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Adverse childhood experiences and suicidality in low-income and middle-income countries: a systematic review and meta-analysis

Dawn-Li Blair ,[1] Mila Kingsbury ,[1] Heidi Eccles,[1] Asia Akther,[1] Sara Siddiqi ,[1] Georgia Condran ,[2] Ishika Obeegadoo ,[1] Joseph Murray ,[3] Marie-Claude Geoffroy ,[4] Ana M B Menezes,[3] Lindsey Sikora ,[5] Ian Colman [1]

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For numbered affiliations see end of article.

Correspondence to
Dr Ian Colman;
icolman@uottawa.ca

ABSTRACT

Introduction Suicide is an important public health problem with a complex aetiology; this includes adverse childhood experiences (ACEs). Common to suicide and ACEs research is a lack of evidence from low-income and middle-income countries (LMICs). This review aims to evaluate associations between ACEs and suicidality in LMICs.

Methods In this systematic review and meta-analysis, a search for articles investigating associations between any ACEs and suicidal outcomes in LMICs was conducted using Medline, Embase, PsycINFO, CINAHL and Web of Science on 2 December 2022; updated on 14 January 2025. Cross-sectional or cohort study research articles investigating ACEs prior to age 18 and using population-based, probabilistic or total population, sampling were eligible for inclusion. Suicidal outcomes across the spectrum were eligible for inclusion. Identified records underwent two-step screening by two independent reviewers; data extraction and risk of bias assessment using Joanna Briggs Institute Critical Appraisal tools were also completed in duplicate. Random-effects models were used to calculate pooled ORs. Articles that could not be meta-analysed were narratively synthesised. Reporting of this review was guided by the Preferred Reporting Items for Systematic Reviews and Meta-Analyses 2020 statement.

Results Ultimately, 118 articles were included; all were of low or moderate risk of bias and none reported on suicide mortality. Six ACEs were significantly associated with increased odds of suicidal outcomes: (1) bullying-victimisation, (2) emotional, verbal or psychological abuse victim, (3) parental separation, divorce or death, (4) physical abuse or violence victim, (5) physical attack victim and (6) sexual abuse victim. Significant ORs ranged from 1.19 to 2.61. Positive associations were found across subgroup and sensitivity analyses. Narrative review found statistically significant positive and non-significant associations between ACEs and suicidal outcomes.

Conclusions ACEs are associated with suicidal outcomes in LMICs, highlighting the need for early intervention strategies and multisector public health approaches to reducing ACEs and their potential impacts.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Previous reviews have found that adverse childhood experiences (ACEs) are associated with increased odds of suicidal outcomes, but there is a lack of evidence for this association in low-income and middle-income countries (LMICs) where 77% of suicide deaths occur. This review synthesised evidence on the association between any ACEs and suicidal outcomes in LMICs from Medline, Embase, PsycINFO, CINAHL and Web of Science (search conducted on 2 December 2022 and updated on 14 January 2025).

WHAT THIS STUDY ADDS

⇒ This novel review found that ACEs are associated with suicidal outcomes in LMICs, with significant pooled ORs between 1.19 (physical attack victim×suicide plan, 95% CI 1.07, 1.32) and 2.61 (sexual abuse victim×suicide plan, 95% CI 2.25, 2.98).

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ Positive associations between ACEs and suicidal outcomes in LMICs highlight the need for early suicide intervention strategies aimed at reducing the occurrence of ACEs. Furthermore, more research on the associations between ACEs and suicidality from low-income countries and using longitudinal study designs is needed.

INTRODUCTION

Despite suicide being preventable, each year there are over 700 000 suicide deaths worldwide and 77% occur in low-income and middle- income countries (LMICs).[1] In LMICs, the 2019 estimated age-standardised suicide rates per 100 000 people are 9.9 in low-income, 10.1 in lower-middle income and 7.3 in upper-middle-income countries.[2] More common than suicide mortality are self-harm

(ie, intentional self-injury distinct from other suicidal behaviours), suicide ideation (or suicidal thought), suicide planning and suicide attempt; throughout this review we refer to these four behaviours together as suicidal behaviours regardless of whether they result in fatality. Each of these behaviours is associated with an increased risk of suicide mortality[3]; we refer to this risk as suicidality.[4] Regarding suicide ideation and attempt, 2001–2007 estimates from the WHO World Mental Health Surveys indicated that the average 12-month prevalences in LMICs are 2.1% and 0.4%, respectively.[5] Moreover, within communities, an estimated 135 people are exposed to suicide per each suicide death, and exposure to suicide is associated with increased odds of subsequent suicidal behaviours[5 6]; notably, evidence for these community effects largely comes from high-income countries (HICs). Data on suicide and suicide behaviours in LMICs are limited, but current epidemiological research suggests that suicidal behaviour in LMICs differs from that in HICs.[6]

The aetiology of suicidal behaviours is complex, but widely recognised and well-researched dimensions of risk are adverse childhood experiences (ACEs). Interdisciplinary research on ACEs includes four broad categories: child maltreatment (eg, physical abuse), household dysfunction (eg, exposure to parental substance abuse), peer victimisation (eg, physical bullying) and community violence (eg, seen or heard shooting or threat of shooting with a gun).[7 8] ACEs can have a significant effect on a young person's development and are associated with a wide variety of negative physical and mental health outcomes. A global umbrella review and meta-analysis found that ACEs were associated with twofold higher odds of common mental disorders (eg, depression and anxiety) and suicidality.[9] This review did not investigate whether these associations were consistent across country income levels; however, it did highlight a lack of data from LMICs. ACEs occur worldwide, and the prevalence of reporting any ACE is reported to be similar across country income levels.[10] Still, certain ACEs, such as food insecurity and community violence, are more common in LMICs compared with HICs.[11 12] Furthermore, global estimates indicate that about 60% of adults have experienced at least one ACE.[13]

