DAWBA) and in those aged 18 years and older (MINI),[16,17] and both have been validated for use in Brazil.[18,19] Interviews were conducted by trained psychologists with around 40 h of training delivered by an experienced child psychologist with a background in epidemiological assessment. Weekly supervision by the experienced child psychologist was provided throughout data collection. Five categories of current psychiatric disorders were assessed: anxiety, mood, attention–hyperactivity, and conduct–oppositional disorders, and an any disorder category, which included

See Online for appendix 2

	6 years	11 years	15 years	18 years
Eligible	4136	4133	4129	4124
Interviewed	3722 (90·0%)	3566 (86·3%)	1949 (47·2%)	3489 (84·6%)
Losses or refusals	414 (10·0%)	567 (13·7%)	2180 (52·8%)	635 (15·4%)
Deaths*	1 (0·02%)	3 (0·07%)	4 (0·1%)	5 (0·1%)
Complete†	3583 (86·6%)	3562 (86·2%)	1913 (46·3%)	3080 (74·7%)
Child psychopathology				
Caregiver	DAWBA			SDQ
Cohort member				MINI
Child trauma exposure				
Caregiver	DAWBA			
Cohort member			Questionnaire	MINI and questionnaire

Figure: **2004 Pelotas Birth Cohort Study design and measures**

Data shown are n or n%. Note that this is a small subset of the measures available for the 2004 Pelotas Birth Cohort. DAWBA=Development and Well-being Assessment. MINI=Mini-International Neuropsychiatric Interview. SDQ=Strengths and Difficulties Questionnaire. *Deaths were counted in the time period from the previous follow-up; up to the 48-month follow-up, 94 deaths had been reported. †n (%) based on complete case data for trauma exposure and psychiatric disorders at each follow-up. The COVID-19 pandemic prevented assessment of the full cohort at age 15 years.

all diagnoses within the aforementioned categories plus less frequent disorders such as eating disorders, autism, tics, psychotic disorders, and alcohol dependence (appendix 2 p 8). Disorders were coded as present if DSM-IV, DSM-5, or ICD-10 criteria were met.

Adolescent psychopathology was additionally assessed at age 18 years via the parent-report Strengths and Difficulties Questionnaire (SDQ),[20] comprising emotional problems, conduct problems, peer problems, and hyperactivity (five items each), and a total difficulties score. Scores were dichotomised based on standard clinical cutoffs for the total or subscale scores (appendix 2 p 2) and the resultant variables were used in sensitivity analyses.

Baseline confounders were assessed at birth: child sex (male or female), maternal ethnicity (White or other), maternal relationship status (married or in a relationship *vs* single, divorced, or widowed), maternal smoking during pregnancy (yes or no to any use), maternal alcohol consumption during pregnancy (yes or no to any use), maternal education (in years), and monthly family income (in Brazilian reals). Additionally, maternal depression was assessed at 12 months postpartum using the Edinburgh Postnatal Depression Scale,[21] and child psychopathology was assessed at 48 months using the Child Behaviour Checklist (CBCL; appendix 2 pp 2–3).[22]

Statistical analysis

Multivariate imputation by chained equations with 100 imputed datasets was used to address missing data (appendix 2 pp 3–4).[23]

We used logistic regression analysis to examine associations between cumulative trauma load and psychiatric disorders. In cross-sectional analyses, we examined the association between cumulative trauma up to ages 15 or 18 years and concurrent psychiatric disorders. In longitudinal analyses, we examined whether cumulative trauma up to age 11 years was associated with psychiatric disorders at age 15 and 18 years (in separate regression models), and whether cumulative trauma up to age 15 years was associated with psychiatric disorders at age 18 years. For each analysis we conducted three models: unadjusted (outcome–exposure), adjusted for baseline confounders and maternal depression at 12-months postpartum (outcome–exposure–confounders), and additionally adjusted for child psychopathology at 48 months (outcome–exposure–confounders and total CBCL score). This final model was performed to explore whether childhood trauma was associated with adolescent disorders over and above any psychopathology in early childhood.

