Data supplement for Baldwin et al., Childhood Maltreatment and Mental Health Problems: A Systematic Review and Meta-Analysis of Quasi-Experimental Studies. Am J Psychiatry (doi: 10.1176/appi.ajp.20220174)

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Methods S1. Search terms used to conduct the systematic search

((maltreatment) OR (child* abuse) OR (child* neglect) OR (child* trauma) OR (child* advers*) OR (harsh punishment) OR (institutional deprivation) OR (early life deprivation) OR (early life stress) OR (victim*) OR (institutionali#ation))

AND ((mental health) OR (mental illness) OR (psychopathol*) OR (psychiatric) OR (internali*) OR (externali*) OR (depress*) OR (anxi*) OR (panic) OR (obsessive compulsive) OR (self inj*) OR (self harm*) OR (suicid*) OR (eating disorder*) OR (schiz*) OR (psychotic) OR (psychosis*) OR (bipolar) OR (ADHD) OR (attention deficit hyperactivity disorder) OR (attention) OR (hyperactiv*) OR (neurodev*) OR (conduct) OR (antisocial) OR (anti social) OR (crim*) OR (substance) OR (alcohol) OR (drug) OR (cannabis))

AND ((twin*) OR (sibling*) OR (children of twins) OR (natural experiment) OR (adopt*) OR (propensity score) OR (inverse probability weight*) OR (matching) OR (fixed effects) OR (quasiexperiment* OR quasi experiment*) OR (causal*) OR (genetically sens*) OR (genetically inform*) OR (instrumental variable*) OR (interrupted time series analysis) OR (Mendelian randomi#ation) OR (regression discontinuity) OR (experience sampl*) OR (ecological momentary assessment*) OR (difference in difference*)) .mp

Note: The search was conducted in Ovid (for Embase, PsycINFO and Medline).

Methods S2. Data extraction details

Variables extracted

We extracted data containing the following information:

- cohort details (cohort name, country of origin, sex distribution, sample racial or ethnic distribution)
- type of maltreatment
- maltreatment measure information (type of measure, informant, observational period, age at assessment, prospective or retrospective measure)
- mental health measure information (type of measure, informant, observational period, age at assessment)
- quasi-experimental method used
- unadjusted analysis information (sample size and covariates, if any)
- unadjusted effect size and standard error
- quasi-experimental adjusted analysis information (sample size and covariates, if any)
- quasi-experimental adjusted effect size and standard error
- study quality items (see Methods S3)

Extraction of effect sizes based on categorical variables

If the maltreatment variable was categorical (e.g., with categories reflecting “none”, “moderate” and “severe” exposure), we extracted effect sizes for the difference in mental health outcomes between the most severely maltreated group (e.g. “severe maltreatment”) with the non-exposed group. Similarly, if the mental health variable was categorical (e.g., “no problems”, “moderate problems” or “severe problems”), we extracted effect sizes reflecting the risk/odds of having the most severe outcome.

Effect sizes from the ERA Study

For the ERA Study, we extracted effect sizes for the difference in mental health outcomes between Romanian adoptees who experienced less than 6 months in an institution compared to

those who experienced more than 6 months in an institution. Because the duration of exposure to institutional neglect was not likely to be associated with characteristics of the child or biological family (as adoptive parents had little choice over which child they selected)[1], the two groups are likely to be similar in background characteristics, and differ only on the duration of exposure to institutional neglect. We did not extract effect sizes for the comparison between Romanian adoptees and UK adoptees because these groups may differ in background characteristics that might confound associations between institutional neglect and mental health.

Methods S3. Adapted Newcastle-Ottowa Quality Assessment Scale

We adapted the Newcastle-Ottowa Quality Assessment Scale to include specific questions addressing the ability of a study to strengthen causal inference about the role of childhood maltreatment in mental health (see below for full scale). This involved adding questions assessing the extent to which the study controlled for environmental and genetic confounders (see questions 5 and 6), whether maltreatment and mental health outcomes were reported by different informants (i.e., addressing shared rater [or common-method] variance; see question 8), and whether maltreatment and mental health outcomes were assessed concurrently or longitudinally (see question 9). We derived an overall quality score for each study by summing the results across all items.

Representativeness

1) Representativeness of the exposed cohort

   a) truly representative of the average cohort in the community (1)

   b) somewhat representative of the average cohort in the community (0.5)

   c) selected group of users eg nurses, volunteers (0)

   d) no description of the derivation of the cohort (0)

2) Selection of the non-exposed cohort

   a) drawn from the same community as the exposed cohort (1)

   b) drawn from a different source (0)

   c) no description of the derivation of the non exposed cohort (0)

Exposure

3) Ascertainment of exposure (maltreatment)

   a) validated measure (official record or instrument tested for validity and reliability) (1)

   b) non-validated measure or no description (0)

Comparability/confounding

4) Demonstration that outcome of interest was not present prior to exposure, or control for pre-existing outcome

a) yes (1)

b) no (0)

5) Study accounts for the majority of environmental confounders (e.g. SES, parenting, other adversities [e.g. bullying], either by design or statistically accounting for wide range of measured variables)

a) yes (e.g., co-twin control study controlling for victimization and other adversities outside of the family; or propensity score study controlling for SES, parenting, bullying, or other closely related adversities) (1)

b) some but not all (e.g., co-twin control study not controlling for bullying or other adversities, or propensity score study controlling for some but not all environments specified above) (0.5)

c) no (0)

6) Study fully accounts for genetic confounding

a) yes (e.g., MZ twin design) (1)

b) somewhat (e.g. DZ twin design, sibling design, or control for polygenic score or family history of outcome) (0.5)

c) no (0)

Outcome

7) Assessment of outcome

a) validated measure (official record or instrument tested for validity and reliability) (1)

b) non-validated measure or no description (0)

8) Outcome and maltreatment exposure reported by different informants

a) yes (1)

b) no (i.e., same person reported maltreatment and outcome) (0)

9) Outcomes assessed cross-sectionally (same time point as maltreatment assessed)

a) no (assessment was longitudinal – i.e., after exposure) (1)

b) yes – cross-sectional study / outcome assessed concurrently to maltreatment (0)

Attrition

10) Adequacy of follow up of cohorts

a) complete follow up - all subjects accounted for (1)

b) subjects lost to follow up unlikely to introduce bias - small number lost - > 70 % follow up, or method to account for attrition employed) (1)

c) follow up rate < 70% and no description of those lost

d) no statement (0)

Methods S4. Methods used to prepare data for effect size conversion

Below we detail the methods used to prepare data for effect size conversion from studies that did not report conventional effect sizes or standard errors. Where effect sizes could not be derived, we contacted authors to request the necessary information.

Effect sizes. For studies reporting means and standard deviations (of psychiatric symptoms) in maltreated and non-maltreated groups, we directly calculated Cohen's d. For studies reporting the raw prevalence of mental health problems among maltreated and non-maltreated groups,[2-4] we calculated odds ratios. For a study reporting effect sizes between a measure of victimization standardised to mean=0, SD=1 and mental health outcomes standardised to mean=100, SD=15,[5] we divided the coefficients by 15 to obtain standardized betas.

Standard errors. For studies that reported 95% confidence intervals (CIs) and not standard errors,[2,5-17] we converted CIs to standard errors in Excel using the formula: SE = (upper CI-lower CI)/3.92 for differences measures or logSE = ln(upper CI)-ln(lower CI)/3.92 for odds ratios.[18] For studies that did not report standard errors or confidence intervals for extracted effect sizes[19-22], we derived the standard errors using standard formulae.[23]

Table S1. PRISMA reporting checklist

Section and Topic	Item #	Checklist item	Location where item is reported
TITLE			
Title	1	Identify the report as a systematic review.	1
ABSTRACT			
Abstract	2	See the PRISMA 2020 for Abstracts checklist.	2
INTRODUCTION			
Rationale	3	Describe the rationale for the review in the context of existing knowledge.	4
Objectives	4	Provide an explicit statement of the objective(s) or question(s) the review addresses.	5
METHODS			
Eligibility criteria	5	Specify the inclusion and exclusion criteria for the review and how studies were grouped for the syntheses.	6
Information sources	6	Specify all databases, registers, websites, organisations, reference lists and other sources searched or consulted to identify studies. Specify the date when each source was last searched or consulted.	6
Search strategy	7	Present the full search strategies for all databases, registers and websites, including any filters and limits used.	Methods S1
Selection process	8	Specify the methods used to decide whether a study met the inclusion criteria of the review, including how many reviewers screened each record and each report retrieved, whether they worked independently, and if applicable, details of automation tools used in the process.	6
Data collection process	9	Specify the methods used to collect data from reports, including how many reviewers collected data from each report, whether they worked independently, any processes for obtaining or confirming data from study investigators, and if applicable, details of automation tools used in the process.	6-7
Data items	10a	List and define all outcomes for which data were sought. Specify whether all results that were compatible with each outcome domain in each study were sought (e.g. for all measures, time points, analyses), and if not, the methods used to decide which results to collect.	6-7
	10b	List and define all other variables for which data were sought (e.g. participant and intervention characteristics, funding sources). Describe any assumptions made about any missing or unclear information.	Methods S2
Study risk of bias assessment	11	Specify the methods used to assess risk of bias in the included studies, including details of the tool(s) used, how many reviewers assessed each study and whether they worked independently, and if applicable, details of automation tools used in the process.	Methods S3
Effect measures	12	Specify for each outcome the effect measure(s) (e.g. risk ratio, mean difference) used in the synthesis or presentation of results.	7
Synthesis methods	13a	Describe the processes used to decide which studies were eligible for each synthesis (e.g. tabulating the study intervention characteristics and comparing against the planned groups for each synthesis (item #5)).	NA

