



**The Association
for Child and Adolescent
Mental Health**

Beyond the Cumulative Score: An Exploratory Dimensional Approach to Childhood Adversity and Adolescent Mental Health

Athena Chow, PhD

Research Fellow in Mental Health, UCL

Adversity, Protection, and Prevention: Rethinking Childhood Experiences Through New Evidence
ACAMH ACE Conference 30th September 2026

Relationship of Childhood Abuse and Household Dysfunction to Many of the Leading Causes of Death in Adults

The Adverse Childhood Experiences (ACE) Study

Vincent J. Felitti, MD, FACP, Robert F. Anda, MD, MS, Dale Nordenberg, MD, David F. Williamson, MS, PhD, Alison M. Spitz, MS, MPH, Valerie Edwards, BA, Mary P. Koss, PhD, James S. Marks, MD, MPH

Background: The relationship of health risk behavior and disease in adulthood to the breadth of exposure to childhood emotional, physical, or sexual abuse, and household dysfunction during childhood has not previously been described.

Methods: A questionnaire about adverse childhood experiences was mailed to 13,494 adults who had completed a standardized medical evaluation at a large HMO; 9,508 (70.5%) responded. Seven categories of adverse childhood experiences were studied: psychological, physical, or sexual abuse; violence against mother; or living with household members who were substance abusers, mentally ill or suicidal, or ever imprisoned. The number of categories of these adverse childhood experiences was then compared to measures of adult risk behavior, health status, and disease. Logistic regression was used to adjust for effects of demographic factors on the association between the cumulative number of categories of childhood exposures (range: 0–7) and risk factors for the leading causes of death in adult life.

10 'Classic' ACEs

ABUSE



Physical



Emotional



Sexual

NEGLECT



Physical



Emotional

HOUSEHOLD DYSFUNCTION



Mental Illness



Incarcerated Relative



Mother treated violently



Substance Abuse



Divorce

Origin of the ACE Study

The turning point in Felitti's quest came by accident. The physician was running through yet another series of questions with yet another obesity program patient:

How much did you weigh when you were born?

How much did you weigh when you entered high school?

How old were you when you became sexually active?

How old were you when you married?

Origin of the ACE Study

“I misspoke,” he recalls, “Instead of asking, “How old were you when you were first sexually active,” I asked,

“How much did you weigh when you were first sexually active?”

The patient, a woman, answered, ‘Forty pounds.’”

He didn’t understand what he was hearing. He misspoke the question again.

She gave the same answer, burst into tears and added,

“It was when I was four years old, with my father.”

Origin of the ACE Study

“I didn’t know what to do with the information,” Felitti recalls. “About 10 days later, I ran into the same thing. It was very disturbing. **Every other person was providing information about childhood sexual abuse.**”

I thought, “This can’t be true. People would know if that were true. Someone would have told me in medical school.’ ”

Worried that he was injecting some unconscious bias into the questioning, he asked five of his colleagues to interview the next 100 patients in the weight program.

“They turned up the same things,” he says.

Origin of the ACE Study

Of the 286 people whom Felitti and his colleagues interviewed,
most had been sexually abused as children.

Another piece of the puzzle dropped into place during an interview with a woman who had been raped when she was 23 years old. In the year after the attack, she told Felitti that she'd gained 105 pounds.

“As she was thanking me for asking the question,” says Felitti, “she looks down at the carpet, and mutters,
‘Overweight is overlooked, and that’s the way I need to be.’”

What We Do Know

Global population estimates:
6 in 10 adults report ≥ 1 ACE
1 in 6 adults report ≥ 4 ACEs
(Madigan et al., 2023).

Annual health costs associated
with ACEs in Europe and North
America are estimated at
\$581 billion and \$748 billion
(Bellis et al., 2019).



Outside of the WEIRD* context,
the economic burden of ACEs is
estimated at \$194 billion and
\$206 billion for countries in the
East Asia and Pacific region
(Fang et al., 2015).

The CDC-Kaiser ACE Study
summed 10 ACEs as a cumulative
risk score to demonstrate a dose-
response relationship
(Felitti et al., 1998).

*WEIRD = Western, Educated, Industrialised, Rich, and Democratic (Henrich et al., 2010)

What We Don't Know

The cumulative risk approach has dominated the field, but has major limitations:

- Assumes ACEs are equal
- Disregards specific clustering
- Fails to explain mechanisms

The Dimensional Model of Adversity and Psychopathology (DMAP) conceptualises ACEs as threat and deprivation (McLaughlin & Sheridan, 2014).



Reproducibility issue

Evidence for the dimensional approach is mixed, with inconsistent dimensions found across studies.

(Awada et al., 2023; Sisitsky et al., 2023)

Lack of consensus

Studies follow different definitions of adversity, and there is not yet a consensus on the best way to conceptualise ACEs.

What We Should Do

Broaden the definition of childhood adversity beyond the original 10 ACEs, to improve prediction of mental health outcomes.

Apply a data-driven approach to explore ACE dimensions, without being influenced by pre-defined categorisations.



Follow children in large, longitudinal cohort datasets over time, to identify naturally occurring dimensions of adversity in the wider population.

Replicate a pre-registered protocol across different populations to test if there are meaningful dimensions.

Study Aims

1) Investigate if there are *meaningful dimensions* of ACEs using *exploratory data-driven methods* across two different populations: the UK MCS and US ABCD Study.

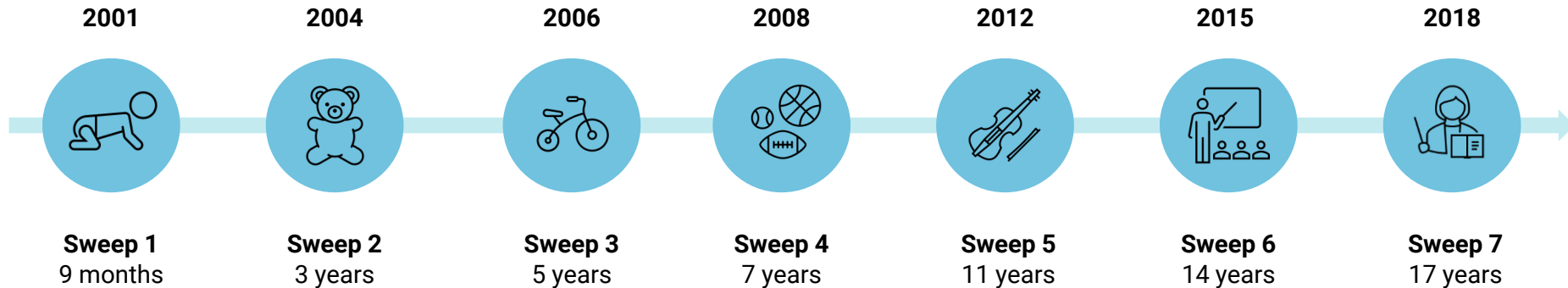


2) If there are meaningful ACE dimensions, test if these dimensions are *differentially associated with psychopathology* outcomes in *adolescence*.

UK Millennium Cohort Study (MCS)

MCS Participants: 18,539 British children (48.6% females) born in the UK between 2000-2002.