Common to both ACEs and suicide research is a lack of evidence from LMICs[6 11 14]; most research on both topics comes from HICs and may not be directly applicable to LMICs. Similarly, research on the association between ACEs and suicidal behaviours in LMICs is also limited. This is particularly significant given that the majority of suicides occur in LMICs.[1] Current evidence suggests that ACEs and suicidal behaviours present differently in LMICs compared to HICs; for example, the age and sex distributions of people who die by suicide differ, as do the types of ACEs children experience.[6 11 15] Furthermore, the associations themselves between ACEs and suicidal behaviours in LMICs are likely different from those associations in HICs. Several sociocultural and political factors likely influence these associations; for example, the relative lack of mental health services available in LMICs might negatively impact the suicidal behaviours of individuals who are exposed to ACEs.[16] Despite relevant differences in LMICs and HICs, the relationship between ACEs and suicidal behaviours in LMICs has yet to be cumulatively assessed.

Objectives

The aim of this systematic review is to evaluate associations between ACEs and suicidality in LMICs. This review will determine whether any specific ACEs are associated with suicidal outcomes and, where possible, calculate pooled ORs via meta-analysis. Where data are available, subgroup analyses based on sex and/or gender, age group and country income level will also be performed (chosen a priori).

METHODS

This systematic review and meta-analysis adhered to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) 2020 guidelines (online supplemental appendix I).[17] A reflexivity statement on equitable authorship in research from international partnerships is provided in online supplemental appendix II.

Search strategy and selection criteria

Peer-reviewed articles published in academic journals were eligible for inclusion based on the following:

- Study design: Only cross-sectional or cohort studies were included.
- Participants and setting: Articles using population-based probabilistic or total population sampling (ie, the entire target population was sampled) methods to investigate human participants from LMICs as defined by the World Bank in the 2023 fiscal year were included (low, lower-middle and upper-middle income were defined as gross national income per capita below US$1085, US$1086–US$4255 and US$4256–US$13 205, respectively).[18] Articles with data from LMICs and HICs were included if data from LMICs could be isolated; otherwise, the study was excluded. Clinical samples (eg, inpatients, HIV patients) were excluded to improve generalisability to the general population. Similarly, non-probability samples (eg, snowball sampling, convenience sampling) were also excluded.
- Exposure: Studies reporting on exposure to at least one ACE prior to the age of 18 were included. This included but was not limited to abuse (psychological, physical, sexual), household dysfunction (exposure to substance abuse, mental illness, criminal behaviour), exposure to household violence, parental divorce, parental death, neglect, foster care, bullying victimisation, victim of violence, homelessness, refugee experiences, natural disaster, kidnapping/abduction and exposure to war. Notable exclusions were studies reporting exclusively on 'left-behind children'; the

suicidal behaviours of left-behind children in LMICs have already been reviewed.[19]

- Comparators: Included studies had to have a comparison group of participants with no ACE exposure.
- Outcomes: Studies reporting on any suicidal outcomes (eg, self-harm, ideation, planning, attempt, mortality), including fatal and non-fatal behaviours, were eligible for inclusion. Notable exclusions were studies that reported exclusively on self-harm with non-suicidal intent (eg, non-suicidal self-injury).
- Timing: No exclusions were made based on publication date or follow-up period.
- Language: No exclusions were made based on language of publication.

The search followed guidance provided by PRISMA search.[20] The following databases were searched by a health sciences librarian (LS): Medline and Medline in Process via Ovid, Embase Classic+Embase via Ovid, PsycINFO via Ovid, CINAHL via EBSCOHost and Web of Science Core Collections (Editions: Social Sciences Citation Index, Arts & Humanities Citation Index, Conference Proceedings Citation Index—Science, Conference Proceedings Citation Index—Social Sciences, Emerging Sources Citation Index). There were no publication restrictions. A search strategy was developed using Medical Subject Headings (MeSH) and keywords in Medline, then translated to the other databases (online supplemental appendix III). The Medline search strategy was peer-reviewed using the Peer Review of Electronic Search Strategies (PRESS) tool by a research librarian (Nicholas Dehler). All databases were searched from their dates of inception to 2 December 2022; a search update was performed on 14 January 2025. All references were entered into an EndNote file for processing and duplicate removal, then uploaded to Covidence (Veritas Health Innovation, Melbourne, Australia) for additional duplicate removal and screening.