Section and Topic	Item #	Checklist item	Location where item is reported
	13b	Describe any methods required to prepare the data for presentation or synthesis, such as handling of missing summary statistics, or data conversions.	Methods S4, Table S5
	13c	Describe any methods used to tabulate or visually display results of individual studies and syntheses.	NA
	13d	Describe any methods used to synthesize results and provide a rationale for the choice(s). If meta-analysis was performed, describe the model(s), method(s) to identify the presence and extent of statistical heterogeneity, and software package(s) used.	7
	13e	Describe any methods used to explore possible causes of heterogeneity among study results (e.g. subgroup analysis, meta-regression).	8
	13f	Describe any sensitivity analyses conducted to assess robustness of the synthesized results.	8
Reporting bias assessment	14	Describe any methods used to assess risk of bias due to missing results in a synthesis (arising from reporting biases).	8
Certainty assessment	15	Describe any methods used to assess certainty (or confidence) in the body of evidence for an outcome.	NA
RESULTS			
Study selection	16a	Describe the results of the search and selection process, from the number of records identified in the search to the number of studies included in the review, ideally using a flow diagram.	Figure S1
	16b	Cite studies that might appear to meet the inclusion criteria, but which were excluded, and explain why they were excluded.	7
Study characteristics	17	Cite each included study and present its characteristics.	Table S7
Risk of bias in studies	18	Present assessments of risk of bias for each included study.	Table S8
Results of individual studies	19	For all outcomes, present, for each study: (a) summary statistics for each group (where appropriate) and (b) an effect estimate and its precision (e.g. confidence/credible interval), ideally using structured tables or plots.	Table S9; Figures 1-4
Results of syntheses	20a	For each synthesis, briefly summarise the characteristics and risk of bias among contributing studies.	9-12
	20b	Present results of all statistical syntheses conducted. If meta-analysis was done, present for each the summary estimate and its precision (e.g. confidence/credible interval) and measures of statistical heterogeneity. If comparing groups, describe the direction of the effect.	9-12
	20c	Present results of all investigations of possible causes of heterogeneity among study results.	11-13
	20d	Present results of all sensitivity analyses conducted to assess the robustness of the synthesized results.	10
Reporting	21	Present assessments of risk of bias due to missing results (arising from reporting biases) for each synthesis assessed.	Figure

Section and Topic	Item #	Checklist item	Location where item is reported
biases			S4
Certainty of evidence	22	Present assessments of certainty (or confidence) in the body of evidence for each outcome assessed.	9-12
DISCUSSION			
Discussion	23a	Provide a general interpretation of the results in the context of other evidence.	13-15
	23b	Discuss any limitations of the evidence included in the review.	16
	23c	Discuss any limitations of the review processes used.	16
	23d	Discuss implications of the results for practice, policy, and future research.	17-18
OTHER INFORMATION			
Registration and protocol	24a	Provide registration information for the review, including register name and registration number, or state that the review was not registered.	6
	24b	Indicate where the review protocol can be accessed, or state that a protocol was not prepared.	6
	24c	Describe and explain any amendments to information provided at registration or in the protocol.	NA
Support	25	Describe sources of financial or non-financial support for the review, and the role of the funders or sponsors in the review.	2
Competing interests	26	Declare any competing interests of review authors.	2
Availability of data, code and other materials	27	Report which of the following are publicly available and where they can be found: template data collection forms; data extracted from included studies; data used for all analyses; analytic code; any other materials used in the review.	7

Table S2. MOOSE (Meta-analyses Of Observational Studies in Epidemiology) Checklist

Recommendation	Pg. no.
Reporting background should include	
Problem definition	4
Hypothesis statement	5
Description of study outcome(s)	4
Type of exposure or intervention used	4
Type of study designs used	4
Study population	6
Reporting of search strategy should include	
Qualifications of searchers (e.g. librarians and investigators)	6-7
Search strategy, including time period included in the synthesis and keywords	Methods S1
Effort to include all available studies, including contact with authors	Methods S4
Databases and registries searched	6
Search software used, name and version, including special features	6
Use of hand searching (e.g. reference lists of obtained articles)	Figure S1
List of citations located and those excluded including justification	Table S6; 7
Method of addressing articles published in languages other than English	NA (only English language included)
Method of handling abstracts and unpublished studies	NA (only published studies included)
Description of any contact with authors	NA
Reporting methods should include	
Description of relevance or appropriateness of studies assembled for assessing the hypothesis to be tested	Table S3
Rationale for the selection and coding of data	6-7
Documentation of how data were classified and coded (eg, multiple raters, blinding, and interrater reliability)	6-7
Assessment of confounding	Methods S3
Assessment of study quality, including blinding of quality assessors; stratification or regression on possible predictors of study results	Methods S3
Assessment of heterogeneity	8

Description of statistical methods (eg, complete description of fixed or random effects models, justification of whether the chosen models account for predictors of study results, dose-response models, or cumulative meta-analysis) in sufficient detail to be replicated	7-8
Provision of appropriate tables and graphics	Figs 1-4; Figs S1-S6
Reporting of results should include	
Graphic summarizing individual study estimates and overall estimate	Figure 1
Table giving descriptive information for each study included	Table S7
Results of sensitivity testing (eg, subgroup analysis)	9-10
Indication of statistical uncertainty of findings	9-12
Reporting of discussion should include	
Quantitative assessment of bias (eg, publication bias)	13
Justification for exclusion (eg, exclusion of non–English-language citations)	NA
Assessment of quality of included studies	Table S8
Reporting of conclusions should include	
Consideration of alternative explanations for observed results	12-16
Generalization of the conclusions (ie, appropriate for the data presented and within the domain of the literature review)	12-16
Guidelines for future research	17
Disclosure of funding source	2

Table S3. Overview of quasi-experimental methods to study the relationship between child maltreatment and mental health

Method	Description	Key limitations
Family-based designs		
Twin differences design	Examines whether twins who differ for exposure to childhood maltreatment differ in mental health outcomes. Because twins share their genotype (either 100% or 50% of their segregating genes, depending on whether they are monozygotic [MZ] or dizygotic [DZ], respectively) and by definition, their shared environment, any within-twin pair association between maltreatment and mental health must be independent of confounding by genetic influences (100% for MZ twins and 50% for DZ twins) and the shared family environment.	Does not control for individual-level (or non-shared) confounding by design. Twin differences in maltreatment can be difficult to identify using prospective parent reports or child protection records, which tend to give concordant results for both children in a family (e.g., [24]) and therefore self-reports are often used, which might involve recall bias.
Sibling differences design	Examines whether siblings who differ for exposure to childhood maltreatment differ in mental health outcomes. Similar to the twin differences design, because siblings share 50% their segregating genes, and their family environment, any within-sibling pair association between maltreatment and mental health must be independent of confounding by 50% of genetic influences and the shared family environment.	Only accounts for 50% of genetic influences and thus does not fully account for genetic confounding. Does not control for individual-level (or non-shared) confounding by design. Often relies on self-reports to maximise within-sibling pair variation in maltreatment measures.
Children of Twins design	Among MZ twin parents and their children, examines whether the association between maltreatment perpetration (by the twin parent) and child mental health is stronger in parent-child pairs versus aunt/uncle-child pairs. This design capitalises on the fact that the child is as genetically related to their parent's twin as they are to their own parent, but they only experience maltreatment by their own parent (and not by their parent's twin). Therefore, if the child's mental health is more strongly associated with their own parent's maltreatment perpetration than their aunt/uncle's maltreatment perpetration, it indicates an effect of maltreatment above genetic confounding and the extended family environment.	Does not control for confounding from the nuclear family environment unless multiple children-of-twins are included. Does not control for individual-level confounding by design.

Method	Description	Key limitations
Adoption design	Examines whether maltreatment perpetrated by adoptive parents is associated with the adopted child's mental health. Because adoptive parents are not genetically related to their adopted children, the adoption design controls for confounding due to passive gene-environment correlations.	Does not control for environmental confounding by design, or genetic confounding arising from evocative gene-environment correlations. Assumes birth and adoptive parents have not been matched for characteristics that may influence child outcomes.
Panel data designs		
Fixed-effects design	Using data with repeated measures of maltreatment and mental health, examines whether within-individual changes in maltreatment exposure over time are associated with changes in mental health. Because each individual acts as their own control, all unmeasured, time-invariant confounders (e.g., stable genetic and environmental factors) are controlled for.	Does not control for time-variant confounders. Does not rule out reverse causation (i.e., that changes in mental health affect maltreatment). Requires there to be individual variation in maltreatment exposure over time.
Random intercept cross-lagged panel model	Similar to the fixed-effects design, cross-lagged paths examine whether within-individual changes in maltreatment exposure over time are associated with changes in mental health. The random intercept accounts for stable between-subject differences (e.g., time-invariant factors).	Does not control for time-variant confounders. Does not rule out reverse causation (i.e., that changes in mental health affect maltreatment). Requires there to be individual variation in maltreatment exposure over time.
Natural experiment		
Natural experiment design	Examines the mental health effects of maltreatment that is caused by wider social or political processes and is not related to family or individual risk factors. Because exposure to maltreatment is not affected by family or individual risk factors, any association with mental health must be independent of these confounding factors. An example of a natural experiment is the English and Romanian Adoptee (ERA) Study, which was set up after the fall of the Romanian Ceausescu regime. During the Ceausescu regime, contraception and abortions were banned and there was widespread poverty throughout Romania. This resulted in thousands of babies being abandoned in orphanages, where they experienced	May be difficult to disentangle the effects of the exposure from other co-occurring risk factors, leading to a possibility of the risk factor being misidentified. However, in the ERA Study, the duration of exposure to institutional neglect was not associated with other risk factors such as birthweight (a marker of prenatal risk)[25] or weight at adoption (a marker of malnutrition)[26]. The exposure may differ to more typical experiences of maltreatment (e.g., institutional neglect in the Romanian orphanages was arguably more severe than neglect occurring in a family environment).

Method	Description	Key limitations
	severe institutional neglect. After the Ceausescu regime fell, institutionalised children were adopted into Western families and a random subsample were followed-up by the ERA Study. The situation provided an opportunity to assess the effects of institutional neglect because: (i) it was very unlikely that institutionalisation was due to pre-existing child characteristics, as the majority of children were placed in institutions during the first few weeks of life and institutionalisation was widespread; (ii) it was possible to estimate the duration of exposure to institutional neglect, and (iii) the duration of institutional neglect was not influenced by child characteristics because adoptive parents had little choice over which child they adopted.[1]	
Propensity score methods		
Propensity score matching	Examines whether mental health outcomes differ between maltreated and non-maltreated individuals statistically matched for confounding factors. This analytic procedure involves (1) estimating a propensity score reflecting the risk of exposure to maltreatment based on measured background characteristics (i.e., confounders), (2) matching maltreated to non-maltreated individuals with a similar propensity score in order to reach an acceptable balance of confounders across maltreated and non-maltreated individuals, before (3) estimating the association between maltreatment and mental health within matched pairs. Any association between maltreatment and mental health should be independent of measured confounding factors included in the propensity score.	Only controls for unmeasured confounders to the extent they are associated with measured confounder. Measurement error in the confounder results in imperfect adjustment. Can be sensitive to matching approach, with a trade-off between inexact matching (which can lead to residual confounding) and incomplete matching (which can limit generalisability and statistical power).
Inverse probability weighting	Examines whether maltreatment is associated with mental health problems after weighting the analysis to account for measured confounding factors. Similar to propensity score matching, inverse probability weighting	Only controls for unmeasured confounders to the extent they are associated with measured confounder. Measurement error in the confounder results in imperfect adjustment.

Method	Description	Key limitations
	involves (1) estimating a propensity score reflecting the risk of exposure to maltreatment based on measured background characteristic, and (2) estimating the association between maltreatment and mental health, after weighting for the inverse of the propensity score. Any association between maltreatment and mental health should be independent of measured confounding factors included in the propensity score.	Unstable for extreme weights.