173 items were identified as longitudinal exposures to ACEs and aggregated across time points from 9 months to 14 years to create composite binary measures of ACEs



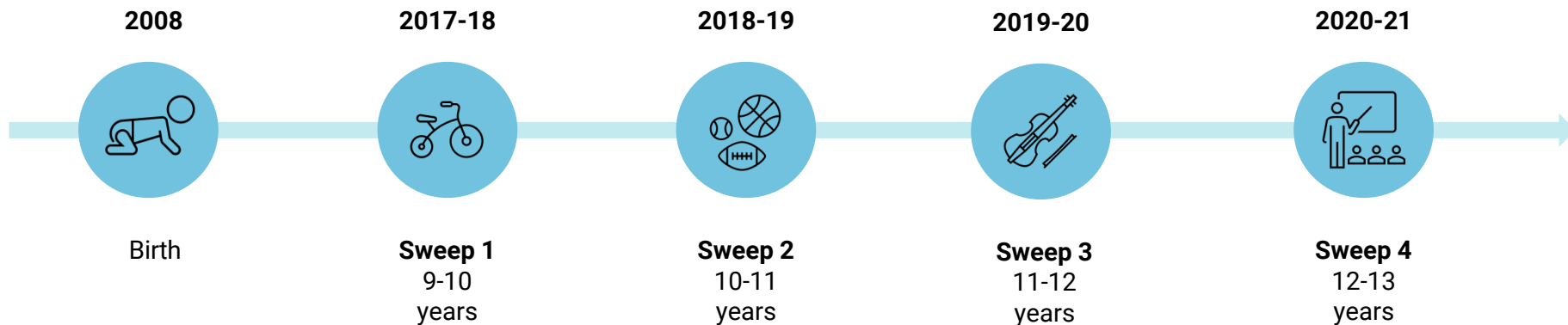
EXPOSURE to 18 ACEs: poor parental mental health, frequent parental alcohol use, parental drug use, single parent, unhappy parental relationship, domestic violence, harsh parental discipline, parental smacking, negative home environment, peer victimisation, verbal victimisation, physical victimisation, theft victimisation, sexual victimisation, low household income, neighbourhood deprivation, unsafe home area, low cognitive stimulation

OUTCOME:
Internalising and externalising symptoms (SDQ)

US Adolescent Brain Cognitive Development (ABCD) Study

ABCD Participants: 11,876 American children (47.8% female) born in the US between 2006-2008.

134 items were identified as longitudinal exposures to ACEs and aggregated across time points from birth to 11-12 years to create composite binary measures of ACEs

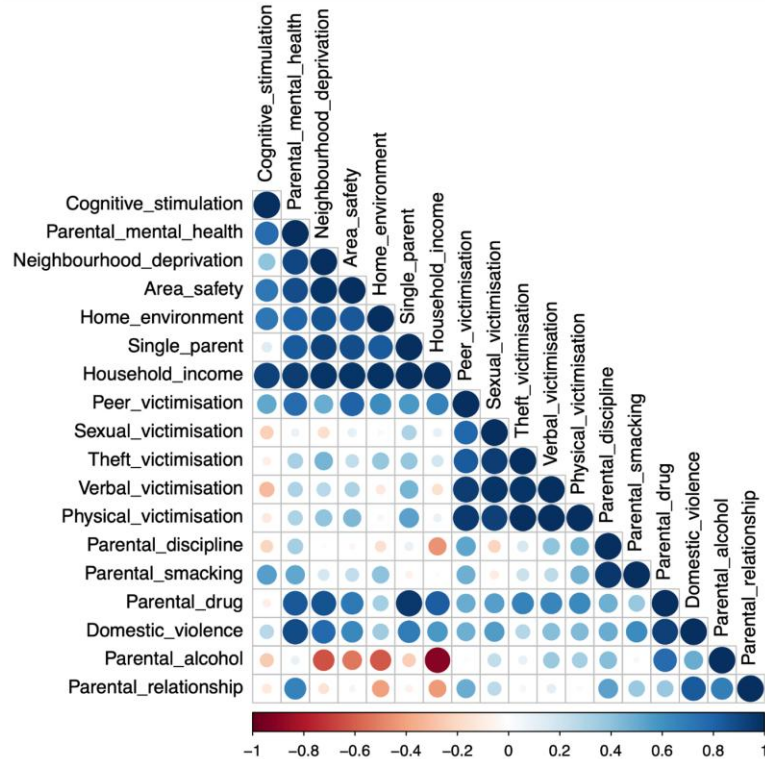


EXPOSURE to 18 ACEs: parental psychopathology, parental alcohol abuse, parental drug abuse, parental separation, domestic violence, parental criminality, peer victimisation, cyber victimisation, physical abuse, emotional abuse, sexual abuse, emotional neglect, accident requiring medical attention, natural disaster, community violence, bereavement, unsafe neighbourhood, and low household income.

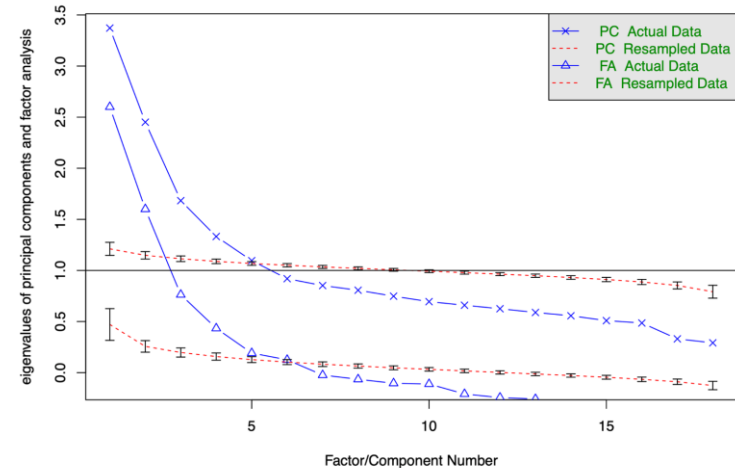
OUTCOME:
*Internalising and
externalising
symptoms (CBCL)*