Two-step screening at the title/abstract and full-text levels was performed in duplicate. Two screeners (D-LB and IC) independently reviewed 200 random titles and abstracts, then discussed inconsistencies until consensus was obtained. Based on this piloting, a calibration exercise was developed to train five additional screeners (HE, AA, SS, GC and IO). The remaining titles and abstracts were independently reviewed by two screeners; a third independent screener (IC) resolved conflicts. Full texts were similarly screened in duplicate. At this stage, case–control studies, studies that were not population based or did not use weights or probabilistic sampling methods to ensure representativeness, and studies exclusively investigating left-behind children or non-suicidal self-injury were excluded. Reasons for exclusions were

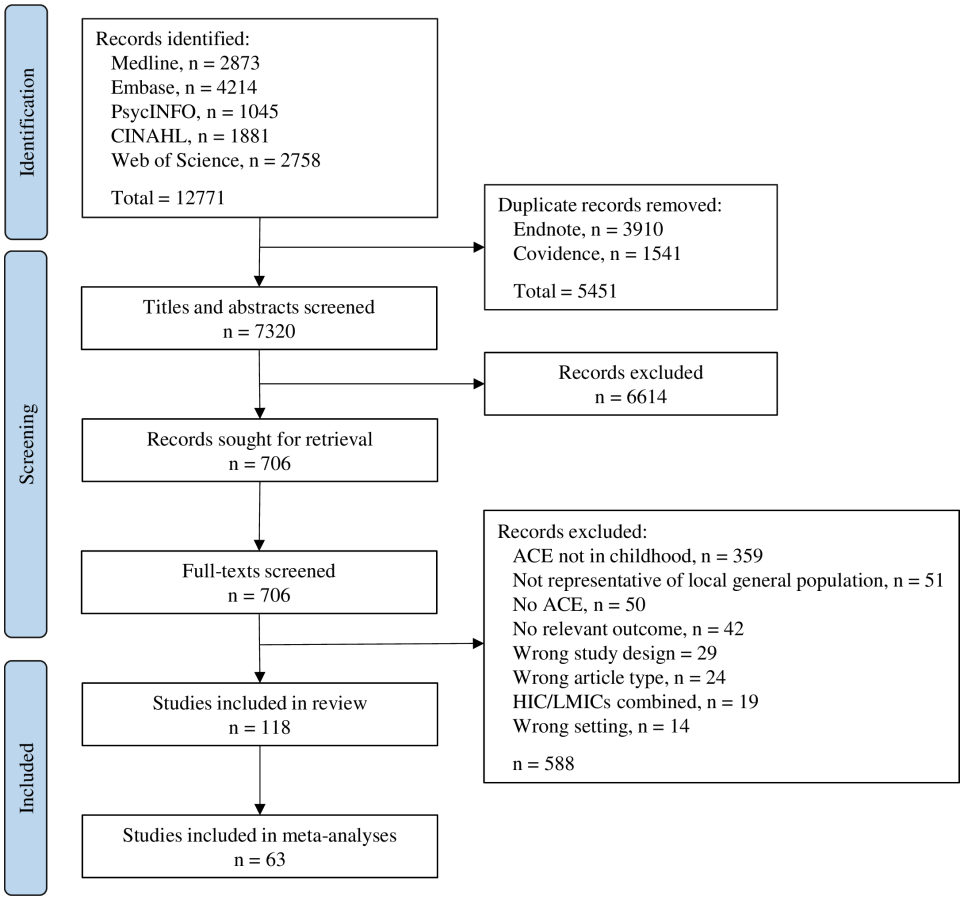

Figure 1 Preferred Reporting Items for Systematic Reviews and Meta-Analyses flow diagram. ACEs, adverse childhood experiences; HICs, high-income countries; LMICs, low-income and middle-income countries.

recorded during full-text screening (figure 1). During both screening steps, non-English articles were assessed using Google Translate.

A standardised data collection form was developed in Google Forms and Microsoft Excel (online supplemental appendix IV; includes all collected data items). To evaluate the risk of bias in each included study, the Joanna Briggs Institute (JBI) critical appraisal tools for cross-sectional and cohort studies were used.[21] These tools consist of 8 and 11 criteria, respectively, rated as yes (1 point), no (0 points), unclear (0 points) or not applicable (0 points). Final scores were summed with higher scores indicating lower risk of bias. JBI critical appraisal tools are used to assess the methodological quality and internal validity of research articles at the study level (not at the results level).[22]

Two extractors (D-LB and IC) independently collected data and assessed risk of bias from eight articles, then discussed inconsistencies until consensus was obtained. Based on this piloting, a calibration exercise was developed to onboard five additional data extractors (HE, AA, SS, GC and IO). Additionally, non-English articles were assessed by at least one fluent language speaker (six additional data extractors). Data collection and risk of bias assessment for the remaining articles were then independently performed by two extractors; conflicts were resolved by discussion with final decisions made by one author (D-LB). Data were extracted from the full text or supplementary materials. Multiple articles reporting on the same study (ie, same sample) were recorded, and the publication presenting the most up-to-date data was used as the primary reference. Data items included study characteristics (including the country where the study occurred), participant characteristics, ACE exposure information, suicidal outcome information and relevant results (including ORs). In situations where the measure of association and/or CI was not provided, the review team attempted to calculate these data based on information provided in the study. Any method of measuring ACE exposures or suicidal outcomes was eligible for inclusion.

Data analysis

Study characteristics of included articles were summarised using frequencies and percentages. Studies reporting ORs were eligible for meta-analysis; other measures of effect were not meta-analysed but were retained for narrative synthesis. If ORs for the same exposure-outcome combination were reported in at least five unique samples and no single article provided more than half of those ORs, a meta-analysis was performed. (Note: some articles reported on multiple samples.) A minimum of five samples was applied based on research showing that at least five are needed to ensure that power from a random effects meta-analysis is greater than that of the individual studies.[23] Under this condition, the R Studio (R V.4.2.2) meta package was used to pool ORs and 95% CIs using random effects meta-analysis. When multiple ORs were presented for the same exposure–outcome combination from the same sample, we prioritised using the final adjusted OR, followed by the OR representing the larger number of participants, and then the OR with the more conservative effect size, so that only one OR per sample was included in each meta-analysis.