Table S4. Observational designs that were excluded from the systematic review and meta-analysis

Method	Reason for exclusion
Bivariate twin model	Design does not aim to provide unbiased estimates of the effect of maltreatment on mental health, but rather decomposes the relationship into additive genetic, shared environmental, and unique environmental influences
Prospective longitudinal study	Potential for confounding by factors that are unmeasured (e.g., genetic influences), imperfectly measured, or which differ substantially between maltreated and non-maltreated individuals and therefore cannot effectively be controlled for.
Case-control study	As cases and controls are typically matched on only a few confounding variables, there is likely substantial potential for confounding by unmeasured factors, as well as imperfectly measured confounders used for matching.

Table S5. Formulae for conversion from raw effect sizes to Cohen's d

Raw effect size type	Formula for conversion to Cohen's d	Reference
Means and standard deviations	$d = \frac{\overline{X}_1 - \overline{X}_2}{S_{within}}$ $S_{within} = \sqrt{\frac{(n_1 - 1)S_1^2 + (n_2 - 1)S_2^2}{n_1 + n_2 - 2}}$	[27]
Standardized beta / correlation coefficient	$d = \frac{2r}{\sqrt{1 - r^2}}$	[28]
Unstandardized beta	$d = \frac{B}{S_{pooled}}$ $S_{pooled} = \sqrt{\frac{s_y^2 (N-1) - B^2 (\frac{n_1 n_2}{n_1 + n_2})}{N-2}}$	[29]
Log odds ratio	$d = LogOddsRatio \times \frac{\sqrt{3}}{\pi}$	[28]
Relative risk	$LogOddsRatio = \frac{\log(1 - p) * RR}{1 - RR * p}$ $d = LogOddsRatio \times \frac{\sqrt{3}}{\pi}$	[30], [28]
Hazard ratio	$RR = \frac{1 - e^{HR x ln(1-p)}}{p}$	

Note. r = standardized beta or correlation coefficient; B = unstandardized beta; s_y = standard deviation of the outcome variable; N = total sample size; n_1 and n_2 = sample size in the exposed and unexposed groups (with equal group sizes estimated for a continuous independent variable); RR = relative risk; p=the prevalence rate in the unexposed individuals, calculated from results presented in the relevant paper[15,31] and HR= hazard ratio.

Table S6. Effect sizes that could not be converted to Cohen's d and were therefore excluded

Reference	Study type	Effect size type	Exposure	Outcome	Effect size	SE	P-value reported
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Child-limited maltreatment	General offending	0.04	0.25	>0.05
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Child-limited maltreatment	Violent crime	-0.19	0.25	>0.05
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Child-limited maltreatment	Problem alcohol use	0.30	0.21	>0.05
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Child-limited maltreatment	Problem drug use	0.73	0.28	<0.05
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Adolescent maltreatment	General offending	0.72	0.30	<0.05
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Adolescent maltreatment	Violent crime	0.60	0.26	<0.05
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Adolescent maltreatment	Problem alcohol use	0.85	0.27	<0.01
Thornberry et al. (2010)	Propensity score matching	Negative binomial regression coefficient	Adolescent maltreatment	Problem drug use	1.32	0.33	<0.01
Warrier et al. (2021)	Mendelian randomisation	Unstandardised beta coefficient	Childhood maltreatment	Depression	0.598	0.145	3.63E-05
Warrier et al. (2021)	Mendelian randomisation	Unstandardised beta coefficient	Childhood maltreatment	Schizophrenia	1.167	0.268	1.35E-05
Warrier et al. (2021)	Mendelian randomisation	Unstandardised beta coefficient	Childhood maltreatment	ADHD	1.04	0.362	4.02E-03
Warrier et al. (2021)	Mendelian randomisation	Unstandardised beta coefficient	Childhood maltreatment	Autism	0.359	0.29	2.16E-01
Warrier et al. (2021)	Mendelian randomisation	Unstandardised beta coefficient	Childhood maltreatment	Bipolar disorder	0.563	0.298	5.90E-02

Table S7. Quasi-experimental studies testing the association between childhood maltreatment and mental health

Reference	Cohort name/description, country	QE method	N (QE-adjusted; unadjusted	Maltreatment type	Age at maltreatment assessment	Maltreatment measure	Mental health outcome(s)	Age at mental health assessment	Mental health measure
MZ twin differences									
Stern et al. (2018)	E-Risk Longitudinal Twin Study (E-Risk), UK	MZ twin differences	1100; NA	Victimization	5, 7, 10, 12 (prospective); 18 (retrospective)	Interview (parent); interview (self)	ADHD	5, 7, 10, 12; 18	Interview (parent, teacher); interview (self)
Dinkler et al. (2017)	Child and Adolescent Twin Study in Sweden (CATSS), Sweden	MZ twin differences	3568; 8166	Maltreatment	9 (prospective)	Interview (parent)	ADHD; autism	9	Interview (parent)
Baldwin et al. (2019)	E-Risk Longitudinal Twin Study (E-Risk), UK	MZ twin differences	1100; 2055	Victimization	18 (retrospective)	Interview (self)	Suicidal ideation; self harm; suicide attempt	18	Interview (self)
Magnusson et al. (2012)	The Study of Twin Adults: Genes and Environment (STAGE), Sweden	MZ twin differences	44; 13595	Emotional neglect; physical abuse; sexual abuse	33.5 (retrospective)	Questionnaire (self)	Alcohol dependence	33.5	Questionnaire (self)
Schaefer et al. (2017)	E-Risk Longitudinal Twin Study (E-Risk), UK	MZ twin differences	1158; 2062	Victimization	18 (retrospective)	Interview (self)	P-factor; internalising; externalising; thought disorder	18	Interview (self)
Alemany et al. (2013)	Cross-sectional study of adult twins from Catalonia, Spain	MZ twin differences	170; 226	ACEs	33.8 (retrospective)	Questionnaire (self)	Positive psychotic experiences; negative psychotic experiences	33.8	Questionnaire (self)
Bornovalova et al. (2013)	Minnesota Twin Family Study (MTFS), USA	MZ twin differences	1792; 2764	Abuse; emotional abuse; physical abuse; sexual abuse	20, 24, 29 (retrospective)	Interview (self)	Borderline personality disorder	24.9	Questionnaire (self)
Capusan et al. (2016)	The Study of Twin Adults: Genes and Environment (STAGE), Sweden	MZ twin differences	940; 17711	Maltreatment; emotional neglect; physical neglect; physical abuse; sexual abuse; abuse; neglect	33.8 (retrospective)	Questionnaire (self)	ADHD	33.8	Questionnaire (self)

Reference	Cohort name/description, country	QE method	N (QE-adjusted; unadjusted	Maltreatment type	Age at maltreatment assessment	Maltreatment measure	Mental health outcome(s)	Age at mental health assessment	Mental health measure
Lecei et al. (2019)	twinssCan Study, Belgium	MZ twin differences	266; 266	Maltreatment	18.2 (retrospective)	Questionnaire (self)	Total psychopathology; psychosis; anxiety; depression	18.2	Questionnaire (self)
Young-Wolff et al. (2011)	Virginia Adult Twin Study of Psychiatric and Substance Use Disorders (VATSPSUD), USA	MZ twin differences	174; 3527	Maltreatment	35 (retrospective)	Interview (self)	Alcohol abuse/ dependence	35	Interview (self)
Twin differences									
Berenz et al. (2013)	Norwegian Twin Registry (NTR), Norway	Twin differences	616; 2780	ACEs	28.2 (retrospective)	Interview (self)	Personality disorders: paranoid; schizoid; schizotypal; histrionic; narcissistic; borderline; antisocial; avoidant; obsessive compulsive; dependent	28.2	Interview (self)
Nelson et al. (2006)	Australian Twin Register young adult cohort, Australia	Twin differences	280; NA	Sexual abuse	29.9 (retrospective)	Interview (self)	Dependence/ abuse: cannabis, opioids; sedatives; stimulants; cocaine; any illicit drug; non-cannabis illicit drug	29.9	Interview (self)
Dinwiddie et al. (2000)	Australian National Health and Medical Research Council	Twin differences	75; 3180	Sexual abuse	44.1 (retrospective)	Interview (self)	Depression; suicidal ideation; suicide attempt; panic disorder;	44.1	Interview (self)

Reference	Cohort name/description, country	QE method	N (QE-adjusted; unadjusted	Maltreatment type	Age at maltreatment assessment	Maltreatment measure	Mental health outcome(s)	Age at mental health assessment	Mental health measure
	(NH&MRC) Twin Register, Australia						social phobia; alcohol dependence; conduct disorder; psychopathology any		
Kendler et al. (2000)	Virginia Twin Registry (VTR), USA	Twin differences	133; 1403	Sexual abuse	32.7 (retrospective)	Questionnaire (self)	Depression; GAD; alcohol dependence; drug dependence; bulimia	37.6	Interview (self)
Nelson et al. (2002)	Australian Twin Register young adult cohort, Australia	Twin differences	73; NA	Sexual abuse	29.9 (retrospective)	Interview (self)	Depression; suicide attempt; conduct disorder; alcohol dependence; social anxiety	29.9	Interview (self)
Schwartz et al. (2019)	Midlife in the United States (MIDUS), USA	Twin differences	862; 862	ACEs	46, 50 (retrospective)	Interview (self)	Depression; antisocial behaviour	50	Interview (self)
Sibling differences									
Barrigon et al. (2015)	Cross-sectional study of patients with psychosis and unaffected siblings from Granada and Jaen, Spain	Sibling differences	98; NA	Maltreatment	31.7 (retrospective)	Interview (self)	Psychosis	31.7	Interview (self)
Kullberg et al. (2020)	Netherlands Study of Depression and Anxiety (NESDA), Netherlands	Sibling differences	636; 636	Emotional abuse; physical abuse; sexual abuse	49.7 (retrospective)	Questionnaire (self)	Depression; anxiety	49.7	Questionnaire (self)
Schwartz et al. (2019)	Add Health, USA	Sibling differences	3112; 3112	ACEs	16.1, 23, 30 (retrospective)	Interview (self)	Depression	30	Interview (self)