Exploratory Factor Analysis

Tetrachoric Correlation Matrix of ACEs



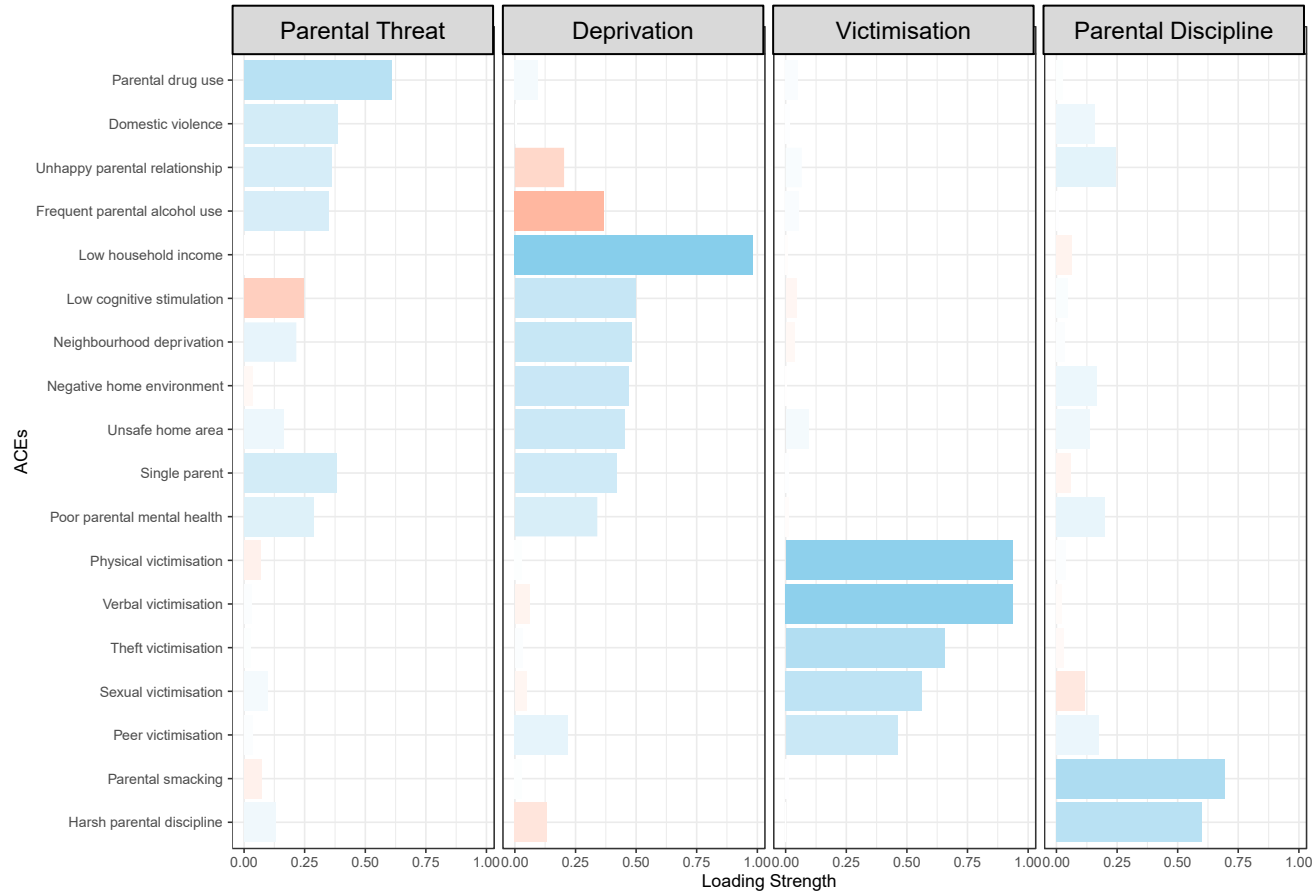
Parallel Analysis Scree Plot



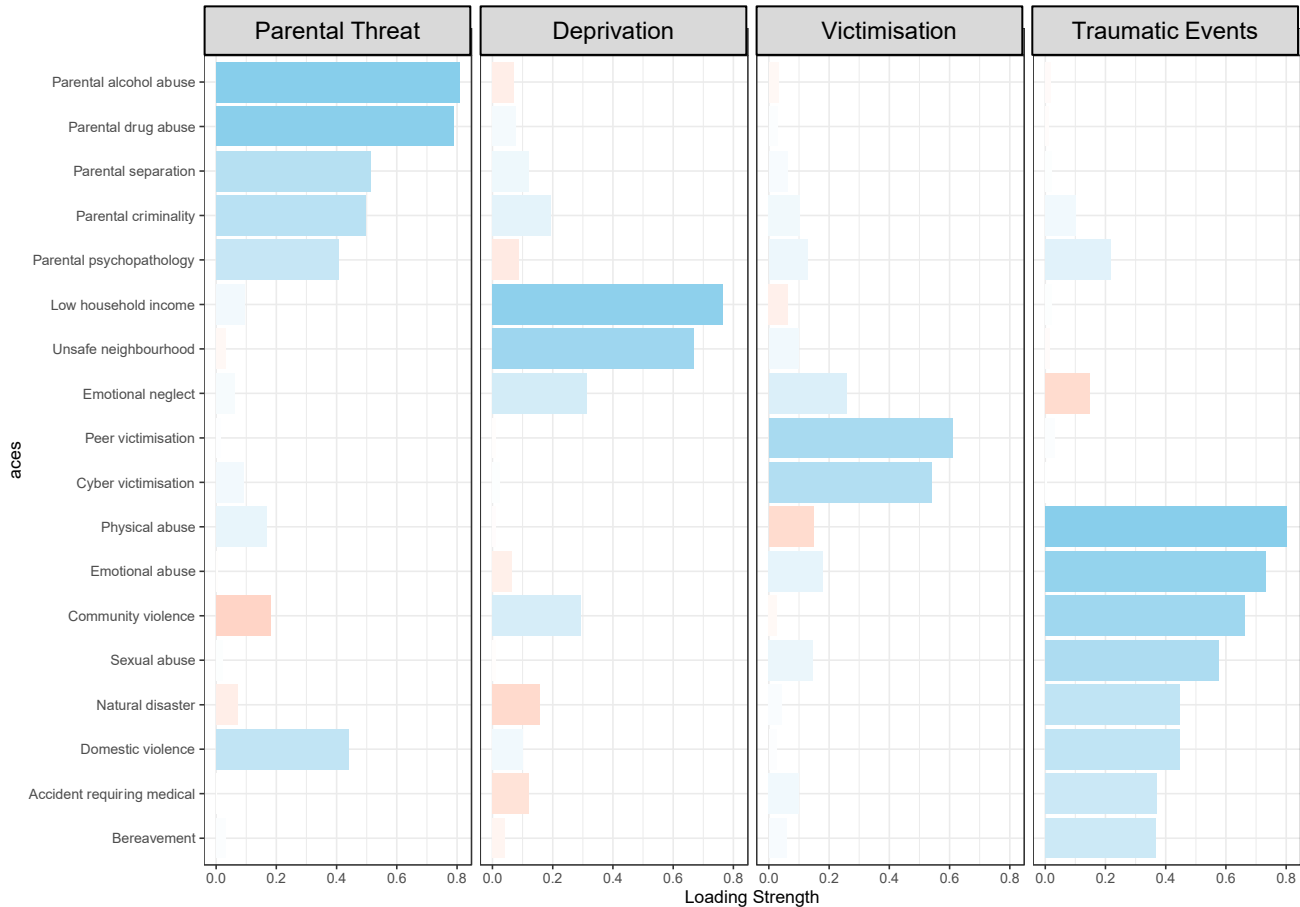
EFA Model Fit Evaluation

- Fit indices (RMSEA, SRMR, CFI, TLI, BIC)
- Factor loadings ≥ 0.30
- Few item cross loadings
- Parsimony (i.e., “clean” factor structure)

Results: MCS Dimensions



Results: ABCD Dimensions



Results: Internalising Symptoms

Table 2 MCS and ABCD adjusted associations between ACE dimensions and internalising symptoms

ACE dimension	Internalising symptoms β (95% CI)	Multivariate model β (95% CI)
<i>Millennium Cohort Study (MCS)</i>		
Parental threat	.17*** (0.15, 0.18)	.06*** (0.05, 0.08)
Deprivation	-.002 (-0.02, 0.01)	.003 (-0.01, 0.02)
Victimisation	.38*** (0.36, 0.39)	.34*** (0.33, 0.36)
Parental discipline	.18*** (0.16, 0.19)	.08*** (0.07, 0.10)
<i>Adolescent Brain Cognitive Development (ABCD) Study</i>		
Parental threat	.10*** (0.08, 0.12)	.07*** (0.05, 0.09)
Deprivation	-.01 (-0.03, 0.01)	-.05*** (-0.07, -0.03)
Victimisation	.13*** (0.11, 0.15)	.11*** (0.10, 0.13)
Traumatic events	.08*** (0.07, 0.10)	.05*** (0.03, 0.07)

All regression models were adjusted for sex and ethnicity. ACE dimensions and internalising symptoms were standardised.
 β = standardised regression coefficient; CI, confidence interval.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Results: Externalising Symptoms

Table 3 MCS and ABCD adjusted associations between ACE dimensions and externalising symptoms

ACE dimension	Externalising symptoms β (95% CI)	Multivariate model β (95% CI)
<i>Millennium Cohort Study (MCS)</i>		
Parental threat	.22*** (0.20, 0.23)	.08*** (0.07, 0.10)
Deprivation	.01 (−0.01, 0.02)	.01 (−0.002, 0.03)
Victimisation	.38*** (0.37, 0.39)	.31*** (0.30, 0.33)
Parental discipline	.30*** (0.29, 0.32)	.21*** (0.20, 0.23)
<i>Adolescent Brain Cognitive Development (ABCD) Study</i>		
Parental threat	.11*** (0.10, 0.13)	.08*** (0.06, 0.10)
Deprivation	.02 (−0.001, 0.04)	−.02** (−0.04, −0.004)
Victimisation	.15*** (0.13, 0.17)	.13*** (0.11, 0.15)
Traumatic events	.09*** (0.07, 0.11)	.04*** (0.02, 0.06)

All regression models were adjusted for sex and ethnicity. ACE dimensions and externalising symptoms were standardised. β , standardised regression coefficient; CI, confidence interval.

* $p < .05$; ** $p < .01$; *** $p < .001$.