Subgroup analyses based on sex and/or gender (female, male), age group at outcome (<18, ≥18) and country income level (low, lower-middle, upper-middle) were performed if at least five unique samples provided ORs for any subgroup and no single article provided more than half of those ORs. Similarly, three sensitivity analyses were also performed where possible. The first included only low risk of bias studies (JBI percentage score ≥70%) and the second included only studies that adjusted for sex and/or gender and age and/or school grade; these analyses were planned a priori. A third sensitivity analysis removed samples that relied on Global School-Based Student Health Survey (GSHS) data, which was identified as a potential source of homogeneity during screening.

Forest plots were used to visualise the results of each meta-analysis. Furthermore, I^2 and τ^2 (DerSimonian-Laird) statistics were calculated to assess between-study heterogeneity and variance. Where a meta-analysis included at least 10 samples, publication bias was assessed using funnel plots and Egger's tests.

Included articles that were not meta-analysed were retained for narrative synthesis.

Patient and public involvement

Patients or the public were not involved in the design, conduct, or reporting, or dissemination plans of our research.

RESULTS

The searches yielded 12 771 records which were reduced to 7329 after duplicate removal. After two-step screening and data extraction, 118 articles were included in this review (figure 1). The 118 included articles represented research from 67 LMICs in 6 World Bank Regions; the countries represented were largely in East Asia and Pacific (38.1%), Latin American and the Caribbean (22.0%) and sub-Saharan Africa (21.2%). Over half were published since 2020 (n=73, 61.9%), over half included participants exclusively under the age of 18 (n=70, 59.3%), most were from upper-middle-income countries (n=67, 56.8%), nearly all used cross-sectional methods (n=108, 91.5%), and nearly all were published in English (n=115, 97.5%) (table 1). The most commonly reported ACE was bullying-victimisation (n=51, 43.2%). The most commonly reported suicidal outcome was ideation (n=81, 68.6%); none of the included studies reported on suicide mortality. 106 articles were rated low risk of bias (89.8%); the rest were rated moderate risk. Relevant study characteristics and risk of bias assessments for each article are summarised in online supplemental Appendixes V and VI, respectively.

Table 1 Overview of included articles (N=118)

Description	Articles (N=118)	
	No. of articles (n)	% of articles (n/118)
World Bank Income Group		
Low-income	5	4.2
Lower-middle-income	32	27.1
Upper-middle-income	67	56.8
Mixed	14	11.9
World Bank Region		
East Asia and Pacific	45	38.1
Latin America and the Caribbean	26	22.0
Sub-Saharan Africa	25	21.2
South Asia	7	5.9
Middle East and North Africa	6	5.1
Europe and Central Asia	4	3.4
Mixed	5	4.2
Sample size		
≤1000	17	14.4
1001–2000	32	27.1
2001–5000	32	27.1
5001–10 000	18	15.3
≥10 001	19	16.1
Study design		
Cross-sectional	108	91.5
Cohort	10	8.5
Age group at outcome		
Child (<18)	70	59.3
Adult (≥18)	21	17.8
Mixed	21	17.8
Unclear	6	5.1
Decade of publication		
2000s	8	6.8
2010s	37	31.4
2020s	73	61.9
Language ofpublication		
English	113	95.8
Chinese	2	1.7
Spanish	3	2.5
Exposures*		
Bullying-victimisation (including cyberbullying)	51	43.2
Community violence	11	9.3
Emotional/verbal/psychological abuse victim	28	23.7
Food insecurity	13	11.0
Household/family violence	19	16.1
Parental separation/divorce/death	19	16.1
Physical abuse/violence victim	43	36.4
Physical attack victim	13	11.0
Sexual abuse victim	42	35.6
Other†	36	30.5
Cumulative or combined	39	33.1
Outcomes*		
Self-harm	7	5.9
Suicidal ideation	81	68.6
Suicide plan	25	21.2
Suicide attempt	52	44.1
Other or mixed‡	22	18.6
JBI Risk of Bias		
Low	106	89.8
Moderate	12	10.2

*Several articles report on multiple exposures and/or outcomes, therefore, the total number of articles is greater than 118.
†Other exposures include but are not limited to neglect, exposure to household mental Illness (including suicide), exposure to household incarceration, exposure to household substance use (alcohol or drugs), serious injury, physical illness, family death, orphanhood, food insecurity, economic adversity and unspecified abuse or trauma.
‡Other and mixed outcomes include combinations of the other outcomes listed as well as outcomes such as: likelihood of future suicide behaviour, suicide preparations and unspecified suicide behaviours.
JBI, Joanna Briggs Institute.

Of the 118 included articles, 63 reported ORs that were included in meta-analyses. The results of the meta-analyses, sensitivity analyses and subgroup analyses are summarised in table 2 with I^2 statistics, τ^2 statistics, and Egger's test p values, where appropriate. Forest and funnel plots, where appropriate, are presented in online supplemental appendix VII. Studies not included in meta-analyses either reported measures of effect other than ORs and/or reported on combined exposures or outcomes. These were retained for narrative synthesis which is summarised in online supplemental appendix VIII; none of these articles reported significant negative associations between ACEs and suicidal outcomes.