Reference	Cohort name/description, country	QE method	N (QE-adjusted; unadjusted	Maltreatment type	Age at maltreatment assessment	Maltreatment measure	Mental health outcome(s)	Age at mental health assessment	Mental health measure
Capusan et al. (2021)	Official record study of participants from Östergötland, Sweden	Sibling differences	865; 3887	Maltreatment	0-18 (prospective)	Medical record	Substance use disorder	29.5	Medical record
Children of twins									
Lynch et al. (2006)	Australian Twin Register children of twins, Australia	Children of twins	2502; 1926	Physical abuse	25.1 (retrospective)	Interview (self)	Externalising behaviour; drug and alcohol use; internalising behaviour	25.1	Interview (self)
Adoption design									
Riggins-Caspers et al. (2003)	Cross-sectional study of adult adoptees from Iowa, USA	Adoption design	150; NA	Physical abuse	31.5 (retrospective)	Questionnaire (self)	Conduct disorder; oppositional behaviour	31.5	Interview (adoptive parent)
Within-individual fixed-effects									
Ma et al. (2018)	Fragile Families and Child Wellbeing Study (FFCWS), USA	Fixed effects	2472; NA	Physical abuse	3, 5 (prospective)	Questionnaire (parent)	Aggressive behaviour	3,5	Questionnaire (parent)
Voith et al. (2014)	National Survey of Child and Adolescent Well-Being (NSCAW-I), USA	Fixed effects	1022; NA	ACEs	10.3, 12.2 (prospective)	Interview (mixed)	Trauma; depression	10.3, 12.2	Interview (self)
Isumi et al. (2021)	Adachi Child Health Impact of Living Difficulty (A-CHILD), Japan	Fixed effects	2920; NA	Maltreatment	6.5, 7.5, 9.5 (prospective)	Questionnaire (parent)	Behavioural difficulties	6.5, 7.5, 9.5	Questionnaire (parent)
Random intercept cross-lagged panel model									
Li et al. (2021)	Longitudinal study of students from schools in Guangdong, China, China	NA	3742; 3742	Emotional abuse	9.9; 10.4; 10.9; 11.4 (prospective)	Questionnaire (self)	Depression	10.4; 10.9; 11.4; 11.9	Questionnaire (self)

Reference	Cohort name/description, country	QE method	N (QE-adjusted; unadjusted	Maltreatment type	Age at maltreatment assessment	Maltreatment measure	Mental health outcome(s)	Age at mental health assessment	Mental health measure
Natural experiment									
Beckett et al. (2002)	English and Romanian Adoptees Study (ERA), UK/Romania	Natural experiment	90; NA	Institutional neglect	0-3.6 (prospective)	Government record	Self-injury	6	Interview (parent)
Golm et al. (2020)	English and Romanian Adoptees Study (ERA), UK/Romania	Natural experiment	98; NA	Institutional neglect	0-3.6 (prospective)	Government record	Depression; generalised anxiety	23.9	Questionnaire (parent)
Sonuga-Barke et al. (2017)	English and Romanian Adoptees Study (ERA), UK/Romania	Natural experiment	148; NA	Institutional neglect	0-3.6 (prospective)	Government record	ASD; inattention overactivity; emotional; conduct problem	6; 11; 15; 24.1	Questionnaire (parent)
Propensity score matching									
Thornberry et al. (2010)	Rochester Youth Development Study (RYDS), USA	Propensity score matching	907; NA	Maltreatment	14, 15, 16, 17, 18 (prospective)	CPS record	Arrest or incarceration; suicidal thoughts; depression	22.7	Interview (self) or crime record (for arrest)
Gerin et al. (2019)	Duke Neurogenetics Study (DNS), USA	Propensity score matching	196; NA	Maltreatment	19.5 (retrospective)	Questionnaire (self)	Internalising	20.5	Questionnaire (self)
Zvara et al. (2017)	Family Life Project (FLP), USA	Propensity score matching	204; NA	Sexual abuse	29.8 (retrospective)	Questionnaire (self)	Postnatal depression	25.8	Questionnaire (self)
Inverse probability weighting									
Kugler et al. (2019)	Female Adolescent Development Study, USA	Inverse probability weighting	367; NA	Maltreatment	14, 15, 16, 17, 18 (prospective)	CPS record	Drug use; depression	19	Questionnaire (self)
Alvanzo et al. (2020)	National Epidemiologic Survey on Alcohol and Related Conditions (NESARC), USA	Inverse probability weighting	10396; 10396	ACEs	45.9; 46.5 (retrospective)	Interview (self)	Severe alcohol problems; moderate alcohol problems	43.9; 44.5	Interview (self)

Reference	Cohort name/description, country	QE method	N (QE-adjusted; unadjusted	Maltreatment type	Age at maltreatment assessment	Maltreatment measure	Mental health outcome(s)	Age at mental health assessment	Mental health measure
Obikane et al. (2018)	The Japanese Study on Stratification, Health, Income, and Neighborhood (J-SHINE), Japan	Inverse probability weighting	1896; 1896	Physical abuse; physical neglect; maltreatment	36.5 (retrospective)	Questionnaire (self)	Suicidal ideation; suicidal plan; suicide attempt	36.5	Questionnaire (self)

Abbreviations: QE = quasi-experimental; MZ monozygotic; CPS = child protection services; ADHD = attention deficit/hyperactivity disorder; GAD = generalized anxiety disorder.
[1] "Maltreatment" includes assessment of multiple subtypes of abuse and/or neglect (i.e., physical abuse, sexual abuse, emotional abuse, physical neglect, or emotional neglect); "victimization" includes assessment of any of forms of maltreatment alongside other types of victimization (e.g., bullying); "ACEs" includes assessment of any of forms of maltreatment alongside other adverse childhood experiences (e.g., domestic violence).

Table S8. Quality and risk of bias assessment for included studies

Reference	Represent. (exposed)	Exposed & unexposed from same cohort	Validated MT assess.	Control for pre-existing MH	Control for environ. confound.	Control for genetic confound.	Validated MH assess	Different informants for MT & MH	Longitud. assess.	Retention >70%	Total quality score
Alemany et al. (2013)	0.5	1	1	0	0.5	1	1	0	0	1	6
Alvanzo et al. (2020)	1	1	0	0	0	0.5	1	0	0	1	4.5
Baldwin et al. (2019)	1	1	1	1	1	1	0	0	0	1	7
Barrigon et al. (2015)	0	1	0	0	0.5	0.5	1	0	0	0	3
Beckett et al. (2002)	1	1	1	1	1	1	0	1	1	1	9
Berenz et al. (2013)	1	1	1	0	0.5	0.5	1	0	0	0	5
Bornovalova et al. (2013)	1	1	1	0	0.5	1	1	0	0	1	6.5
Capusan et al. (2016)	1	1	1	0	0.5	1	1	0	0	1	6.5
Capusan et al. (2021)	0.5	1	1	0	0.5	0.5	1	1	1	1	7.5
Dinkler et al. (2017)	1	1	1	0	0.5	1	1	0	0	1	6.5
Dinwiddie et al. (2000)	0.5	1	0	0	0.5	0.5	1	0	0	1	4.5
Gerin et al. (2019)	0	1	1	0	0.5	0	1	0	1	0	4.5
Golm et al. (2020)	1	1	1	1	1	1	1	1	1	0	9
Isumi et al. (2021)	1	1	1	1	0.5	1	1	0	1	1	8.5
Kendler et al. (2000)	0.5	1	0	0	0.5	0.5	1	0	1	0	4.5
Kugler et al. (2019)	0	1	1	1	0.5	0	1	1	1	1	7.5
Kullberg et al. (2020)	0	1	1	0	0.5	0.5	1	0	0	0	4
Lecei et al. (2019)	0.5	1	1	0	0.5	1	1	0	0	1	6
Li et al. (2021)	1	1	1	1	0.5	1	1	0	1	1	8.5
Lynch et al. (2006)	0.5	1	0	0	0.5	0.5	1	0	0	1	4.5
Ma et al. (2018)	0.5	1	1	1	1	1	1	0	1	1	8.5
Magnusson et al. (2012)	0.5	1	1	0	0.5	1	1	0	0	0	5
Nelson et al. (2002)	1	1	0	0	0.5	1	1	0	0	0	4.5
Nelson et al. (2006)	1	1	0	0	0.5	0.5	1	0	0	0	4
Obikane et al. (2018)	1	1	0	1	0.5	0	1	0	0	0	4.5
Riggins-Caspers et al. (2003)	0	1	1	0	0	0.5	0	1	0	1	4.5
Schaefer et al. (2017)	1	1	1	1	0.5	1	1	0	0	1	7.5
Schwartz et al. (2019)	1	1	0	0	0.5	0.5	1	0	1	1	6
Sonuga-Barke et al. (2017)	1	1	1	1	1	1	1	1	1	1	10
Stern et al. (2018)	1	1	1	0	0.5	1	1	1	0	1	7.5
Thornberry et al. (2010)	0.5	1	1	0	0.5	0.5	1	1	1	1	7.5
Voith et al. (2014)	0	1	1	1	0.5	1	1	1	1	0	7.5
Young-Wolff et al. (2011)	0.5	1	0	0	0.5	1	1	0	0	0	4
Zvara et al. (2017)	1	1	1	0	1	0	1	0	0	0	5

Note. MT=maltreatment; MH=mental health; assess.=assessment; confound=confounders.This table shows a single quality score for each study, but occasionally the scores varied within a single study (e.g., if some outcomes were assessed longitudinally and others cross-sectionally). Here we have reported the maximum score for each study.