Discussion



Rigorous methodology

- Data-driven methods
- Missing data imputation
- Replicability checks



Maximised measures

- Multiple informants
- Statistical & clinical cut-offs
- Inclusion of additional ACEs



Cross-cohort validation

- Millennium Cohort Study (UK)
- ABCD Study (US)



Open science

- Pre-registered
- Open access paper
- Open access code



Proxy measures

- Parental alcohol use $\neq$ abuse
- Parental drug use $\neq$ abuse
- Limited to available data



Measurement bias

- Parent vs child self-reports
- Possible underreporting
- Shared method variance



Cross-cohort replication

- No one-to-one mapping of measures
- Time points did not align perfectly



Causal inference

- Cannot infer that dimensions caused psychopathology (e.g., unmeasured genetic confounding)

Takeaway

Beyond the Cumulative Score: An Exploratory Dimensional Approach to ACEs and Mental Health.

- ACEs can be captured by meaningful dimensions of parental threat, deprivation, and victimisation.
- These dimensions were differentially associated with adolescent psychopathology.
- Results support the dimensional approach over the cumulative risk approach.
- Victimisation emerged as a distinct dimension most strongly associated with psychopathology.
- Future research should include peer victimisation as an ACE.
- Deprivation is a complex construct; research should clarify deprivation measures.
- There is no clear delineation of either threat or deprivation; ACEs display duality in nature.
- Improve reproducibility by replicating open science resource of ACE measures in the MCS and ABCD.

Original Article |  Open Access |  

Do meaningful dimensions of childhood adversity exist? Data-driven evidence from two prospective cohort studies

Athena R.W. Chow , Jessie R. Baldwin, Lucy Bowes

First published: 17 December 2024 | <https://doi.org/10.1111/jcpp.14098>

Conflict of interest statement: No conflicts declared.

☰ SECTIONS



PDF



TOOLS



SHARE



Abstract

Background

There is not yet a consensus on the best way to conceptualise adverse childhood experiences (ACEs). We used data-driven methods across two populations to examine (a) if there were meaningful dimensions underlying ACEs and (b) whether dimensions were differentially associated with increased risk of adolescent psychopathology.

 [Product](#) [Solutions](#) [Resources](#) [Open Source](#) [Enterprise](#) [Pricing](#)

[athena-chow / dimensions-aces](#) Public

[Code](#) [Issues](#) [Pull requests](#) [Actions](#) [Projects](#) [Security](#) [Insights](#)

 main

 1 Branch

 0 Tags

 Code

 **athena-chow** Update abcd-dimensions.md c9ecd46 · last year 🕒 16 Commits

 README.md	Update README.md	last year
 abcd-dimensions.md	Update abcd-dimensions.md	last year
 mcs-dimensions.md	Update mcs-dimensions.md	last year

 **README**

Do Meaningful Dimensions of Childhood Adversity Exist? Data-Driven Evidence from Two Prospective Cohort Studies

This repository provides scripts for all analytical steps involved in the study "Do Meaningful Dimensions of Childhood Adversity Exist? Data-Driven Evidence from Two Prospective Cohort Studies". The scripts can be run in R.





Podcast Episode

Dimensions of Childhood Adversity - Athena Chow

'Mind the Kids': an ACAMH podcast

Mar 10 • 28 min 15 sec



Episode Description

What are Adverse Childhood Experiences (ACEs)? Do meaningful dimensions of childhood adversity exist? Should victimisation be considered an adverse childhood experience? All this and more answered as Professor Umar Toseeb interviews Athena Chow about her latest research into the existence of meaningful dimensions of childhood adversity.



Thank you!

Supervisors

Dr Jessie Baldwin, UCL

Professor Lucy Bowes, Oxford

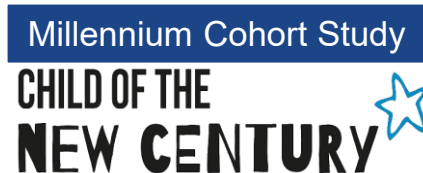


Funders

Leverhulme Trust

Magdalen College

Department of Experimental Psychology



Get in touch ☺

Email: athena.chow.17@ucl.ac.uk

LEVERHULME
TRUST

Paper



Code



Podcast



References

- Bellis, M.A., Hughes, K., Leckenby, N. *et al.* (2014). National household survey of adverse childhood experiences and their relationship with resilience to health-harming behaviours in England. *BMC Med* **12**, 72. <https://doi.org/10.1186/1741-7015-12-72>
- Bellis, M. A., Hughes, K., Ford, K., Rodriguez, G. R., Sethi, D., & Passmore, J. (2019). Life course health consequences and associated annual costs of adverse childhood experiences across Europe and North America: a systematic review and meta-analysis. *The Lancet Public Health*, *4*(10), 517–528. [https://doi.org/10.1016/S2468-2667\(19\)30145-8](https://doi.org/10.1016/S2468-2667(19)30145-8)
- Centers for Disease Control and Prevention. (2024, October 8). *About Adverse Childhood Experiences*. <https://www.cdc.gov/aces/about/index.html>
- Fang, X., Fry, D. A., Brown, D. S., Mercy, J. A., Dunne, M. P., Butchart, A. R., Corso, P. S., Maynzyuk, K., Dzhygyr, Y., & Chen, Y. (2015). The burden of child maltreatment in the East Asia and Pacific region. *Child Abuse & Neglect*, *42*, 146–162.
- Felitti, V. J., Anda, R. F., Nordenberg, D., Williamson, D. F., Spitz, A. M., Edwards, V., Koss, M. P., & Marks, J. S. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults: The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventive Medicine*, *14*(4), 245–258.
- Henrich, J., Heine, S. J., & Norenzayan, A. (2010). The weirdest people in the world? *Behavioral and Brain Sciences*, *33*(2–3), 61–83.
- Madigan, S., Deneault, A. A., Racine, N., Park, J., Thiemann, R., Zhu, J., Dimitropoulos, G., Williamson, T., Fearon, P., Cénat, J. M., McDonald, S., Devereux, C., & Neville, R. D. (2023). Adverse childhood experiences: a meta-analysis of prevalence and moderators among half a million adults in 206 studies. *World Psychiatry*, *22*(3), 463–471. <https://doi.org/10.1002/wps.21122>
- Stevens, J. (2012, October 3). The Adverse Childhood Experiences Study — the largest, most important public health study you never heard of — began in an obesity clinic. ACES Too High LLC. <https://acestoohigh.com/2012/10/03/the-adverse-childhood-experiences-study-the-largest-most-important-public-health-study-you-never-heard-of-began-in-an-obesity-clinic/>