We calculated PAFs treating trauma exposure as a binary variable to estimate the proportion of psychiatric disorders at age 18 years attributable to childhood trauma, using the formula $PAF=p_c*(1-[1/RR])$, in which p_c is the prevalence of trauma exposure among those with disorders and RR is the adjusted risk ratio.[24]

In sensitivity analyses, we examined whether associations differed by sex. Additionally, we explored potential informant effects (self *vs* caregiver) by investigating whether associations between trauma at age 15 years and disorders at age 18 years were similar when the same informant reported on both trauma and mental health, compared with when different informants were used. Dichotomised SDQ scores were used as a proxy for caregiver-reported disorders at age 18 years in these analyses.

Our analysis plan was pre-registered on the Open Science Framework (appendix 2 p 3). Statistical analyses were conducted using Stata version 17.

For the **analysis plan** see https://doi.org/10.17605/OSF.IO/C48QW

	Total sample	Trauma		OR (95% CI) or mean difference	p value
		Unexposed (18·8%)	Exposed (81·2%)		
Binary variables					
Child sex					
Female	48·1% (0·01)	51·9% (0·02)	47·2% (0·01)	0·83 (0·69–1·00)	0·045
Male	51·9% (0·01)	48·1% (0·02)	52·8% (0·01)	1·20 (1·00–1·44)	0·045
Maternal ethnicity (White)*	61·6% (0·01)	66·9% (0·02)	60·4% (0·01)	0·75 (0·63–0·91)	0·0030
Maternal smoking (yes)	27·5% (0·01)	20·2% (0·02)	29·2% (0·01)	1·62 (1·31–2·01)	<0·0001
Maternal alcohol consumption (yes)	3·3% (0·003)	1·8% (0·01)	3·7% (0·003)	2·08 (1·08–3·98)	0·028
Maternal relationship status (single, divorced, or widowed)†	16·4% (0·01)	13·6% (0·01)	17·0% (0·01)	1·30 (1·01–1·67)	0·040
Continuous variables					
Monthly family income, BRL‡	803·59 (17·1)	902·98 (48·4)	780·60 (19·3)	−122·39	0·019
Maternal education, years	8·12 (0·05)	8·45 (0·10)	8·05 (0·10)	−0·40	0·016
Maternal depression (0–30)§	7·26 (0·08)	6·49 (0·20)	7·45 (0·10)	0·95	<0·0001

Data are % (SE) or mean (SE), unless stated otherwise. Based on imputed data (N=4229). BRL=Brazilian real. OR=odds ratio. *Reference group is Black or mixed race. †Reference group is married or in a relationship. ‡Conversion rate on Jan 1, 2004 was 1 BRL to US$0·34. §Maternal depression was measured using the Edinburgh Postnatal Depression Scale.

Table 1: **Sample characteristics of mothers and children at birth according to child trauma exposure status at age 18 years**

Role of the funding source
The funders of this study had no role in study design, data collection, data analysis, data interpretation, writing of the report, or the decision to submit the paper for publication.

Results

Of 4263 livebirths, 4231 (99·2%) infants were recruited into the cohort at birth. Around 55% of adolescents at age 15 years (due to data collection stopping as a result of the COVID-19 pandemic) and 25% at age 18 years had missing data (complete case analyses are presented in appendix 2 [p 3]). The findings presented are therefore based on imputed data (appendix 2 pp 21–25). 4229 adolescents (2195 [51·9%] boys and 2034 [48·1%] girls) were included in the imputed analyses (table 1). At age 15 years, 14·7% of adolescents had at least one current psychiatric disorder; 30·1% had been exposed to one trauma, 20·8% to two traumas, and 27·2% to three or more traumas in their lifetime (table 2; appendix 2 p 8). By age 18 years, 38·6% of adolescents had at least one current psychiatric disorder and 36·2% had been exposed to one trauma, 19·8% to two traumas, and 25·3% to three or more traumas in their lifetime (table 2).