Table S9. Individual effect sizes included in the meta-analysis

Reference	Cohort name/description	Maltreatment type	Mental health outcome	Cohen's d	95% CI
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Depression	0.197	-0.180-0.575
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Suicidal ideation	0.252	-0.065-0.569
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Suicide attempt	0.466	-0.281-1.213
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Panic disorder	0.382	-0.211-0.975
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Social phobia	0.224	-0.476-0.923
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Alcohol dependence	0.505	-0.017-1.027
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Conduct disorder	0.123	-0.599-0.845
Dinwiddie et al. (2000)	ATR (females)	Sexual abuse	Psychopathology any	0.242	-0.069-0.553
Dinwiddie et al. (2000)	ATR (males)	Sexual abuse	Depression	0.224	-0.476-0.923
Dinwiddie et al. (2000)	ATR (males)	Sexual abuse	Suicidal ideation	0.940	0.110-1.770
Dinwiddie et al. (2000)	ATR (males)	Sexual abuse	Alcohol dependence	0.000	-0.885-0.885
Dinwiddie et al. (2000)	ATR (males)	Sexual abuse	Conduct disorder	0.382	-0.382-1.146
Dinwiddie et al. (2000)	ATR (males)	Sexual abuse	Psychopathology any	0.382	-0.281-1.045
Kendler et al. (2000)	VTR	Sexual abuse	Depression	0.186	-0.095-0.466
Kendler et al. (2000)	VTR	Sexual abuse	GAD	0.212	-0.144-0.569
Kendler et al. (2000)	VTR	Sexual abuse	Alcohol dependence	0.574	0.066-1.081
Kendler et al. (2000)	VTR	Sexual abuse	Drug dependence	0.382	-0.212-0.976
Kendler et al. (2000)	VTR	Sexual abuse	Bulimia	0.157	-0.664-0.978
Beckett et al. (2002)	ERA	Institutional neglect	Self injury	1.219	0.084-2.353
Nelson et al. (2002)	ATR (young adults)	Sexual abuse	Depression	0.245	0.033-0.458
Nelson et al. (2002)	ATR (young adults)	Sexual abuse	Suicide attempt	0.554	0.174-0.934
Nelson et al. (2002)	ATR (young adults)	Sexual abuse	Conduct disorder	0.606	0.165-1.046
Nelson et al. (2002)	ATR (young adults)	Sexual abuse	Alcohol dependence	0.245	0.007-0.484
Nelson et al. (2002)	ATR (young adults)	Sexual abuse	Social anxiety	0.466	0.132-0.801
Riggins-Caspers et al. (2003)	Iowa adoption study	Physical abuse	Conduct disorder	0.387	0.059-0.715
Riggins-Caspers et al. (2003)	Iowa adoption study	Physical abuse	Oppositional behaviour	0.516	0.184-0.849
Lynch et al. (2006)	ATR (CoT)	Physical abuse	Externalising behaviour	0.303	0.179-0.426
Lynch et al. (2006)	ATR (CoT)	Physical abuse	Drug and alcohol use	0.343	0.220-0.467
Lynch et al. (2006)	ATR (CoT)	Physical abuse	Internalising behaviour	0.165	0.042-0.289
Nelson et al. (2006)	ATR (young adults)	Sexual abuse	Cannabis dep.	0.136	-0.152-0.424
Nelson et al. (2006)	ATR (young adults)	Sexual abuse	Opioids dep.	1.032	0.212-1.852
Nelson et al. (2006)	ATR (young adults)	Sexual abuse	Sedatives dep.	0.829	-0.016-1.674
Nelson et al. (2006)	ATR (young adults)	Sexual abuse	Stimulants dep.	0.302	-0.108-0.712
Nelson et al. (2006)	ATR (young adults)	Sexual abuse	Cocaine dep.	0.382	-0.382-1.146
Nelson et al. (2006)	ATR (young adults)	Sexual abuse	Any illicit drug dep.	0.318	0.036-0.599
Nelson et al. (2006)	ATR (young adults)	Sexual abuse	Non-cannabis illicitdrug abuse	0.430	0.037-0.823
Thornberry et al. (2010)	RYDS	Maltreatment (0-11y)	Arrest or incarceration	0.243	-0.006-0.491
Thornberry et al. (2010)	RYDS	Maltreatment (0-11y)	Suicidal thoughts	0.369	0.067-0.672
Thornberry et al. (2010)	RYDS	Maltreatment (0-11y)	Depression	0.209	0.004-0.413
Thornberry et al. (2010)	RYDS	Maltreatment (12-17y)	Arrest or incarceration	0.408	0.105-0.711
Thornberry et al. (2010)	RYDS	Maltreatment (12-17y)	Suicidal thoughts	0.496	0.150-0.842
Thornberry et al. (2010)	RYDS	Maltreatment (12-17y)	Depression	0.197	-0.044-0.438
Young-Wolff et al. (2011)	VATSPSUD	Maltreatment	Alcohol abuse/dependence	-0.046	-0.491-0.399
Magnusson et al. (2012)	STAGE	Emotional neglect	Alcohol dependence	0.032	-0.331-0.395
Magnusson et al. (2012)	STAGE	Physical abuse	Alcohol dependence	0.201	-0.266-0.669
Magnusson et al. (2012)	STAGE	Sexual abuse	Alcohol dependence	0.466	-0.060-0.993
Alemany et al. (2013)	Catalonia twin study	ACEs	Positive psychotic experiences	0.381	0.078-0.685
Alemany et al. (2013)	Catalonia twin study	ACEs	Negative psychotic experiences	0.390	0.086-0.693
Berenz et al. (2013)	NTR	ACEs	Paranoid PD	0.063	-0.095-0.221
Berenz et al. (2013)	NTR	ACEs	Schizoid PD	0.090	-0.069-0.248
Berenz et al. (2013)	NTR	ACEs	Schizotypal PD	0.063	-0.095-0.221
Berenz et al. (2013)	NTR	ACEs	Histrionic PD	0.063	-0.095-0.221
Berenz et al. (2013)	NTR	ACEs	Narcissistic PD	0.127	-0.031-0.285
Berenz et al. (2013)	NTR	ACEs	Borderline PD	0.155	-0.003-0.314
Berenz et al. (2013)	NTR	ACEs	Antisocial PD	0.155	-0.003-0.314
Berenz et al. (2013)	NTR	ACEs	Avoidant PD	0.000	-0.158-0.158
Berenz et al. (2013)	NTR	ACEs	Obsessive comp. PD	0.127	-0.031-0.285
Berenz et al. (2013)	NTR	ACEs	Dependent PD	0.000	-0.158-0.158
Bornovalova et al. (2013)	MTFS	Abuse	Borderline PD	0.090	-0.086-0.266
Bornovalova et al. (2013)	MTFS	Emotional abuse	Borderline PD	0.190	-0.045-0.425
Bornovalova et al. (2013)	MTFS	Physical abuse	Borderline PD	0.130	-0.066-0.326
Bornovalova et al. (2013)	MTFS	Sexual abuse	Borderline PD	-0.050	-0.344-0.244
Voith et al. (2014)	NSCAW-I	ACEs	Trauma	0.150	0.062-0.238
Voith et al. (2014)	NSCAW-I	ACEs	Depression	0.118	0.030-0.206

Reference	Cohort name/description	Maltreatment type	Mental health outcome	Cohen's d	95% CI
Barrigon et al. (2015)	Spanish CS study	Maltreatment	Psychosis	1.096	0.033-2.159
Capusan et al. (2016)	STAGE	Maltreatment	ADHD	0.180	0.105-0.255
Capusan et al. (2016)	STAGE	Emotional neglect	ADHD	0.190	0.115-0.265
Capusan et al. (2016)	STAGE	Physical neglect	ADHD	0.250	-0.040-0.540
Capusan et al. (2016)	STAGE	Physical abuse	ADHD	0.080	-0.065-0.225
Capusan et al. (2016)	STAGE	Sexual abuse	ADHD	0.200	0.020-0.380
Capusan et al. (2016)	STAGE	Maltreatment	ADHD	0.190	0.065-0.315
Capusan et al. (2016)	STAGE	Abuse	ADHD	0.240	0.015-0.465
Capusan et al. (2016)	STAGE	Neglect	ADHD	0.150	-0.005-0.305
Dinkler et al. (2017)	CATSS	Maltreatment	ADHD	0.260	-0.065-0.585
Dinkler et al. (2017)	CATSS	Maltreatment	Autism	0.500	0.200-0.800
Schaefer et al. (2017)	E-Risk	Victimisation	P-factor	0.644	0.385-0.904
Schaefer et al. (2017)	E-Risk	Victimisation	Internalising factor	0.655	0.449-0.862
Schaefer et al. (2017)	E-Risk	Victimisation	Externalising factor	0.676	0.488-0.863
Schaefer et al. (2017)	E-Risk	Victimisation	Thought disorder	0.698	0.475-0.920
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	ASD (parent, 6y)	0.772	0.340-1.204
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	ASD (parent, 11y)	1.378	0.838-1.919
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	ASD (parent, 15y)	0.937	0.289-1.586
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	ASD (parent, 24.1y)	0.937	0.289-1.586
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Inattention/overactivity (parent, 6y)	0.827	0.287-1.367
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Inattention/overactivity (parent, 11y)	0.551	0.011-1.092
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Inattention/overactivity (parent, 15y)	0.882	0.342-1.422
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Inattention/overactivity (parent, 24.1y)	1.048	0.399-1.696
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Emotional problems (parent, 6y)	0.000	-0.648-0.648
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Emotional problems (parent, 11y)	0.165	-0.375-0.706
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Emotional problems (parent, 15y)	0.551	-0.205-1.308
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Emotional problems (parent, 24.1y)	1.048	0.399-1.696
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Emotional problems (self, 11y)	0.055	-0.377-0.487
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Emotional problems (self, 15y)	0.221	-0.212-0.653
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Emotional problems (self, 24.1y)	0.717	0.176-1.257
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Conduct problem (parent, 6y)	0.276	-0.373-0.924
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Conduct problem (parent, 11y)	0.717	0.068-1.365
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Conduct problem (parent, 15y)	0.276	-0.373-0.924
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Conduct problem (parent, 24.1y)	1.158	0.401-1.914
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Conduct prob (self;11y)	0.441	-0.099-0.981
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Conduct prob (self;15y)	0.055	-0.485-0.595
Sonuga-Barke et al. (2017)	ERA	Institutional neglect	Conduct prob (self;24y)	-0.221	-0.761-0.320
Zvara et al. (2017)	FLP	Sexual abuse	Postnatal depression	0.290	0.016-0.564
Ma et al. (2018)	FFCWS	Physical abuse	Aggressive behaviour	0.704	0.512-0.895
Obikane et al. (2018)	J-SHINE (males)	Physical abuse	Suicidal ideation	0.532	0.298-0.767
Obikane et al. (2018)	J-SHINE (males)	Physical neglect	Suicidal ideation	0.258	-0.315-0.832
Obikane et al. (2018)	J-SHINE (males)	Maltreatment	Suicidal ideation	0.439	0.203-0.675
Obikane et al. (2018)	J-SHINE (females)	Physical abuse	Suicidal ideation	0.576	0.363-0.788
Obikane et al. (2018)	J-SHINE (females)	Physical neglect	Suicidal ideation	0.567	0.156-0.978
Obikane et al. (2018)	J-SHINE (females)	Maltreatment	Suicidal ideation	0.539	0.339-0.740
Obikane et al. (2018)	J-SHINE (males)	Physical abuse	Suicidal plan	0.462	0.099-0.826
Obikane et al. (2018)	J-SHINE (males)	Physical neglect	Suicidal plan	0.167	-0.437-0.771
Obikane et al. (2018)	J-SHINE (males)	Maltreatment	Suicidal plan	0.396	0.062-0.731
Obikane et al. (2018)	J-SHINE (females)	Physical abuse	Suicidal plan	0.447	0.111-0.782
Obikane et al. (2018)	J-SHINE (females)	Physical neglect	Suicidal plan	0.314	-0.170-0.799
Obikane et al. (2018)	J-SHINE (females)	Maltreatment	Suicidal plan	0.463	0.136-0.790
Obikane et al. (2018)	J-SHINE (males)	Physical abuse	Suicide attempt	0.510	0.060-0.961
Obikane et al. (2018)	J-SHINE (males)	Physical neglect	Suicide attempt	-0.348	-1.323-0.626
Obikane et al. (2018)	J-SHINE (males)	Maltreatment	Suicide attempt	0.358	-0.127-0.842
Obikane et al. (2018)	J-SHINE (females)	Physical abuse	Suicide attempt	0.651	0.378-0.924
Obikane et al. (2018)	J-SHINE (females)	Physical neglect	Suicide attempt	0.961	0.400-1.521