Bullying-victimisation (including cyberbullying): Meta-analyses found that childhood bullying-victimisation in LMICs was significantly associated with increased odds of suicidal ideation (OR 1.66; 95% CI 1.46, 1.85), plan (OR 1.46; 95% CI 1.29, 1.63) and attempt (OR 1.75; 95% CI 1.62, 1.96).[24–56] Where data were available for subgroup and sensitivity analyses, results remained significant. Of 15 articles that were narratively reviewed, 2 studies[57 58]

Table 2 Summary of meta-analyses, subgroup analyses and sensitivity analyses by ACE exposure

Outcome subgroup or sensitivity analysis	No. of articles*	Sample size (n)	OR (95% CI)	I^2 (τ^2)	Egger's test p value†
Bullying-victimisation (including cyberbullying)					
Suicide ideation	25	175514	1.66 (1.46, 1.85)	99% (0.19)	0.0747‡
Age group=child	21	168299	1.65 (1.45, 1.86)	99% (0.20)	0.0879‡
Gender=male	5	18514	1.27 (1.23, 1.31)	21% (0.00)	–
Country income level=lower-middle	12	52082	1.66 (1.38, 1.93)	86% (0.20)	<0.0001‡
Country income level=upper-middle	14	79038	1.72 (1.45, 1.99)	99% (0.20)	0.9887
GSHS studies removed	12	62470	1.88 (1.52, 2.25)	91% (0.30)	0.2162
Low risk of bias studies only	24	175027	1.64 (1.45, 1.84)	99% (0.20)	0.0806‡
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	12	150713	1.79 (1.48, 2.10)	100% (0.28)	0.1752
Suicide plan	12	113380	1.46 (1.29, 1.63)	99% (0.08)	0.1491
Country income level=lower-middle	5	20527	1.36 (1.08, 1.65)	75% (0.09)	–
Country income level=upper-middle	7	49965	1.55 (1.31, 1.79)	97% (0.09)	–
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	7	99246	1.52 (1.24, 1.80)	100% (0.14)	–
Suicide attempt	12	105845	1.79 (1.62, 1.96)	31% (0.03)	0.0107‡
Country income level=lower-middle	6	13189	1.72 (1.43, 2.01)	14% (0.04)	–
Country income level=upper-middle	6	47543	1.82 (1.57, 2.08)	54% (0.04)	–
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	8	93305	1.80 (1.56, 2.04)	49% (0.06)	–
Community violence					
Suicide ideation	7	19636	1.44 (0.98, 1.89)	77% (0.19)	–
Low risk of bias studies only	6	17882	1.35 (0.93, 1.78)	75% (0.15)	–
Emotional, verbal or psychological abuse vicitm					
Suicide ideation	10	69479	2.36 (1.95, 2.77)	86% (0.32)	0.7032
Country income level=lower-middle	5	11277	2.72 (2.05, 3.39)	46% (0.28)	–
Country income level=upper middle	4	54884	2.32 (1.80, 2.85)	93% (0.28)	–
GSHS studies removed	9	44305	2.43 (1.99, 2.88)	84% (0.34)	0.9363
Low risk of bias studies only	8	43818	2.39 (1.92, 2.86)	85% (0.36)	0.8492
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	6	50464	2.63 (2.04, 3.23)	90% (0.40)	–
Suicide attempt	9	40740	2.20 (1.80, 2.60)	57% (0.16)	0.3203
Country income level=upper-middle	6	32247	2.41 (2.08, 2.73)	57% (0.04)	–
Low risk of bias studies only	7	38835	2.17 (1.76, 2.59)	63% (0.17)	–
Food insecurity					
Suicide ideation	7	37253	1.07 (0.95, 1.18)	0% (0.00)	–
Age group=child	6	36234	1.07 (0.95, 1.18)	0% (0.00)	–
Suicide attempt	6	12017	1.02 (0.82, 1.21)	37% (0.02)	–
Household or family violence					
Suicide ideation	7	33882	1.51 (0.98, 2.05)	94% (0.43)	–
Low risk of bias studies only	6	33395	1.49 (0.87, 2.10)	95% (0.51)	–
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	5	32406	1.74 (1.29, 2.19)	94% (0.19)	–
Parental separation, divorce or death					
Suicide ideation	13	107659	1.39 (1.21, 1.58)	72% (0.06)	0.3010
Age group=child	6	72887	1.21 (1.10, 1.32)	6.7% (0.01)	–
Country income level=upper-middle	11	102452	1.34 (1.16, 1.52)	72% (0.05)	0.5509
GSHS studies removed	12	82485	1.42 (1.20, 1.63)	74% (0.08)	0.3219
Low risk of bias studies only	11	81998	1.41 (1.19, 1.62)	76% (0.08)	0.3904
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	8	95636	1.37 (1.16, 1.59)	81% (0.06)	–
Suicide attempt	7	79107	1.49 (1.11, 1.88)	72% (0.13)	–
Low risk of bias studies only	6	77830	1.52 (1.12, 1.92)	76% (0.14)	–