At age 15 years, the odds of any disorder (odds ratio adjusted for confounders and total CBCL score at 48 months [aOR] 1·19 [95% CI 1·03–1·38]), anxiety disorders (1·45 [1·21–1·75)], and conduct–oppositional disorders (1·60 [1·13–2·27]) increased for each category increase in cumulative trauma, but mood and attention–hyperactivity disorders were not related to cumulative trauma. At age 18 years, the odds of any disorder (1·34 [1·24–1·44]), anxiety disorders (1·23 [1·13–1·34]), mood disorders (1·33 [1·22–1·46]), attention–hyperactivity disorders (1·24 [1·09–1·41]), and conduct–oppositional disorders (1·59 [1·36–1·86]) all increased for each category increase in cumulative trauma (table 3).

For cumulative trauma up to age 11 years, each category increase in exposure was associated with increased odds of any disorder (1·26 [1·11–1·44]), anxiety disorders (1·27 [1·04–1·56]), and conduct–oppositional disorders (1·43 [1·04–1·97]) at age 15 years, but not mood disorders or attention–hyperactivity disorders (table 4). There was no association between cumulative trauma up to age 11 years and any of the disorder outcomes at age 18 years. For cumulative trauma up to age 15 years, each category increase was associated with increased odds of any disorder (1·32 [1·21–1·45]), anxiety disorders (1·27 [1·14–1·40]), mood disorders (1·26 [1·12–1·41]), and conduct–oppositional disorders at age 18 years (1·52 [1·24–1·87]), but not attention–hyperactivity disorders (table 4).

The PAF analyses showed that trauma exposure up to age 18 years accounted for 30·6% (95% CI 21·2–38·7) of any disorder, 30·6% (18·0–40·9) of anxiety disorders, 41·2% (27·0–52·1) of mood disorders, 36·5% (12·4–52·9) of attention–hyperactivity disorders, and 76·6% (50·7–87·7) of conduct–oppositional disorders at age 18 years (see appendix 2 [p 16] for the cross-sectional analyses using binary trauma exposure underpinning these analyses).

	Total sample	Any trauma	
		No	Yes
Adolescents aged 15 years			
Total	4229	22·5% (0·01)	77·5% (0·01)
Any psychiatric disorder	14·7% (0·01)	10·3% (0·02)	16·0% (0·01)
Anxiety disorders	6·9% (0·01)	3·0% (0·01)	8·0% (0·01)
Mood disorders	4·4% (0·005)	3·9% (0·01)	4·5% (0·01)
Attention–hyperactivity disorders	2·8% (0·005)	3·6% (0·01)	2·5% (0·01)
Conduct–oppositional disorders	2·6% (0·004)	1·3% (0·01)	2·9% (0·005)
Adolescents aged 18 years			
Total	4229	18·8% (0·01)	81·2% (0·01)
Any psychiatric disorder	38·6% (0·01)	26·5% (0·02)	41·5% (0·01)
Anxiety disorders	22·9% (0·01)	16·1% (0·02)	24·5% (0·01)
Mood disorders	17·8% (0·01)	10·4% (0·01)	19·5% (0·01)
Attention–hyperactivity disorders	8·3% (0·005)	5·2% (0·01)	9·0% (0·01)
Conduct–oppositional disorders	5·7% (0·004)	1·2% (0·01)	6·8% (0·01)

Data are % (SE) or n. Based on imputed data (N=4229).

Table 2: **Prevalence of current psychiatric diagnoses at ages 15 and 18 years according to trauma exposure status up to ages 15 and 18 years**