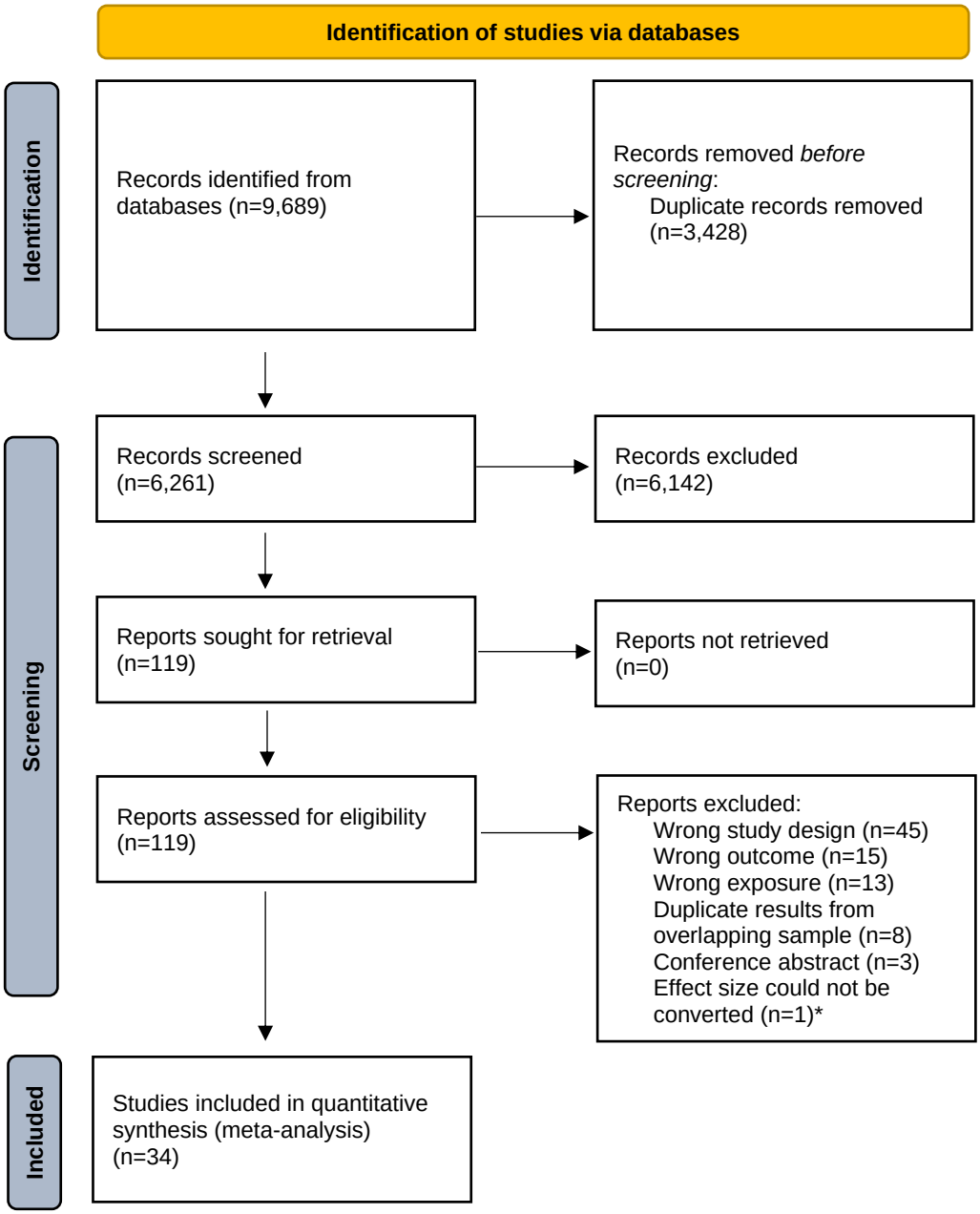
Reference	Cohort name/description	Maltreatment type	Mental health outcome	Cohen's d	95% CI
Obikane et al. (2018)	J-SHINE (females)	Maltreatment	Suicide attempt	0.659	0.394-0.924
Stern et al. (2018)	E-Risk	Victimisation (5-12y)	ADHD (5-12y)	0.140	0.022-0.259
Stern et al. (2018)	E-Risk	Victimisation (18y)	ADHD (18y)	0.345	0.225-0.465
Baldwin et al. (2019)	E-Risk	Victimisation	Suicidal ideation	0.205	0.053-0.357
Baldwin et al. (2019)	E-Risk	Victimisation	Self harm	0.224	0.091-0.356
Baldwin et al. (2019)	E-Risk	Victimisation	Suicide attempt	0.136	-0.104-0.376
Gerin et al. (2019)	DNS	Maltreatment	Internalising	0.620	0.326-0.914
Kugler et al. (2019)	FADS	Maltreatment	Drug use	0.362	0.156-0.568
Kugler et al. (2019)	FADS	Maltreatment	Depression	0.235	0.030-0.441
Lecei et al. (2019)	TwinssCan	Maltreatment	Total psychopathology	0.295	0.054-0.537
Lecei et al. (2019)	TwinssCan	Maltreatment	Psychosis	0.270	0.029-0.512
Lecei et al. (2019)	TwinssCan	Maltreatment	Anxiety	0.386	0.143-0.628
Lecei et al. (2019)	TwinssCan	Maltreatment	Depression	0.254	0.012-0.495
Schwartz et al. (2019)	MIDUS	ACEs	Depression	0.116	-0.018-0.249
Schwartz et al. (2019)	MIDUS	ACEs	Antisocial behaviour	0.226	0.093-0.360
Schwartz et al. (2019)	Add Health	ACEs	Depression	0.107	0.036-0.177
Alvanzo et al. (2020)	NESARC (males)	ACEs	Severe alcohol problems	-0.090	-0.329-0.150
Alvanzo et al. (2020)	NESARC (females)	ACEs	Severe alcohol problems	0.005	-0.222-0.233
Alvanzo et al. (2020)	NESARC (males)	ACEs	Moderate alcohol problems	0.067	-0.106-0.241
Alvanzo et al. (2020)	NESARC (females)	ACEs	Moderate alcohol problems	0.136	-0.028-0.300
Golm et al. (2020)	ERA	Institutional neglect	Depression (parent)	0.480	0.088-0.872
Golm et al. (2020)	ERA	Institutional neglect	Generalised anxiety (parent)	0.490	0.098-0.882
Golm et al. (2020)	ERA	Institutional neglect	Depression (self)	0.410	-0.002-0.822
Golm et al. (2020)	ERA	Institutional neglect	Generalised anxiety (self)	0.380	-0.032-0.792
Kullberg et al. (2020)	NESDA	Emotional abuse	Depression	0.509	0.351-0.667
Kullberg et al. (2020)	NESDA	Physical abuse	Depression	-0.002	-0.158-0.153
Kullberg et al. (2020)	NESDA	Sexual abuse	Depression	0.068	-0.087-0.224
Kullberg et al. (2020)	NESDA	Emotional abuse	Anxiety	0.292	0.135-0.448
Kullberg et al. (2020)	NESDA	Physical abuse	Anxiety	0.073	-0.083-0.228
Kullberg et al. (2020)	NESDA	Sexual abuse	Anxiety	0.104	-0.051-0.260
Capusan et al. (2021)	Östergötland cohort	Maltreatment	Substance use disorder	0.771	0.488-1.053
Isumi et al. (2021)	A-CHILD	Maltreatment	Behavioural difficulties	0.333	0.281-0.384
Li et al. (2021)	Chinese long. study	Emotional abuse	Depression	0.100	0.037-0.163
Li et al. (2021)	Chinese long. study	Emotional abuse	Depression	0.100	0.037-0.163
Li et al. (2021)	Chinese long. study	Emotional abuse	Depression	0.100	0.037-0.163
Li et al. (2021)	Chinese long. study	Emotional abuse	Depression	0.080	0.017-0.143

Table S10. Meta-analytic effect sizes for the relationship between maltreatment and mental health outcomes reported in previous meta-analyses of non-quasi-experimental studies.

Reference	Outcome	Maltreatment type	Odds Ratio	Cohen's D
Nelson et al. (2017)	Depression	Sexual abuse	2.66 (2.38-2.98)	0.54 (0.03)
Nelson et al. (2017)	Depression	Physical abuse	2.68 (2.29-3.12)	0.54 (0.04)
Nelson et al. (2017)	Depression	Emotional abuse	3.73 (2.88-4.83)	0.73 (0.07)
Nelson et al. (2017)	Depression	Emotional neglect	3.54 (2.48-5.04)	0.70 (0.10)
Nelson et al. (2017)	Depression	Physical neglect	2.45 (1.63-3.68)	0.49 (0.11)
Nelson et al. (2017)	Depression	Any	2.81 (2.35-3.36)	0.57 (0.05)
Li et al. (2016)	Depression	Any	2.03 (1.37-3.01)	0.39 (0.11)
Li et al. (2016)	Anxiety	Any	2.70 (2.10-3.47)	0.55 (0.07)
Varese et al. (2012)	Psychosis	Any	2.78 (2.34-3.31)	0.56 (0.05)
Liu et al. (2018)	NSSI	Any	3.42 (2.74-4.26)	0.68 (0.06)
Liu et al. (2018)	NSSI	Sexual abuse	2.65 (2.33-3.03)	0.54 (0.04)
Liu et al. (2018)	NSSI	Physical abuse	2.31 (1.97-2.69)	0.46 (0.04)
Liu et al. (2018)	NSSI	Physical neglect	2.22 (1.75-2.80)	0.44 (0.07)
Liu et al. (2018)	NSSI	Emotional abuse	3.03 (2.59-3.54)	0.61 (0.04)
Liu et al. (2018)	NSSI	Emotional neglect	1.84 (1.45-2.34)	0.34 (0.07)
Angelaskis et al. (2019)	Suicide attempt	Sexual abuse	3.17 (2.76-3.64)	0.64 (0.04)
Angelaskis et al. (2019)	Suicide attempt	Physical abuse	2.52 (2.09-3.04)	0.51 (0.05)
Angelaskis et al. (2019)	Suicide attempt	Emotional abuse	2.49 (1.64-3.77)	0.50 (0.12)
Angelaskis et al. (2019)	Suicide attempt	Any	2.09 (1.67-2.60)	0.41 (0.06)
Angelaskis et al. (2019)	Suicide attempt	Emotional neglect	2.29 (1.79-2.94)	0.46 (0.07)
Angelaskis et al. (2019)	Suicide attempt	Physical neglect	1.51 (0.87-2.61)	0.23 (0.15)
Angelaskis et al. (2019)	Suicide attempt	Complex abuse	5.18 (2.52-1.63)	0.91 (0.06)
Angelaskis et al. (2019)	Suicidal ideation	Sexual abuse	2.15 (1.77-2.61)	0.42 (0.05)
Angelaskis et al. (2019)	Suicidal ideation	Physical abuse	2.43 (1.85-3.18)	0.49 (0.08)
Angelaskis et al. (2019)	Suicidal ideation	Emotional abuse	2.10 (1.51-2.94)	0.41 (0.09)
Angelaskis et al. (2019)	Suicidal ideation	Any	2.66 (1.93-3.68)	0.54 (0.09)
Angelaskis et al. (2019)	Suicidal ideation	Emotional neglect	1.40 (1.02-1.93)	0.19 (0.09)
Angelaskis et al. (2019)	Suicidal ideation	Physical neglect	1.44 (1.06-1.95)	0.20 (0.09)
Halpern et al. (2018)	Substance abuse	Physical abuse	1.74 (1.36-2.21)	0.31 (0.07)
Halpern et al. (2018)	Substance abuse	Sexual abuse	1.73 (1.24-2.41)	0.30 (0.09)
Halpern et al. (2018)	Substance abuse	Neglect	1.19 (0.92-1.52)	0.10 (0.07)
Braga et al. (2018)	Antisocial behaviour	Any	1.96 (1.42-2.71)	0.37 (0.09)
Hailes et al. (2019)	Schizophrenia	Sexual abuse	1.40 (0.80-2.30)	0.19 (0.15)
Hailes et al. (2019)	Eating disorders	Sexual abuse	2.20 (1.80-2.80)	0.43 (0.06)
Hailes et al. (2019)	PTSD	Sexual abuse	2.30 (1.60-3.40)	0.46 (0.11)
Hailes et al. (2019)	Depression	Sexual abuse	2.70 (2.40-3.00)	0.55 (0.03)
Hailes et al. (2019)	Anxiety	Sexual abuse	2.70 (2.50-2.80)	0.55 (0.02)
Hailes et al. (2019)	Borderline personality disorder	Sexual abuse	2.90 (2.50-3.30)	0.59 (0.04)
Pooled effect size			2.36 (2.07-2.7)	0.48 (0.04)