Continued

Table 2 Continued

Outcome subgroup or sensitivity analysis	No. of articles*	Sample size (n)	OR (95% CI)	I^2 (τ^2)	Egger's test p value†
Physical abuse or violence victim					
Suicide ideation	15	129 657	2.07 (1.74, 2.40)	83% (0.41)	0.1985
Gender=female	6	41 208	2.39 (1.90, 2.88)	76% (0.24)	–
Gender=male	6	26 220	1.97 (1.56, 2.39)	48% (0.13)	–
Country income level=lower-middle	6	43 611	2.19 (1.73, 2.66)	79% (0.58)	0.9587
Country income level=upper-middle	9	76 885	2.27 (1.81; 2.73)	80% (0.44)	0.9648
GSHS studies removed	14	104 483	2.07 (1.71, 2.42)	84% (0.45)	0.1945
Low risk of bias studies only	13	103 996	2.06 (1.69, 2.43)	85% (0.47)	0.1880
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	8	90 708	2.10 (1.59, 2.61)	88% (0.49)	–
Suicide attempt	14	149 125	2.24 (1.73, 2.75)	87% (0.75)	0.8096
Gender=female	5	34 062	2.45 (1.45, 3.45)	80% (0.77)	–
Gender=male	5	19 296	1.71 (0.82, 2.59)	58% (0.57)	–
Country income level=upper-middle	11	114 613	2.58 (1.99, 3.17)	85% (0.81)	0.0982‡
Low risk of bias studies only	12	147 220	2.25 (1.70, 2.80)	89% (0.81)	0.9152
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	10	130 119	2.34 (1.77, 2.90)	85% (0.66)	0.2953
Physical attack victim					
Suicide ideation	8	89 847	1.35 (1.06, 1.64)	84% (0.14)	–
Suicide plan	5	53 995	1.19 (1.07, 1.32)	0% (0.00)	–
Suicide attempt	5	53 995	1.33 (1.05, 1.60)	64% (0.07)	–
Sexual abuse victim					
Suicide ideation	19	109 979	2.35 (1.98, 2.73)	82% (0.47)	0.8927
Gender=female	6	35 915	2.85 (2.02, 3.67)	83% (0.72)	–
Age group=child	7	20 184	1.93 (1.65, 2.20)	0% (0.00)	–
Age group=adult	4	12 876	1.83 (1.42, 2.25)	3% (0.07)	–
Country income level=lower-middle	8	47 447	3.06 (2.44, 3.67)	84% (0.79)	0.0191
Country income level=upper-middle	11	59 214	2.56 (2.00, 3.12)	62% (0.79)	0.2026
GSHS studies removed	15	96 186	2.46 (2.01, 2.92)	83% (0.58)	0.9286
Low risk of bias studies only	18	109 492	2.37 (1.98, 2.77)	83% (0.51)	0.8566
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	9	74 609	2.63 (1.91, 3.35)	91% (0.93)	–
Suicide plan	4	35 760	2.61 (2.25, 2.98)	36% (0.04)	–
Suicide attempt	17	147 131	2.51 (2.06, 2.97)	75% (0.76)	0.8753
Country income level=upper-middle	13	106 353	2.60 (2.10, 3.10)	61% (0.69)	0.4005
GSHS studies removed	15	139 893	2.60 (2.11, 3.09)	72% (0.80)	0.5274
Low risk of bias studies only	15	145 226	2.52 (2.05, 2.99)	77% (0.79)	0.9969
Sex-adjusted and/or gender-adjusted and age-adjusted studies only	9	105 996	3.03 (2.20, 3.87)	88% (1.14)	–

*Meta-group, subgroup or sensitivity analysis was only performed if ORs for the same exposure outcome combination were reported in at least five unique samples and no single article provided more than half of those ORs. Since some articles reported on multiple samples occasionally fewer than five articles were analysed.
†Egger's test was performed if ORs for the same exposure outcome combination were reported in at least 10 unique samples. Since some articles reported on multiple samples occasionally fewer than ten articles were analysed.
‡Egger's test p values are significant, p<0.1.
GSHS, Global School-Based Student Health Survey.

found largely non-significant associations between childhood bullying-victimisation and suicidal outcomes in LMICs, and 11[59–69] found significant positive associations. The last two articles found mixed significant positive and non-significant associations depending on the suicidal outcomes investigated[70] and level of bullying involvement.[71]

Community violence: This ACE in LMICs was not significantly associated with increased odds of suicide ideation (OR 1.44; 95% CI 0.98, 1.89).[33 34 38 39 72–74] Non-significant results were also found when one study with moderate risk of bias was removed. Of six articles that were narratively reviewed, three had non-significant results,[75–77] two found significant positive associations,[78 79] and one

found mixed results depending on sex (non-significant for males, significant positive for females).[78 80]

Emotional, verbal or psychological abuse victim: Significantly higher odds of suicide ideation and attempt were found among LMIC residents who had experienced childhood emotional, verbal or psychological abuse (OR 2.36; 95% CI 1.95, 2.77 and OR 2.20; 95% CI 1.80, 2.60, respectively).[29 34 38 40 74 81–90] Subgroup and sensitivity analyses agreed with these findings. Six of 10 additional articles that were narratively reviewed found significant positive associations between childhood emotional, verbal or psychological abuse and suicidal outcomes[70 78 80 91–93]; the other four had non-significant results.[75 79 94 95]