	Cumulative trauma up to age 15 years		Cumulative trauma up to age 18 years	
	OR (95% CI)	p value	OR (95% CI)	p value
Unadjusted				
Any psychiatric disorder	1·34 (1·16–1·53)	<0·0001	1·36 (1·27–1·46)	<0·0001
Anxiety disorders	1·58 (1·32–1·89)	<0·0001	1·24 (1·14–1·34)	<0·0001
Mood disorders	1·35 (1·11–1·65)	0·0030	1·35 (1·24–1·48)	<0·0001
Attention–hyperactivity disorders	1·10 (0·83–1·46)	0·50	1·26 (1·11–1·43)	<0·0001
Conduct–oppositional disorders	1·88 (1·33–2·67)	<0·0001	1·71 (1·47–2·00)	<0·0001
Adjusted (confounders)				
Any psychiatric disorder	1·26 (1·09–1·45)	0·0020	1·35 (1·25–1·45)	<0·0001
Anxiety disorders	1·51 (1·26–1·82)	<0·0001	1·24 (1·14–1·34)	<0·0001
Mood disorders	1·30 (1·06–1·58)	0·011	1·34 (1·22–1·46)	<0·0001
Attention–hyperactivity disorders	0·99 (0·74–1·32)	0·93	1·26 (1·11–1·43)	<0·0001
Conduct–oppositional disorders	1·67 (1·18–2·36)	0·0040	1·61 (1·38–1·89)	<0·0001
Adjusted (confounders and total CBCL score at 48 months)				
Any psychiatric disorder	1·19 (1·03–1·38)	0·018	1·34 (1·24–1·44)	<0·0001
Anxiety disorders	1·45 (1·21–1·75)	<0·0001	1·23 (1·13–1·34)	<0·0001
Mood disorders	1·22 (1·00–1·50)	0·054	1·33 (1·22–1·46)	<0·0001
Attention–hyperactivity disorders	0·93 (0·69–1·25)	0·62	1·24 (1·09–1·41)	0·0010
Conduct–oppositional disorders	1·60 (1·13–2·27)	0·0090	1·59 (1·36–1·86)	<0·0001

Based on imputed data (N=4229). Forest plots for fully adjusted findings are presented in the appendix (p 19). Confounders include child sex, maternal smoking, maternal relationship status, maternal alcohol consumption, maternal ethnicity, maternal education, maternal depression, and family income. CBCL=Child Behaviour Checklist. OR=odds ratio.

Table 3: **Cross-sectional associations between cumulative trauma load up to ages 15 and 18 years and psychiatric disorders at ages 15 and 18 years**

	Trauma up to 11 years and disorder at 15 years		Trauma up to 11 years and disorder at 18 years		Trauma up to 15 years and disorder at 18 years	
	OR (95% CI)	p value	OR (95% CI)	p value	OR (95% CI)	p value
Unadjusted						
Any psychiatric disorder	1·40 (1·24–1·57)	<0·0001	1·03 (0·94–1·12)	0·51	1·34 (1·23–1·46)	<0·0001
Anxiety disorders	1·38 (1·14–1·67)	0·0010	0·93 (0·84–1·03)	0·18	1·26 (1·15–1·39)	<0·0001
Mood disorders	1·18 (0·93–1·48)	0·17	1·06 (0·95–1·19)	0·27	1·27 (1·14–1·42)	<0·0001
Attention–hyperactivity disorders	1·13 (0·81–1·57)	0·47	0·95 (0·81–1·11)	0·50	1·08 (0·93–1·26)	0·31
Conduct–oppositional disorders	1·67 (1·24–2·24)	0·0010	1·17 (0·98–1·39)	0·075	1·63 (1·33–1·99)	<0·0001
Adjusted (confounders)						
Any psychiatric disorder	1·32 (1·16–1·49)	<0·0001	0·98 (0·90–1·08)	0·75	1·33 (1·22–1·45)	<0·0001
Anxiety disorders	1·32 (1·08–1·60)	0·0060	0·91 (0·82–1·01)	0·075	1·27 (1·15–1·40)	<0·0001
Mood disorders	1·12 (0·88–1·42)	0·35	1·02 (0·91–1·14)	0·75	1·26 (1·13–1·41)	<0·0001
Attention–hyperactivity disorders	1·03 (0·72–1·46)	0·88	0·94 (0·80–1·10)	0·43	1·07 (0·92–1·25)	0·38
Conduct–oppositional disorders	1·48 (1·08–2·03)	0·016	1·08 (0·91–1·30)	0·38	1·55 (1·26–1·90)	<0·0001
Adjusted (confounders and total CBCL score at 48 months)						
Any psychiatric disorder	1·26 (1·11–1·44)	0·0010	0·98 (0·89–1·07)	0·61	1·32 (1·21–1·45)	<0·0001
Anxiety disorders	1·27 (1·04–1·56)	0·020	0·90 (0·81–1·00)	0·060	1·27 (1·14–1·40)	<0·0001
Mood disorders	1·05 (0·82–1·35)	0·68	1·01 (0·90–1·14)	0·83	1·26 (1·12–1·41)	<0·0001
Attention–hyperactivity disorders	0·97 (0·68–1·39)	0·87	0·92 (0·78–1·08)	0·30	1·05 (0·90–1·23)	0·53
Conduct–oppositional disorders	1·43 (1·04–1·97)	0·028	1·06 (0·89–1·27)	0·51	1·52 (1·24–1·87)	<0·0001