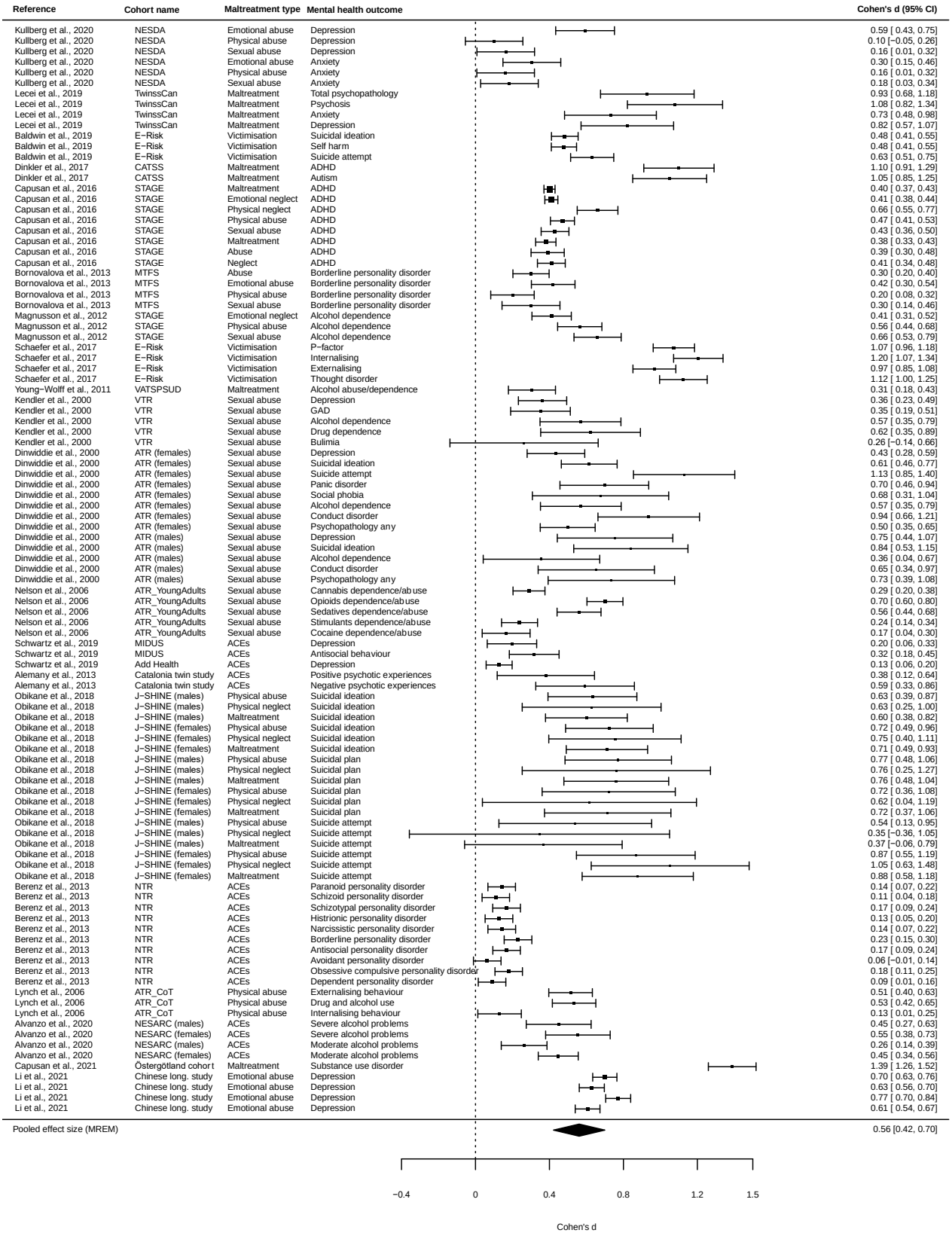
Note. We selected the most recent meta-analyses that assessed the relationships between child maltreatment and the mental health outcomes examined in this meta-analysis. Results were extracted as odds ratios from original meta-analyses and were converted to Cohen's d values for comparability with effect sizes presented in this meta-analysis.

Figure S1. Study selection procedure



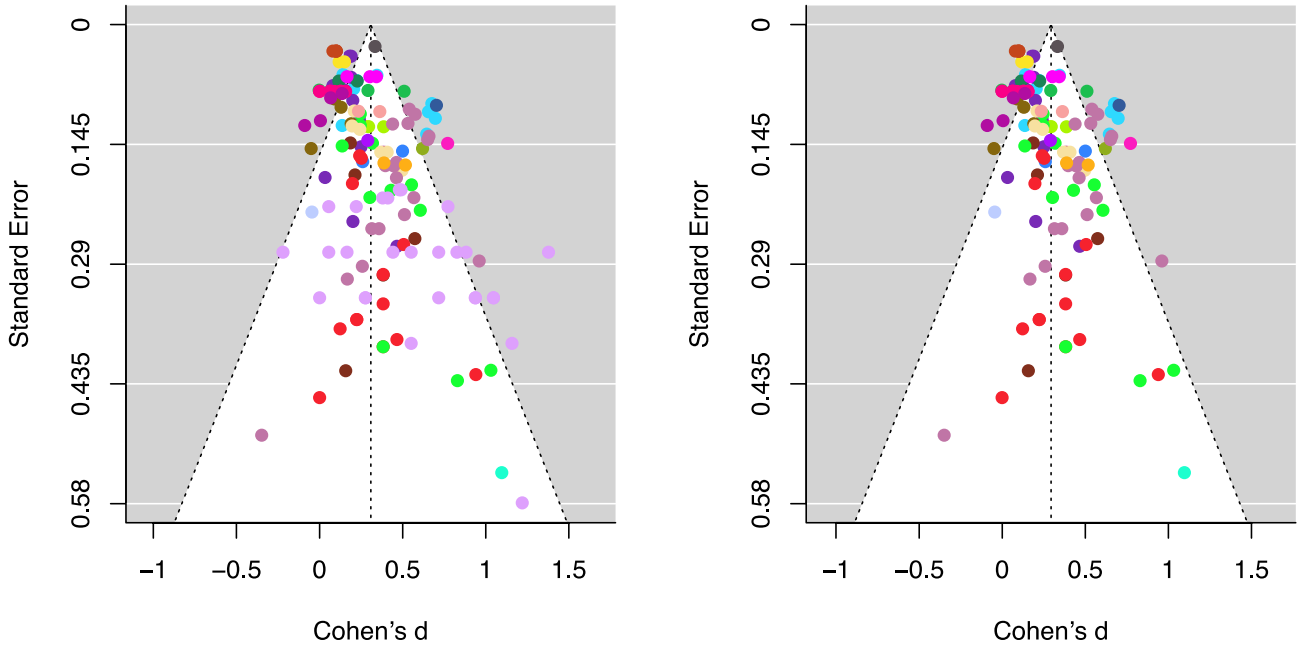
Note: *A Mendelian Randomisation study [32] met criteria for inclusion, but the effect sizes could not be accurately converted to Cohen's d (following consultation with the authors), so it was not included in the meta-analysis.

Figure S2. Meta-analysis of the unadjusted association between childhood maltreatment and mental health problems



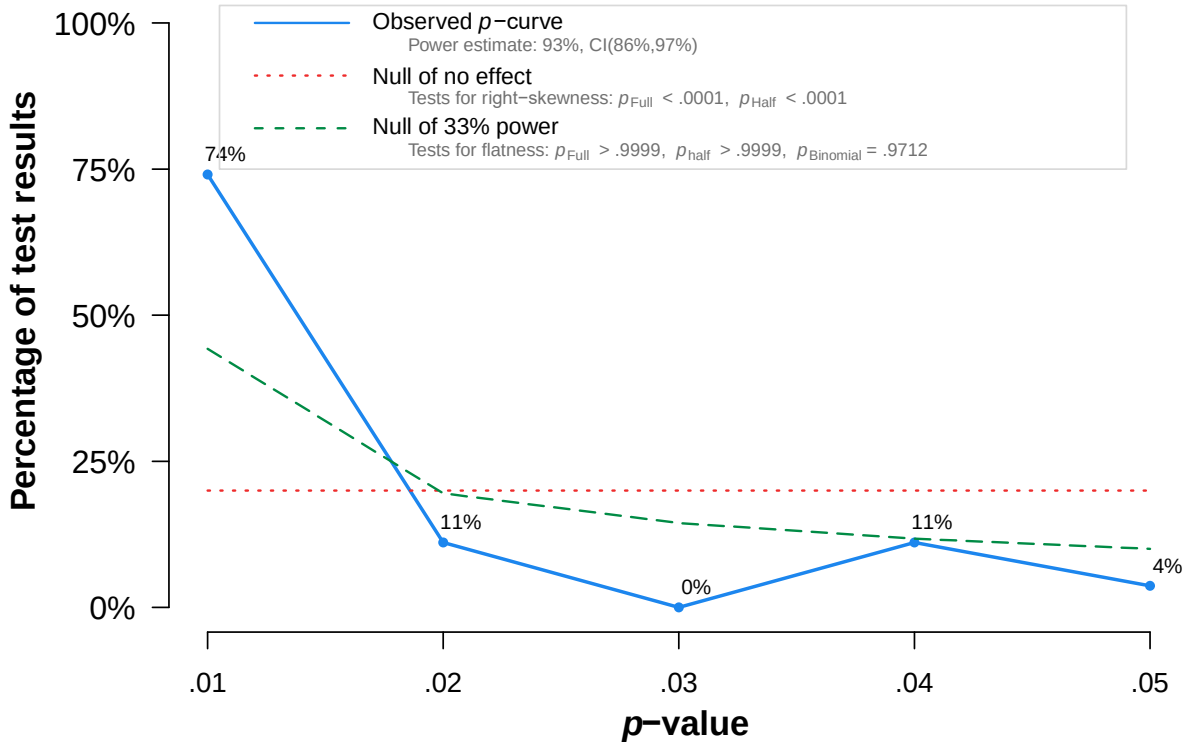
Note. I^2 for the MREM was 97.29, indicating that 97% of variation between effect sizes would remain if sampling error was eliminated.