Statistical Analysis

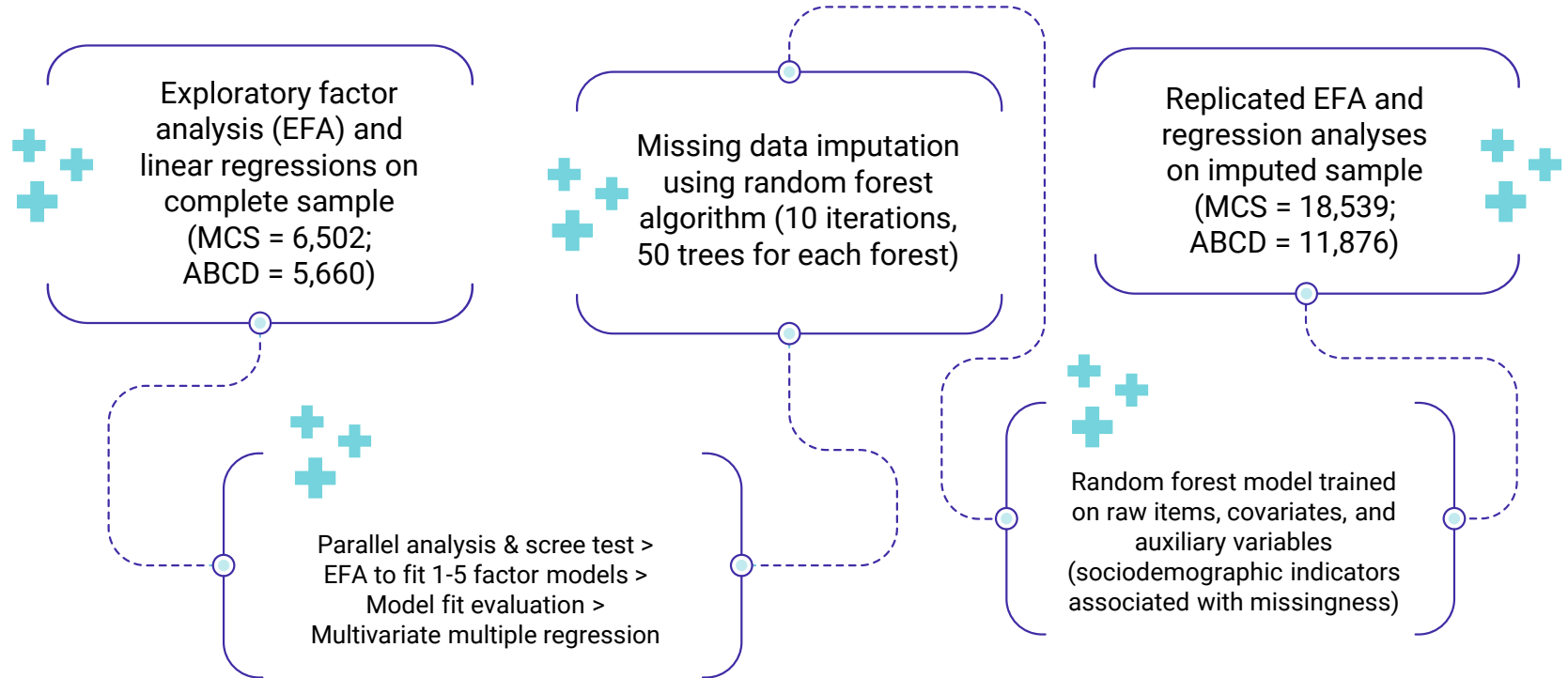


Figure 7.8 Four-factor model for the MCS complete sample.

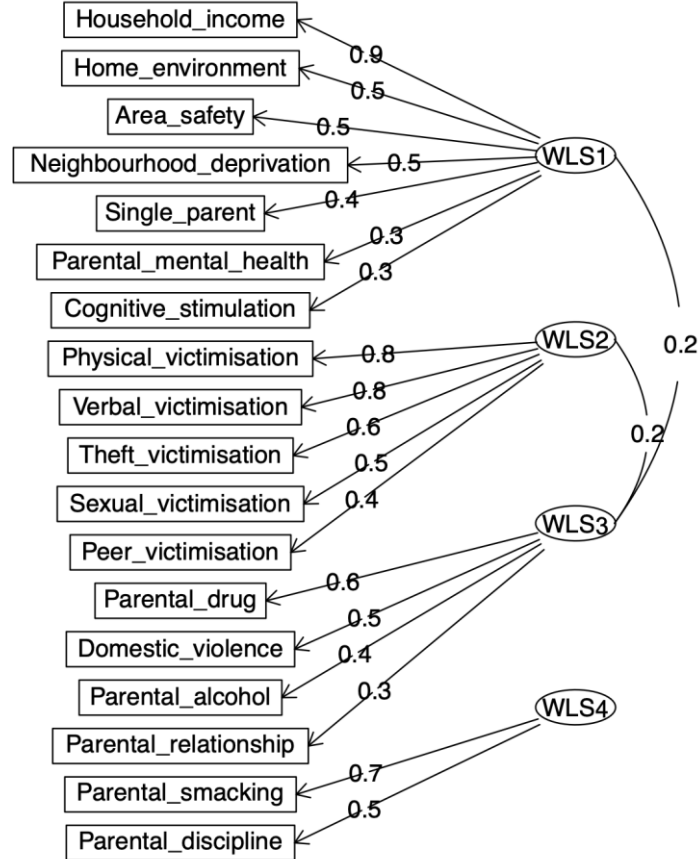
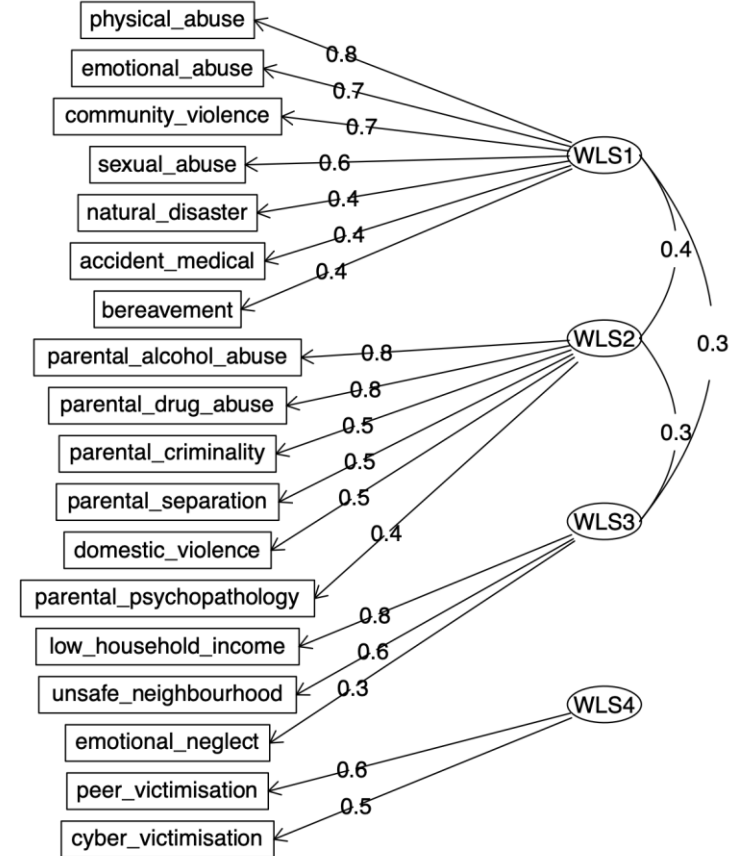


Figure 7.16 Four-factor model for the ABCD complete sample.