Based on imputed data (N=4229). Forest plots for fully adjusted findings are presented in the appendix (p 20). Confounders include child sex, maternal smoking, maternal relationship status, maternal alcohol consumption, maternal ethnicity, maternal education, maternal depression, and family income. CBCL=Child Behaviour Checklist. OR=odds ratio.

Table 4: **Longitudinal associations between cumulative trauma up to ages 11 and 15 years and psychiatric disorders at ages 15 and 18 years**

In sensitivity analyses, there was minimal evidence that trauma–disorder associations differed by sex. Associations differed by sex in some cases but not others, and any sex differences were weak (appendix 2 p 16). In sensitivity analyses for informant effects, adolescent-reported cumulative trauma up to age 15 years was associated with increased odds of adolescent-reported mental disorder at age 18 years across all categories except attention–hyperactivity disorders (aORs 1·33–1·82), whereas caregiver-reported trauma was only associated with increased odds of any disorder (aOR 1·20 [95% CI 1·06–1·36]) and mood disorders (1·25 [1·07–1·46]), and associations were weaker (appendix 2 p 17). For caregiver-reported adolescent psychopathology at age 18 years (assessed via SDQ), potential informant effects were less clear (appendix 2 p 18). Adolescent-reported cumulative trauma at age 15 years was associated with scoring above the cutoff for any problem or difficulty (1·17 [1·06–1·30]) and hyperactivity problems (1·14 [1·01–1·28]), whereas caregiver-reported cumulative trauma was associated with any problem or difficulty (1·19 [1·03–1·38]) and conduct problems (1·22 [1·02–1·47]). No associations were identified for emotional problems.

Discussion

In this large LMIC birth cohort study, approximately 81% of adolescents had experienced at least one trauma, and around 40% met criteria for at least one current psychiatric disorder at age 18 years. We found strong concurrent associations between cumulative trauma load and psychiatric disorders at ages 15 and 18 years. Furthermore, we found longitudinal associations between trauma up to age 11 years and disorders at age 15 years, and from trauma up to age 15 years and disorders at age 18 years. In terms of specific disorder categories, across all analyses the strongest associations emerged for conduct–oppositional disorders and anxiety disorders, with cross-sectional and longitudinal associations for mood disorders being present only at age 18 years. We also found little evidence of associations between cumulative trauma and attention–hyperactivity disorders. Cumulative trauma up to age 11 years (caregiver-report) was not associated with psychiatric disorders at age 18 years (adolescent-report), and there was evidence of potential informant effects in our data. Finally, PAF estimates showed that trauma exposure up to age 18 years explained at least 30·6% of psychiatric disorders at age 18 years.

In a previous study using the same cohort, we reported associations between trauma exposure and child psychiatric disorder at age 6 years, and stronger and more widespread associations by age 11 years, including longitudinally.[6] Here, given the very high prevalence of trauma in this sample, we focused on cumulative trauma load, indexed as the number of different trauma types reported over the lifetime, and we extended analyses of mental health outcomes to ages 15 and 18 years. We found that, with increasing trauma load, adolescents