Food insecurity: This ACE in LMICs was not significantly associated with increased odds of suicide ideation or attempt (OR 1.07; 95% CI 0.95, 1.18 and OR 1.02; 95% CI 0.82, 1.21, respectively).[32 35 39 48 50–52 56 63] Subgroup analysis for the ideation outcome where only child samples were included agreed with the original meta-analysis. Three articles that were narratively reviewed found significant positive associations between food insecurity and suicidal outcomes.[77 95 96]

Household/family violence: The association between exposure to childhood household or family violence with suicide ideation in LMICs was non-significant (OR 1.51; 95% CI 0.98, 2.05).[33 34 38 40 74 85 97] While this held true when one study with moderate risk of bias was removed, significantly increased odds of suicide ideation were found in the sensitivity analysis where only studies adjusting for sex and/or gender and age were included. Of seven articles narratively reviewed, four found significant positive associations between childhood exposure to household or family violence and suicidal outcomes,[78 79 88 92] two had non-significant results[75 76] and one found mixed results depending on sex (non-significant for males, significant positive for females).[80]

Parental separation/divorce/death: Meta-analysis found that parental separation, divorce or death in childhood was significantly associated with increased odds of suicide ideation (OR 1.39; 95% CI 1.21, 1.58) and attempt (OR 1.49; 95% CI 1.11, 188) in LMICs.[29 30 34 38 40 54 85 88 97–103] Subgroup and sensitivity analyses were only possible for the suicide ideation outcome; results remained significant. Three articles were narratively reviewed; however, two represented the same sample from Lebanon. These two found significant positive associations between parental separation in childhood and suicidal ideation.[91 104] The third article had non-significant associations.[95]

Physical abuse or violence victim: Significantly higher odds of suicide ideation and attempt among LMIC residents who experienced childhood physical abuse or violence were found in the meta-analyses (OR 2.07; 95% CI 1.74, 2.40 and OR 2.24; 95% CI 1.73, 2.75, respectively).[27 29 34 38 40 74 81 82 84–90 97 101 103 105–108] Subgroup and sensitivity analyses agreed with these findings. Narrative review of 14 additional articles found significant positive associations between childhood physical abuse or violence and suicidal outcomes in LMICs in 8 articles.[78 79 91–94 109 110] Four articles reported non-significant results[75 76 95 111] and two reported mixed significant positive and non-significant associations depending on sex[80] and the outcome investigated.[70]

Physical attack victim: This ACE was analysed separately from physical abuse or violence, given that sufficient data was available and given that physical attack was presented and measured separately in the literature. Childhood physical attack in LMICs was significantly associated with increased odds of suicide ideation, plan and attempt (OR 1.35; 95% CI 1.06, 1.64, OR 1.19; 95% CI 1.07, 1.32 and OR 1.33; 95% CI 1.05, 1.60, respectively)[27 32 35 37 50–53 55 96]; insufficient data were available for subgroup or sensitivity analyses. Three articles were narratively reviewed and found significant positive associations between childhood physical attack with suicide attempt in LMICs.[56 112 113] One of these articles included samples from over three dozen LMICs, and although overall results were significant, effect size and significance varied by country.[112]

Sexual abuse victim: In LMICs, childhood sexual abuse was associated with increased odds of suicide ideation, plan and attempt (OR 2.35; 95% CI 1.98, 2.73, OR 2.61; 95% CI 2.25, 2.98 and OR 2.51; 95% CI 2.06, 2.97, respectively).[25 31 34 35 38 40 72 74 81 82 85–88 90 96–98 101 105 108 114–118] Subgroup and sensitivity analysis was not possible for suicide plan, but results for suicide ideation and attempt remained significant. Among the 12 articles that were narratively reviewed, 5 found significant positive associations between childhood sexual abuse and suicidal outcomes.[78 79 91 110 119] Four articles reported non-significant results[70 75 76 95] and three reported mixed significant positive and non-significant associations depending on sex and/or gender and the outcome investigated.[80 120 121]

Other ACEs: Several other ACEs were reported in the included articles, but insufficient data were available for meta-analysis (eg, neglect, household mental illness, orphanhood). Narrative review of these articles found significant positive associations between the various ACE exposures and suicidal outcomes or non-significant associations.[32–35 37–40 51 53 56 63 70 75 76 78 79 85–89 91–98 101 103 116 122–126]

Cumulative or combined ACEs: 39 articles reported on the effects of cumulative or combined ACEs.[38 39 59 72 75 78–81 85–88 90 93 95 97 98 100 102 103 121 123 124 127–141] In the narrative review, 23 articles found significant positive associations, 3 found non-significant associations and 13 reported mixed significant positive and non-significant associations. 18 articles[38 72 78–81 88 90 95 97 102 103 121 123 132 134–136] investigated cumulative ACE exposure by categorising levels of exposure (eg, 0 ACEs, 1 ACE, 2–3 ACEs, ≥4 ACEs), but meta-analysis was inappropriate due to differences in ACEs included and categorisation used.

DISCUSSION

This is the first systematic review and meta-analysis of ACEs and suicidal outcomes in LMICs. Analysis of 118 studies identified 6 ACEs that were significantly

associated with increased odds of suicidal outcomes in LMICs: (1) bullying-victimisation, (2) emotional, verbal or psychological abuse victim, (3) parental separation, divorce or death, (4) physical abuse or violence victim, (5) physical attack victim and (6) sexual abuse victim. Meta-analysis determined that significant ORs were between 1.19 (physical attack×suicide plan, 95% CI 1.07, 1.32) and 2.61 (sexual abuse victim×suicide plan, 95% CI 2.25, 2.98). Positive associations were found across subgroup analyses investigating age, sex and/or gender, and country income level. Similarly, results were robust to sensitivity analyses, which investigated risk of bias, adjustments made for sex and/or gender and age, and GSHS data as a source of homogeneity. Narrative review found significant positive and non-significant associations between ACEs and suicidal outcomes; none of the articles that were narratively reviewed found significant negative associations.