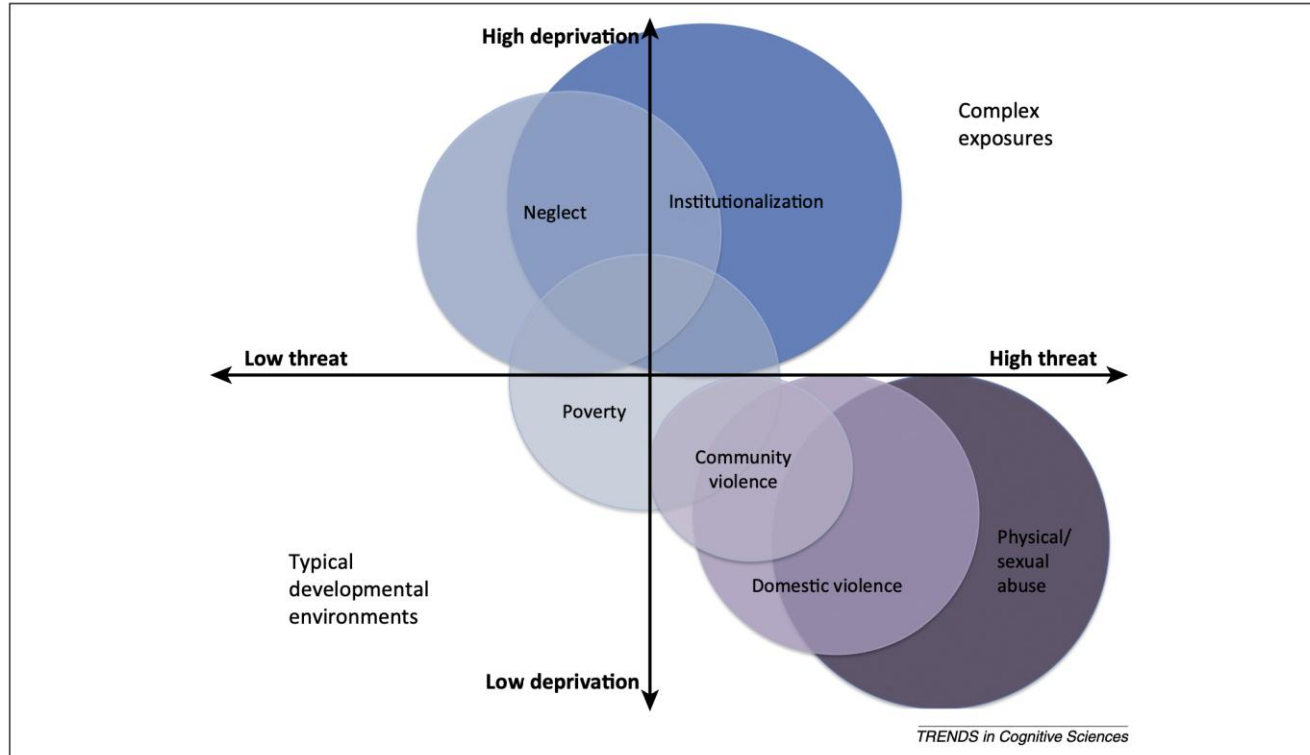


Figure 1. Dimensions of threat and deprivation associated with commonly occurring adverse childhood experiences (ACEs). This figure illustrates our argument that threat and deprivation are dimensions of experience that can be measured among children exposed to a range of adverse childhood experiences, both those that occur in isolation (e.g., a single incident of community violence exposure) and those that are co-occurring (e.g., physical abuse and physical neglect). We use the term 'complex exposures' to refer to experiences that, in most cases, involve aspects of both threat and deprivation.

Miller et al., 2021). Furthermore, subjective practices in defining ACE measures can lead to inconsistent dimensions of adversity across studies (Wang et al., 2023), even if samples were drawn from the same dataset. Two independent studies that applied CFA on the same US birth cohort derived different numbers of dimensions, despite drawing from the same population and being informed by DMAP (Awada et al., 2023; Sisitsky et al., 2023). This was likely because each study chose different ACEs for each dimension and different measures for the same construct. For instance, Awada et al. (2023) derived two dimensions of threat and deprivation, which included parenting, financial, and neighbourhood measures of deprivation. However, Sisitsky et al. (2023) selected physical, emotional, and cognitive measures of deprivation and found that a four-dimensional model of home threat, community threat, neglect, and lack of stimulation demonstrated better fit in their study. Altogether, these findings suggest that utilising a data-driven approach to explore whether each measure might load onto different factors would help distinguish dimensions without being influenced by a priori categorisations.

References for The Future of Families and Child Wellbeing Study:

Awada, S.R., Shelleby, E.C., Alfonso, D., & Keane, J. (2023). Differential mechanisms linking early childhood threat and social/environmental deprivation to adolescent conduct problems. *Journal of Family Violence*, 1-13.

Sisitsky, M., Hare, M., DiMarzio, K., Gallat, A., Magarino, L., & Parent, J. (2023). Associations between early life adversity and youth psychobiological outcomes: Dimensional and person-centered approaches. *Research on Child and Adolescent Psychopathology*, 51, 1789–1800.

Millennium Cohort Study (MCS)

ACEs (9 months to 14 years)		Complete n	n exposed	% exposed
Poor parental mental health		18,312	3,721	20.07
Frequent parental alcohol use		18,521	2,385	12.86
Parental drug use		15,574	990	5.34
Single parent		18,521	9,510	51.30
Unhappy parental relationship		16,383	6,117	33.00
Domestic violence		16,233	1,446	7.80
Harsh parental discipline		15,163	7,276	39.25
Parental smacking		15,118	3,201	17.27
Negative home environment		13,863	675	3.64
Peer victimisation		16,420	4,477	24.15
Verbal victimisation		10,787	4,634	25.00
Physical victimisation		10,786	2,386	12.87
Theft victimisation		10,782	770	4.15
Sexual victimisation		10,781	293	1.58
Low cognitive stimulation		16,377	1,484	8.00
Neighbourhood deprivation		17,844	2,100	11.33
Unsafe home area		16,351	3,472	18.73
Low household income		18,513	7,586	40.92
Sociodemographic characteristics (baseline)		Complete n	%	
Sex	Male	9,526	51.38	
	Female	9,013	48.62	
Ethnicity	White	15,277	82.40	
	Black/Black British	666	3.59	
	Pakistani/Bangladeshi	1,265	6.82	
	Indian	465	2.51	
	Mixed	552	2.98	
	Other (inc. Chinese)	266	1.43	
Maternal education	Higher degree	635	3.44	
	First degree/diploma in higher educ.	3813	20.65	
	A/AS/S levels	1732	9.38	
	GCSE A*-C	6167	33.40	
	GCSE D-G/no qualifications	5600	30.33	
	Other (inc. overseas)	515	2.79	
Psychopathology (17 years)		Complete n	M (SD)	Range
Internalising symptoms		9,398	5.62 (3.47)	0 – 20
Externalising symptoms		9,399	5.61 (3.29)	0 – 20

Adolescent Brain Cognitive Development (ABCD) Study

ACEs (0–11/12 years)		Complete n	n exposed	% exposed
Parental psychopathology		11,784	4,742	39.93
Parental alcohol abuse		11,876	1,720	14.48
Parental drug abuse		11,607	1,366	11.50
Parental separation		11,409	2,750	23.16
Domestic violence		11,836	1,150	9.68
Parental criminality		11,446	1,146	9.65
Peer victimisation		10,392	829	6.98
Cyber victimisation		10,361	930	7.83
Physical abuse		11,836	122	1.03
Emotional abuse		11,836	189	1.59
Sexual abuse		11,836	287	2.42
Emotional neglect		11,876	433	3.65
Accident requiring medical attention		11,836	1,347	11.34
Natural disaster		11,836	754	6.35
Community violence		11,836	187	1.57
Bereavement		11,836	3,876	32.64
Unsafe neighbourhood		11,441	2,056	17.31
Low household income		10,607	1,901	16.01
Sociodemographic characteristics (baseline)		Complete n	%	
Sex	Male	6,196	52.17	
	Female	5,680	47.83	
Ethnicity	White	7,522	63.34	
	Black/African American	2,269	19.11	
	Other Race	800	6.74	
	Asian	716	6.03	
	American Indian/Alaska Native	346	2.91	
	Native Hawaiian/Pacific Islander	50	0.42	
Parental education	Postgraduate degree	4,043	34.04	
	Bachelor's degree	3,015	25.39	
	Some college degree	3,079	25.93	
	HS Diploma/GED	1,131	9.52	
	< HS Diploma	592	4.98	
Psychopathology (12/13 years)		Complete n	M (SD)	Range
Internalising symptoms		6,169	5.13 (5.78)	0 – 44
Externalising symptoms		6,169	6.69 (7.89)	0 – 64

Table S1. Criteria for deriving exposure and outcome measures from the Millennium Cohort Study.