were increasingly likely to meet criteria for a current psychiatric disorder, with effects being relatively consistent across concurrent analyses at ages 15 and 18 years, and longitudinal analyses from age 11 to 15 years and from age 15 to 18 years. Associations were strongest for conduct–oppositional disorders, with each one-category increase in number of trauma types experienced up to age 18 years resulting in an increase of approximately 60% in the odds of conduct–oppositional disorders. Correspondingly, our PAF analyses showed that trauma accounted for 76·6% of conduct–oppositional disorders at age 18 years. This observation of particularly strong links between childhood trauma and conduct–oppositional disorders was also observed in this cohort at age 11 years,[6] suggesting persistent effects. Childhood trauma is likely to increase the risk for conduct–oppositional disorders through multiple mechanisms, including altered emotional responding, heightened threat perception, and socialisation of negative behaviours.[25] However, reciprocal influences are also likely, with antisocial or risky behaviours potentially increasing risk of trauma exposure.[26] Our findings emphasise the need for interventions to address this negative cycle among young people in LMICs, consistent with the theory of latent vulnerability whereby trauma exposure results in neurobiological adaptions that are advantageous in the short-term, but increase risk of adverse outcomes in later life (eg, heightened threat sensitivity being adaptive in the short-term, but potentially leading to anxiety disorders in the long-term).[27]

Findings in relation to anxiety and mood disorders were also relatively consistent across analyses. For anxiety disorders, concurrent and longitudinal associations with trauma were identified at ages 15 and 18 years. For mood disorders, associations were only evident in relation to trauma up to age 18 years and not trauma up to age 15 years, possibly because mood disorders have a later age of onset than anxiety and conduct–oppositional disorders,[28] or because parents and caregivers are less aware of their child's emotional problems.[29] We found little evidence that trauma was associated with attention–hyperactivity disorders in adolescents, possibly due to the developmental progression of this disorder: ADHD symptoms can become less apparent during adolescence compared with childhood,[30] and ADHD in adulthood is potentially associated with different risk factors or has even been proposed to emerge secondary to other mental disorders.[31] Also, evidence has shown that the heritability of ADHD is approximately 80%, which might offer some explanation of our findings.[32] Overall, further studies that track the mental health consequences of trauma exposure across this key developmental period are needed, particularly in LMIC cohorts.

Notably, we found no evidence of associations between cumulative trauma up to age 11 years and psychiatric disorders at age 18 years. This finding is particularly surprising given the considerable evidence that retrospectively reported exposure to childhood trauma is associated with effects on mental health that persist throughout adulthood.[2,3] There are several possible interpretations of these null findings. First, the effects of early trauma might genuinely diminish over time, with more proximal exposures being more important to adolescent mental health than distal exposures. In this cohort, associations from age 11 years to age 18 years might have been overshadowed by the impact of the COVID-19 pandemic, which affected adolescents in this cohort from age 15 years. We found an approximately 2·5 times increase in the prevalence of psychiatric disorders at age 18 years (around 40%) compared with ages 11 and 15 years (around 15%), which could be attributable to the COVID-19 pandemic; however, disorders at age 18 years were adolescent-reported, whereas disorders were caregiver-reported at ages 11 and 15 years, which might also have influenced these findings. Second, although the caregiver-reported assessments of trauma used standard trauma checklists, they might not have adequately captured the kinds of traumatic events that have long-standing effects on the mental health of young people. Third, informant bias might have influenced our findings: reports of trauma at age 11 years were based solely on caregiver-report and mental health at age 18 years was based only on adolescent-report, whereas there was at least some degree of informant overlap for all other analyses. When we probed possible informant effects between ages 15 and 18 years, trauma exposure based only on adolescent-report at age 15 years was a much stronger predictor of adolescent-reported psychiatric disorders at age 18 years than was trauma exposure at age 15 years based only on caregiver-report. In similar analyses of caregiver-reported adolescent mental health at age 18 years, we did not find clear evidence of informant effects, precluding strong conclusions. Consistent with emerging findings in adults,[33] the subjective, first-person experiences of trauma might be more strongly associated with later psychopathology than are secondary informant reports.[4] In addition, adolescents in our cohort were asked about more interpersonal trauma items than were caregivers, which might also have contributed to stronger associations when adolescent self-report data were used. Nonetheless, although cohort studies sometimes avoid asking children directly about trauma exposure due to ethical concerns,[34] our findings indicate that, from a scientific perspective, including children's own reports of trauma exposure at the earliest possible age is highly desirable.