Figure S3. Funnel plots



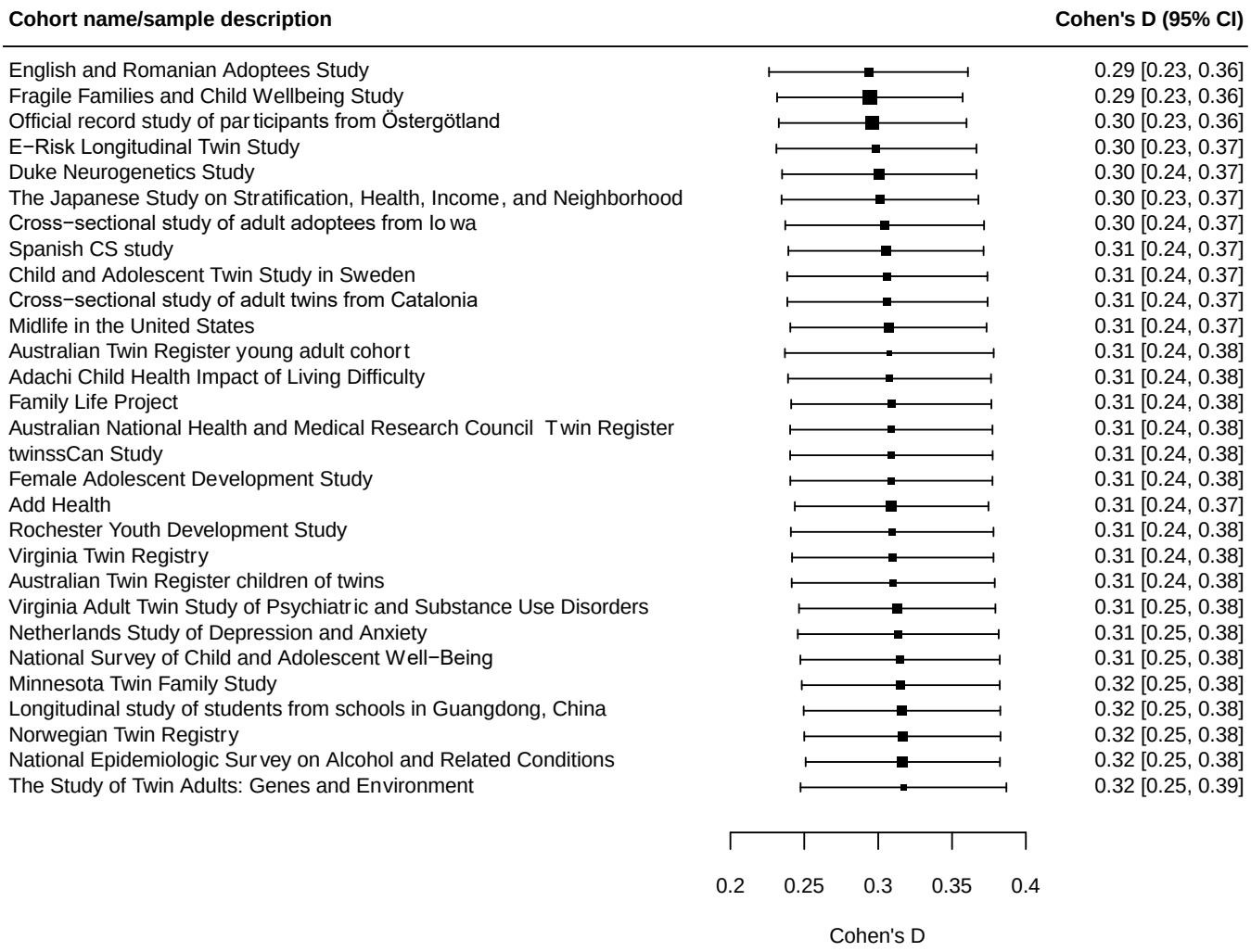
A shows all quasi-experimental adjusted effect sizes; B shows quasi-experimental adjusted effect sizes excluding the ERA Study (shown in pink in A). Colours represent independent samples.

Figure S4. P-curve analysis across study-averaged effect sizes



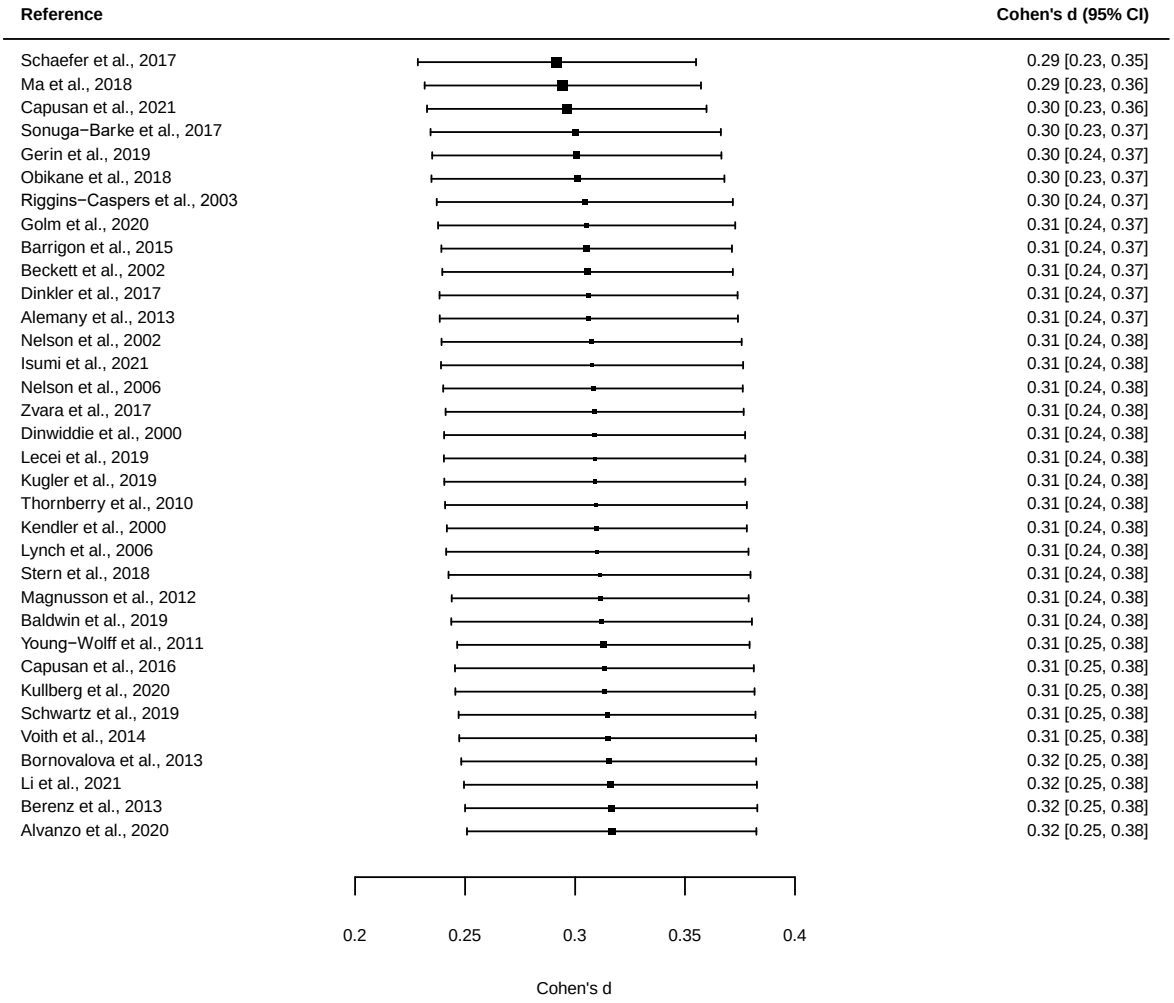
Note. The shape of the distribution of p-values diagnoses whether the findings contain evidential value, or whether selective reporting of studies (i.e., file-drawering) or analyses (i.e., p-hacking) are the only cause of statistically significant findings. True findings produce p-curves with a right-skewed distribution, containing more low than high statistically significant p-values (e.g., p≤0.01 vs p~0.04). Therefore, statistically significant right-skewed p-curves (tested against a null of no effect; see red dotted line) reflect evidential value. In contrast, findings linked to p-hacking or selective reporting produce p-curves with flat or left skew, with at least as many high significant p-values (e.g., p~0.04) than low (p≤0.01). To test whether the p-curve is flat, the observed p-curve is compared against a p-curve that would be expected if the studies had 33% power (see green dashed line), given that studies with greater power yield a steeper right-skewed p-curve.[33] If the observed p-curve is significantly flatter than the null of 33% power, it suggests that the p-curve is flat. This p-curve includes 27 statistically significant (p<0.05) results, of which 23 are p<0.025. There were 7 additional results excluded from p-curve analysis because they were p>0.05.

Figure S5. Leave-one-out analysis in which each cohort was omitted in turn from the meta-analysis



Note. Results were also consistent when removing each of the 156 effect sizes in turn: the meta-analytic effect ranged from ranged between Cohen's d = 0.29 to 0.31.

Figure S6. Leave-one-out analysis in which each cohort was omitted in turn from the meta-analysis



Note. Results were also consistent when removing each of the 156 effect sizes in turn: the meta-analytic effect ranged from ranged between Cohen's d = 0.29 to 0.31.

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