Measure	Informant	Assessment type	Exposure period	Assessment phase	Criteria for coding measure as present
Poor parental mental health	Parent	Rutter Malaise Inventory (RMI); Kessler (K6) Scale	9 months, 3, 5, 7, 11, and 14 years	Sweeps 1-6	At 9 months, the Rutter Malaise Inventory (RMI) scale was used to measure parental mental health in the last 30 days (e.g., “do you often feel miserable or depressed?”, “does your heart often race like mad?”). Scores were summed and then dichotomised (cut-off score ≥ 4 ; Adjei et al., 2022). At 3, 5, 7, 11, and 14 years, the Kessler (K6) scale was used to measure parental mental health in the last 30 days (e.g., “so depressed nothing could cheer you up”, “nervous”). Scores were summed and then dichotomised (cut-off score ≥ 13 ; Straatmann et al., 2020). If parents reported poor mental health for at least 1 out of 6 sweeps, poor parental mental health was coded as present.
Frequent parental alcohol use	Parent	Parent interview (alcohol consumption)	9 months, 3, 5, 7, 11, and 14 years	Sweeps 1-6	Parents reported the frequency of their alcohol use which was dichotomised (every day/5-6 times per week = 1 vs 3-4 times per week/1-2 times per week/less than once a month/never = 0; Straatmann et al., 2020). If parents reported frequent alcohol use for at least 1 out of 6 sweeps, frequent parental alcohol use was coded as present.
Parental drug use	Parent	Parent interview (substance abuse)	3, 5, and 14 years	Sweeps 2, 3, 6	Parents reported the frequency of their drug use, which was dichotomised (regularly/occasionally = 1 vs never = 0; Bevilacqua et al., 2020). If parents reported drug use for at least 1 out of 3 sweeps, parental drug use was coded as present.
Single parent	Parent	Parent interview (marital status)	9 months, 3, 5, 7, 11, and 14 years	Sweeps 1-6	Parents reported their marital status, which was dichotomised (divorced/legally separated/widowed/single = 1 vs married/remarried/civil partnership = 0). If parents reported a single parent status for at least 1 out of 6 sweeps, the single parent measure was coded as present.
Unhappy parental relationship	Parent	Golombok Rust Inventory of Marital State (GRIMS)	9 months, 3, 5, 7, 11, and 14 years	Sweeps 1-6	Parents reported how happy they were with their relationship with their partner on a 7-point scale (1 = very unhappy and 7 being very happy), which was dichotomised (very unhappy [1]/2/3 = 1 vs 4/5/6/very happy [7] = 0). If parents reported an unhappy relationship for at least 1 out of 6 sweeps, unhappy parental relationship was coded as present.
Domestic violence	Parent	Golombok Rust Inventory of Marital State (GRIMS)	9 months, 3, 5, 7, 11, and 14 years	Sweeps 1-6	Parents reported whether their partner had ever used force in their relationship, which was dichotomised (yes = 1 vs no = 0). If parents reported experiencing this for at least 1 out of 6 sweeps, domestic violence was coded as present.

Measure	Informant	Assessment type	Exposure period	Assessment phase	Criteria for coding measure as present
Harsh parental discipline	Parent	Straus Conflict Tactics scale (CTS)	3, 5, and 7 years	Sweeps 2-4	The Straus Conflict Tactics scale was used to measure parental discipline practices (e.g., “tells child off when naughty”). Scores were summed and then dichotomised (with a cut-off score ≥ 5 based on previous research; Bevilacqua et al., 2021). If parents surpassed the cut-off for at least 1 out of 3 sweeps, harsh parental discipline was coded as present.
Parental smacking	Parent	Straus Conflict Tactics scale (CTS)	3, 5, and 7 years	Sweeps 2-4	Parents reported whether they smacked their child, which was dichotomised (daily/once a week or more/once a month = 1 vs never/rarely = 0; Bevilacqua et al., 2021). If parents smacked their child for at least 1 out of 3 sweeps, parental smacking was coded as present.
Negative home environment	Interviewer	Home Observation for Measurement of the Environment (HOME-SF)	3 years	Sweep 2	An interviewer visited the cohort member’s home to observe the physical environment (e.g., “child’s in-home play environment safe”) and responsiveness of the mother (e.g., “mother’s voice positive when speaking to child”). Scores were negatively coded, summed, and then dichotomised (scores that were 2 standard deviations above the mean were coded as a negative home environment; Totsika & Sylva, 2004).
Peer victimisation	Parent, teacher, child	Strengths and Difficulties Questionnaire (SDQ)	3, 5, 7, 11, and 14 years	Sweeps 2-6	At ages 7, 11, and 14, children self-reported on peer victimisation (e.g., “how often do other children hurt you or pick on you on purpose?”). The victimisation items from the SDQ were used for parent reports at ages 3, 5, 7, and 14, and teacher reports at ages 7 and 11 (e.g., “child picked on or bullied by other children”). Scores were dichotomised (most days/about once a week = 1 vs once a month/every few months/less often/never = 0). If children were reported by at least one informant to have experienced peer victimisation for at least 1 out of 5 sweeps, peer victimisation was coded as present.
Verbal victimisation	Child	Victimisation questionnaire	14 years	Sweep 6	Children self-reported whether they had ever been insulted, threatened, or shouted at by anyone in the past 12 months. Scores were dichotomised (yes = 1 vs no = 0).
Physical victimisation	Child	Victimisation questionnaire	14 years	Sweep 6	Children self-reported whether anyone had ever been physically violent (e.g., “pushed, shoved, hit, slapped or punched you”), or used a weapon against them in the past 12 months. Scores were dichotomised (yes = 1 vs no = 0).
Theft victimisation	Child	Victimisation questionnaire	14 years	Sweep 6	Children self-reported whether anyone had ever stolen something from them (e.g., mobile phone, money) in the past 12 months. Scores were dichotomised (yes = 1 vs no = 0).
Sexual victimisation	Child	Victimisation questionnaire	14 years	Sweep 6	Children self-reported whether anyone had ever sexually assaulted them in the past 12 months. Scores were dichotomised (yes = 1 vs no = 0).

Measure	Informant	Assessment type	Exposure period	Assessment phase	Criteria for coding measure as present
Low cognitive stimulation	Parent	Parenting questionnaire	3, 5, 7, and 11 years	Sweeps 2-5	Cognitive stimulation was measured using several parent-reported items (e.g., “how often do you read to the child?”, “how often do you teach child counting?”) which were dichotomised (not at all/on special occasions = 1 vs once a week/several times a week/every day = 0). If cognitive stimulation was reported as low for at least 1 out of 4 sweeps, low cognitive stimulation was coded as present.
Neighbourhood deprivation	Parent	Neighbourhood questionnaire	9 months	Sweep 1	Neighbourhood deprivation was measured using several parent-reported items on the neighbourhood (e.g., “noisy neighbours”), cleanliness (e.g., “how common are rubbish/litter in area”), and access (e.g., “poor public transport”). Scores were dichotomised (very dissatisfied/fairly dissatisfied = 1 vs fairly satisfied/very satisfied = 0) and then summed. If more than half of the items were reported as unsatisfactory, neighbourhood deprivation was coded as present.
Unsafe home area	Parent	Housing questionnaire	3, 5, and 11 years	Sweeps 2, 3, 5	Home area safety was measured using several parent-reported items (e.g., “is this a good area to bring up a child?”, “how safe is it to walk/play in this area?”) which were dichotomised (very unsafe/fairly unsafe = 1 vs fairly safe/very safe = 0). If home area was reported as unsafe for at least 1 out of 3 sweeps, unsafe home area was coded as present.
Low household income	Parent	OECD Income Weighted Quintiles	9 months, 3, 5, 7, 11, and 14 years	Sweeps 1-6	Household equivalised income was measured using the OECD Income Weighted Quintiles. Scores were dichotomised (lowest quintile = 1 vs second/third/fourth/highest quintile = 0). If household income was reported as the lowest quintile for at least 1 out of 6 sweeps, low household income was coded as present.
Internalising symptoms	Child	Strengths and Difficulties Questionnaire (SDQ)	17 years	Sweep 7	Children self-reported on a three-point scale (0 = not true, 1 = somewhat true, 2 = certainly true) if they displayed: emotional problems (e.g., “I am often unhappy, down-hearted or tearful”) and peer problems (e.g., “other children pick on me or bully me”). Scores were summed across the internalising subscales and then standardised as a composite measure of internalising symptoms.
Externalising symptoms	Child	Strengths and Difficulties Questionnaire (SDQ)	17 years	Sweep 7	Children self-reported on a three-point scale (0 = not true, 1 = somewhat true, 2 = certainly true) if they displayed: conduct problems (e.g., “I get very angry and often lose my temper”) and hyperactivity/inattention (e.g., “I am restless, I cannot sit still for long”). Scores were summed across the externalising subscales and then standardised as a composite measure of externalising symptoms.