Our findings affirm childhood trauma as a potential transdiagnostic risk factor for psychopathology,[4,6] and suggest that associations might strengthen through adolescence—although further research is needed to elucidate potential mechanisms linking childhood

trauma to transdiagnostic psychopathology. A recent systematic review highlighted the potential importance of perceived social support, emotion regulation, and negative cognitive appraisals;[35] and models of risk and resilience posit changes in social information processing, emotional responding, and biological ageing as key transdiagnostic mechanisms of the trauma–mental health relationship.[36] Overall, rates of trauma exposure in this LMIC cohort were two times higher than what was observed in a similar high-income country cohort,[4] and reducing or mitigating the impact of childhood trauma exposure could reduce the burden of psychiatric disorders substantially among LMIC youth.[13] Our PAF analyses suggested that childhood trauma exposure by age 18 years accounts for at least 30·6% of psychiatric disorders at age 18 years, consistent with evidence from retrospective population-based studies[2,3] and a representative sample of US adolescents.[5] Identification of targets for mental health prevention strategies could therefore be crucial, particularly given the limitations of the provision and uptake of mental health services in LMICs.[14]

This study addressed multiple limitations of the existing literature. We extended previous research by investigating childhood trauma and psychopathology in an LMIC population-based sample of adolescents. We used prospective data on trauma exposure collected across four timepoints and from multiple informants, and used data from earlier follow-ups, to consistently identify trauma exposure and minimise the effect of inaccurate recall. We also computed PAFs to estimate the proportion of psychiatric disorders explained by childhood trauma for, to our knowledge, the first time in an LMIC youth population. We adjusted for key confounders and showed longitudinal dose–response associations between trauma and mental health problems.

However, several limitations must also be considered. First, Pelotas is a predominantly urban area with a lower gross domestic product per capita and greater income inequality compared with the Brazilian national average (appendix 2 p 1); this potentially limits the generalisability of these findings, given the considerable socioeconomic variation in Brazil. Second, confounders were mostly based on maternal characteristics measured at birth and therefore did not reflect the current status of these confounders during adolescence, at which time they might show different associations with adolescent outcomes. Third, our assessments of childhood traumas showed some variation across informants and over time, and we were unable to capture actual frequency of exposure and, therefore, used the number of different trauma types reported as a proxy. Fourth, as data at age 18 years were collected in 2022, the COVID-19 pandemic might have increased the prevalence of psychiatric disorders in this sample, although a similar prevalence of current disorders has been observed in UK adolescents.[4] Fifth, an absence of detailed temporal information regarding trauma timing and the age-of-onset of psychiatric disorders limited our ability to make strong causal inferences. In some cases, disorder onset might have preceded trauma exposure, given previous research evidencing bi-directional associations, particularly for externalising disorders.[26] In addition, although we calculated PAFs, which assume causality, we can only partially infer causality based on covariance adjustment. Future population-based studies should collect detailed information on both the timing of traumatic experiences and the age-of-onset of disorders to help elucidate this complex interplay between childhood trauma and psychiatric disorders.

In conclusion, we found strong cross-sectional and longitudinal associations between exposure to childhood trauma and multiple classes of adolescent psychiatric disorders, such that increasing numbers of trauma exposures were associated with increased odds of psychiatric disorders. Our findings show that psychiatric disorders (particularly conduct–oppositional disorders) are elevated substantially among trauma-exposed adolescents. Health-care practitioners, especially in LMICs, should be aware that trauma exposure is highly prevalent among young people and is associated with multiple classes of psychiatric disorders. Support for prevention and intervention programmes from clinicians, researchers, and policy makers is especially crucial to implement widespread strategies to reduce trauma exposure and build individual, family, and social resources that help foster resilience and other positive outcomes.