Overall, these associations are consistent with other reviews where research from HICs is included,[9 142 143] but whether or not these associations are causal remains unclear.[144] The highest ORs were for the ACE of sexual abuse victim, which agrees with previous research,[142 143] although we did not conduct statistical tests to determine if differences between ACEs and suicidal outcomes were statistically significant. Moreover, our review excluded clinical samples, which improves the generalisability of our findings to the general population, but consequently may exclude more severe or clinically complex cases. A 2019 meta-analysis on childhood maltreatment and adult suicidality found similar ORs to our own results and no significant differences between community samples versus clinical samples.[143]

Regarding research gaps, additional studies on the associations between ACEs and suicidal behaviours from low-income countries and studies using cohort designs are needed. Representative, population-based, cohort studies will help establish sequences of events and identify potentially causal relationships in the general population. Where possible, these studies should also aim to investigate the putative impact of ACEs on suicide mortality and self-harm. These outcomes appear to be understudied in the current research.

Although this review used a comprehensive search strategy and was not limited to research published in English, there are still several limitations to recognise. First, there was substantial heterogeneity across studies. Although this was partially addressed in the subgroup and sensitivity analyses, additional sources of heterogeneity that were not explored in depth include: timeframes of ACE exposure (eg, past month for samples younger than 18 vs prior to age 18 for adult samples vs other time frames), time frame of outcome measures (eg, last week vs last year suicidal ideation vs other time frames) and adjustments for covariates. A second related limitation is the lack of meta-regression and lack of meta-analysis for cumulative ACEs. These analyses were omitted due to the large amount of methodological heterogeneity across relevant studies. Third, nearly all the studies included in this review were cross-sectional, prohibiting causal inference. Furthermore, these surveys often relied on self-reported exposure and outcome data which may inflate effect sizes due to shared variance. Fourth, although 29 of the 35 Egger's tests were non-significant, indicating no publication bias, there remains the possibility of this bias. This review comprised largely of studies from middle-income countries published in English in the last 14 years. The under-representation of other studies indicates sources of potential publication bias. Fifth, none of the studies included in this review reported on suicide mortality and only three reported on self-harm. Regarding mortality, lack of research may reflect the lack of vital registration systems in LMICs.[1]

In summary, this review reveals that ACEs are associated with suicidal outcomes in LMICs, highlighting the need for early intervention strategies in these countries and for whole society[145] public health approaches to reducing ACEs and their potential impacts on suicidal outcomes. Guidance for evidence-based child maltreatment prevention is provided by the WHO in their 2016 publication *INSPIRE, Seven strategies to end violence against children.*[146] These strategies align with the Convention on the Rights of the Child that all children have the right to be free from all forms of violence, with Sustainable Development Goal Target 16.2 which calls for the end of violence against children, and with WHO guidelines on parenting interventions to prevent maltreatment.[147] Prevention of childhood maltreatment will in turn help reduce the individual and community burdens of suicidal behaviours. Particularly relevant to LMICs is INSPIRE's fifth strategy which emphasises empowering families economically and reducing poverty to prevent child maltreatment and exposure to intimate partner violence. Reducing poverty is a complex issue which requires substantial efforts from multiple sectors, but among other benefits, such as improving child development outcomes,[148] those efforts could have important impacts on reducing ACEs and preventing suicides. Beyond reducing poverty and ACEs, direct public health efforts in LMICs are needed in suicide prevention. Effective strategies may include restricting access to lethal means of suicide, school-based awareness programmes and increasing access to treatment options for depression and other mental health conditions.[149] There is no single solution to the problems of ACEs or suicide that will fit the needs of all LMICs, but the current review demonstrates that an association exists between the two, highlighting the need for intervention.

Author affiliations
[1]School of Epidemiology and Public Health, University of Ottawa, Faculty of Medicine, Ottawa, Ontario, Canada
[2]Temerty Faculty of Medicine, University of Toronto, Toronto, Ontario, Canada
[3]Postgraduate Program in Epidemiology, Federal University of Pelotas, Pelotas, Brazil
[4]Department of Psychiatry, Douglas Mental Health University Institute, McGill University, Montreal, Quebec, Canada
[5]Health Sciences Library, University of Ottawa, Ottawa, Ontario, Canada

X Dawn-Li Blair @DawnLiBlair

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ORCID iDs
Dawn-Li Blair http://orcid.org/0000-0003-2382-0880
Mila Kingsbury http://orcid.org/0000-0001-9422-2381
Sara Siddiqi http://orcid.org/0000-0002-4818-2355
Georgia Condran http://orcid.org/0009-0003-3585-6474
Ishika Obeegadoo http://orcid.org/0009-0005-2296-6150
Joseph Murray http://orcid.org/0000-0002-5511-3454
Marie-Claude Geoffroy http://orcid.org/0000-0002-8587-8378
Lindsey Sikora http://orcid.org/0000-0002-9715-8634
Ian Colman http://orcid.org/0000-0001-5924-0277

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