Table S2. Criteria for deriving exposure and outcome measures from the Adolescent Brain Cognitive Development Study.

Measure	Informant	Assessment type	Exposure period	Assessment phase	Criteria for coding measure as present
Parental psychopathology	Parent	Family History Assessment, Adult Self-Report (ASR)	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether they had ever suffered from depression, manic episodes, psychotic experiences for more than 6 months, attempted or committed suicide in the Family History Assessment. If family history of psychopathology was present for either biological father or mother, or if parents scored above the clinical cut-off (ASR > 63; Achenbach & Rescorla, 2003) for depression, anxiety, or ADHD for at least 1 assessment, parental psychopathology was coded as present.
Parental alcohol abuse	Parent	Family History Assessment	0-9/10y	Baseline	Parents reported whether they ever had any problems due to alcohol (e.g., marital problems, work problems, arrests/DUI, in a treatment programme, isolated self/caused arguments/drank a lot). If family history of alcohol abuse was present for either biological father or mother, parental alcohol abuse was coded as present.
Parental drug abuse	Parent	Family History Assessment, Adult Self-Report (ASR)	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether they ever had any problems due to drugs (e.g., marital problems, work problems, arrests/DUI, in a treatment programme, isolated self/caused arguments/high a lot). If family history of drug abuse was present for either biological father or mother, or if parents reported using drugs multiple times weekly in the past 6 months in the ASR for at least 1 assessment, parental drug abuse was coded as present.
Parental separation	Parent	Parent Demographics Survey, Longitudinal Parent Demographics Survey, Parent Life Events	0-9/10y, 10/11y, 11/12y	Baseline, 1y follow-up, 2y follow-up	Parents reported whether they had separated or divorced, or if their current partner was not the child's biological or adoptive parent. If any instance of parental separation was reported for at least 1 assessment, parental separation was coded as present.
Domestic violence	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether their child had ever witnessed the grown-ups in the home push, shove or hit one another. If parents reported any instance of domestic violence for at least 1 assessment, domestic violence was coded as present.
Parental criminality	Parent	Parent Life Events	0-10/11y, 11/12y	1y follow-up, 2y follow-up	Parents reported whether they had ever got into trouble with the law or went to jail, or a family member had been arrested. If any instance of parental criminality was reported for at least 1 assessment, parental criminality was coded as present.

Measure	Informant	Assessment type	Exposure period	Assessment phase	Criteria for coding measure as present
Peer victimisation	Child	Peer Experiences Questionnaire	11/12y	2y follow-up	Children reported whether they had been victimised by peers in the past year (e.g., kids left me out; chased me like trying to hurt me; spread rumours about me; did not invite me to party; left me out; gossiped about me; threatened to hurt/beat me; said mean things about me; hit/kicked/pushed me). Scores were dichotomised (a few times a week /once a week = 1 vs a few times/once or twice/never = 0). If children reported at least 1 type of victimisation, peer victimisation was coded as present.
Cyber victimisation	Child	Cyber Bully Questionnaire	11/12y	2y follow-up	Children reported whether they had experienced cybervictimisation, and if they had, how often they had been cyberbullied in the past year. Scores were dichotomised (≥ 10 times in the past 12 months = 1). If children reported at least 1 experience of cybervictimisation, cybervictimisation was coded as present.
Physical abuse	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether their child had ever been shot, stabbed, beaten brutally, or beaten to the point of having bruises by a grown-up in the home. If parents reported any instance of physical abuse for at least 1 assessment, physical abuse was coded as present.
Emotional abuse	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether a non-family member or family member had ever threatened to kill their child. If parents reported any instance of emotional abuse for at least 1 assessment, emotional abuse was coded as present.
Sexual abuse	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether a grown-up in the home or an adult outside the family had ever touched their child in their privates, had their child touch the adult's privates, or if the adult did other sexual things to their child, or if a peer had ever forced their child to do something sexually. If parents reported any instance of sexual abuse for at least 1 assessment, sexual abuse was coded as present.
Emotional neglect	Child	Children's Report of Parental Behavioural Inventory	0-9/10y, 10/11y	Baseline, 1y follow-up	Children rated their caregiver's behaviour (e.g., believes in showing love for me; makes me feel better when upset; or when talking over worries; is easy to talk to; smiles at me very often). Scores were dichotomised (not like him/her = 1 vs somewhat/a lot like him/her = 0) and then if children reported 2 or more items (cut-off score ≥ 2 ; Baldwin et al., 2023) for at least 1 assessment, emotional neglect was coded as present.
Accident requiring medical attention	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether their child had ever been in a car accident or another significant accident for which their child or another person needed medical attention. If parents reported any instance of an accident for at least 1 assessment, this was coded as present.

Measure	Informant	Assessment type	Exposure period	Assessment phase	Criteria for coding measure as present
Natural disaster	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether their child had ever witnessed or been caught in a fire or natural disaster that caused significant property damage or personal injury. If parents reported any instance of a natural disaster for at least 1 assessment, this was coded as present.
Community violence	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether their child had ever witnessed an act of terrorism, death or mass destruction in a war zone, or someone shot or stabbed in the community. If parents reported any instance of community violence for at least 1 assessment, community violence was coded as present.
Bereavement	Parent	KSADS Traumatic Events	0-9/10y, 11/12y	Baseline, 2y follow-up	Parents reported whether their child had ever learned about the sudden unexpected death of a loved one. If parents reported any instance of bereavement for at least 1 assessment, bereavement was coded as present.
Unsafe neighbourhood	Parent, Child	Parent and Youth Neighbourhood Safety/Crime Survey	9/10y, 10/11y, 11/12y	Baseline, 1y follow-up, 2y follow-up	Parents and children reported neighbourhood safety (e.g., feel safe walking in my neighbourhood; violence is not a problem; my neighbourhood is safe from crime). Scores were dichotomised (strongly disagree = 1 vs disagree/neutral/agree/strongly agree = 0). If either parent or child reported the neighbourhood as unsafe for at least 1 assessment, unsafe neighbourhood was coded as present.
Low household income	Parent	Parent Demographics Survey	9/10y, 10/11y, 11/12y	Baseline, 1y follow-up, 2y follow-up	Parents reported their total combined family income for the past 12 months. Scores were dichotomised according to guidelines from the US Census Bureau (lowest quintile households had ≤ \$28,007 income = 1; Semega & Kollar, 2022). If household income was reported as the lowest quintile for at least 1 assessment, low household income was coded as present.
Internalising symptoms	Parent	Child Behaviour Checklist (CBCL)	12/13y	3y follow-up	Parents reported on a three-point scale (0 = absent, 1 = occurs sometimes, 2 = occurs often) if their child displayed: anxious/depressed behaviour (e.g., cries a lot), withdrawn/depressed behaviour (e.g., there is very little he/she enjoys), and somatic complaints (e.g., nightmares). Scores were summed across the internalising subscales and then standardised as a composite measure of internalising symptoms.
Externalising symptoms	Parent	Child Behaviour Checklist (CBCL)	12/13y	3y follow-up	Parents reported on a three-point scale (0 = absent, 1 = occurs sometimes, 2 = occurs often) if their child displayed: rule-breaking behaviour (e.g., drinks alcohol without parents' approval), aggressive behaviour (e.g., argues a lot), and attention problems (e.g., fails to finish things he/she starts). Scores were summed across the externalising subscales and then standardised as a composite measure of externalising symptoms.