Contributors

MB and AM accessed and verified the study data. MB, SLH, GF, AM, and GH designed the analysis plan. MB and AB coded the trauma variables. MB and MXC coded the psychiatric disorder variables. MB and GH performed the statistical analyses. MB, SLH, GF, AM, and GH interpreted the data and drafted the manuscript. AB, MXC, JM, ISS, AJDB, LT-R, and AD revised the manuscript. All authors had access to the study data and had final responsibility for the decision to submit the article for publication.

Declaration of interests

GF and SLH report funding for a relevant, but unrelated, project from the UK Medical Research Council. SLH also reports funding for a relevant, but unrelated, project from the Economic and Social Research Council, and is a Scientific Committee member for the UK Trauma Council and Child and War Foundation. AD consulted for the Yale Child Study Center and holds the following roles: Academic Secretary of the Faculty of Child & Adolescent Psychiatry, UK Royal College of Psychiatrists; General Secretary, European Society for Child and Adolescent Psychiatry; and Editor-at-large, *Journal of the American Academy of Child & Adolescent Psychiatry*. All other authors declare no competing interests.

Data sharing

Applications to use the data can be made by contacting the researchers of the 2004 Pelotas Birth Cohort and completing the application form. A list of administered questionnaires at each timepoint can be accessed online. Researchers with successful applications will receive a dataset including the requested variables and unique participant IDs. The analysis code is available through a public GitHub repository at https://github.com/megan-l-bailey/2004Pelotas-Trauma-MentalHealth.

For a **list of key faculty members** see https://epidemio-ufpel.org.br/corpo-docente-ppgep/

For the **application form and list of questionnaires** see https://epidemio-ufpel.org.br/coorte-2004/

Acknowledgments

We thank the young people included in the 2004 Pelotas Birth Cohort Study and their families; this research would not be possible without their ongoing participation. We also thank the 2004 Pelotas Birth Cohort Study research team. This article used data from the 2004 Pelotas Birth Cohort Study, conducted by the Postgraduate Program in Epidemiology at Universidade Federal de Pelotas, with the collaboration of the Brazilian Public Health Association. The Wellcome Trust, WHO, National Support Program for Centers of Excellence, Brazilian National Research Council (CNPq), Brazilian Ministry of Health, and Children's Pastorate supported previous phases of the study. The 11-year follow-up was supported by the Department of Science and Technology (DECIT) of the Brazilian Ministry of Health, CNPq, and the Research Support Foundation of the State of São Paulo (FAPESP; grant number 2014/13864–6). The 15-year follow-up was supported by the DECIT, CNPq, FAPESP (grant number 2020/07730–8), the Research Support Foundation of the State of Rio Grande do Sul (FAPERGS), and the L'Oréal-Unesco-ABC Program for Women in Science in Brazil-2020. The 18-year follow-up was supported by DECIT, CNPq (grant number 409224/2021–9), FAPERGS, L'Oréal-Unesco-ABC Program for Women in Science in Brazil-2020, and the All for Health Institute, São Paulo, Brazil. The current analyses were funded by a studentship awarded to the first author (MB) from the University of Bath and by grant ES/P000630/1 to the South-West Doctoral Training Partnership, awarded to the Universities of Bath, Bristol, Exeter, Plymouth, and the West of England from the Economic and Social Research Council (ESRC)/ UK Research and Innovation (UKRI). GH is supported by a Sir Henry Wellcome Postdoctoral Fellowship (grant number 209138/Z/17/Z). GH is a member of the UK Medical Research Council Integrative Epidemiology Unit at the University of Bristol (MC_UU_00011/7). CNPq supports LTR (308319/2021–4), ISS (303042/2018–4), AJDB, and AM (312746/2021–0). SLH and AM also received funding from the UKRI, ESRC, and FAPESP (2023/12905–0). The Wellcome Trust supports MXC (225019/Z/22/Z), JM (210735_A_18_Z), and AM (309183/Z/24/Z). AD received funding from the National Institute for Health Research (NIHR) Biomedical Research Centre at South London and Maudsley NHS Foundation Trust (NIHR203318), King's College London, and the Maudsley Charity. The content is solely the responsibility of the authors and does not necessarily represent the official views of the funders or institutions.

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