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Doctopic: Primary Research

Prevalence of suicidal ideation and self-harm behaviours in children aged 12 years and younger: a systematic review and meta-analysis

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Summary

Background Suicide in children is a pressing public health concern. The increasing number of deaths by suicide and emergency visits for suicidal ideation and self-harm in children might not be fully representative; it is likely that many more children are in distress but do not seek out help. We conducted a systematic review and meta-analysis of existing studies to quantify the prevalence of suicidal ideation and self-harm behaviours among children in the community aged 12 years and younger.

Methods In this systematic review and meta-analysis, we searched PsycINFO, MEDLINE, and Web of Science via OVID from database inception to Feb 28, 2022, for articles published in French or English that reported estimates of prevalence of suicidal ideation (including suicide planning) and self-harm behaviours (namely, self-harm, suicide attempts, and non-suicidal self-injury) in children aged 12 years and younger. Reference lists were also searched; case studies, qualitative studies, and health-care visit studies were excluded. The outcomes were suicidal ideation, suicide plan or attempts, and self-harm. We used a random-effects model to calculate the overall pooled prevalence of suicidal ideation and self-harm behaviours for all timeframes combined and for ever versus the past 12 months for suicidal ideation. We used the Joanna Briggs Institute Critical Appraisal tool to evaluate the risk of bias in each study. This study is registered with PROSPERO, CRD42020179041.

Findings 28 articles, encompassing 30 studies overall, met the inclusion criteria, aggregating findings from 98 044 children (of whom 46 980 [50·5%] were girls and 46 136 [49·5%] were boys; six articles did not report sex or gender) aged 6–12 years. The pooled prevalence estimate was 7·5% (95% CI 5·9–9·6) for suicidal ideation from 28 studies and 2·2% (2·0–2·5) for suicide planning from three studies. The pooled prevalence was 1·4% (0·4–4·7) for self-harm from four studies, 1·3% (1·0–1·9) for suicide attempt from six studies, and 21·9% (6·2–54·5) for non-suicidal self-injury from two studies. The prevalence of suicidal ideation was higher in studies that included child-reported outcomes (10·9% [95% CI 8·1–14·5] for child only and 10·4% [6·8–15·5] for child and parent combined) than for parent-only reported outcomes (4·7% [3·4–6·6]; p=0·0004). The prevalence of suicidal ideation and self-harm behaviours was similar in boys and girls (suicidal ideation, 7·9% [95% CI 5·2–12·0] for boys *vs* 6·4% [3·7–10·7] for girls; self-harm behaviours, 3·5% [1·6–7·2] for boys *vs* 3·0% [1·4–6·4%] for girls). Detailed ethnicity data were not available. High heterogeneity was identified across estimates (I^2>90%), which was not well explained by the characteristics of the studies.

Interpretation A high number of children in the general population can experience suicidal ideation and self-harm behaviours, thus underlining the need for more research on childhood suicide, including developmentally appropriate preventive strategies, such as youth-nominated support teams or dialectical behavioural therapy.

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Introduction

Suicide risk in children aged 12 years and younger is a growing concern. Although suicide before adolescence is uncommon, the number of suicides[1] and the number of emergency visits for suicidal ideation and suicide attempts[2] among children have increased in the USA. A 2019 study tracking the number of children and adolescents aged 5–18 years with suicidal ideation or attempts across 300 emergency rooms in the USA reported that 690 (43%) of 1613 visits were by children aged 5–11 years.[2] Notably, a large number of children who experience distress probably do not seek help; therefore, it is probable that this alarming trend is not fully representative.[3]

The prevalence of suicidal ideation and self-harm behaviours has been well documented in adolescents (with an estimated lifetime prevalence of 12·1% for suicidal ideation, 4·0% for suicide planning, and 4·1% for

Research in Context

Evidence before this study

We searched MEDLINE, PsycINFO, and Web of Science on the OVID platform and backward citations for studies published from database inception to Feb 28, 2022, using terms related to suicide ('suicid*', 'self injur*', 'self mutilat*', 'auto mutilat*', 'parasuicid*', 'self poison*', 'self injurious behavio*', 'self harm*', or 'self destruct*'), combined with terms relevant to children ('child*', 'pediatric*', 'school age*', 'schoolage*', 'pre adolescen*', 'preadolescen*', 'elementary 'school*', 'primary school*', 'pre teen*', 'preteen*', 'kindergarten*', 'nursery school*', 'daycare*', 'day care*', 'pre school*', 'preschool*', 'young adolescen*', 'latency age', 'first grade*', 'second grade*', 'third grade*', 'fourth grade*', 'fifth grade*', or 'sixth grade*'), in the title. Studies were included if they were in French or in English and reported prevalence of suicidal ideation, suicide plan, self-harm, suicide attempt, or non-suicidal self-injury in children aged 12 years or younger from the community. We identified several studies reporting the prevalence of suicidal ideation and self-harm behaviour in children aged 12 and younger, but those studies were highly heterogenous (eg, sampling and sample sizes). We found no previous systematic reviews or meta-analyses.

Added value of this study

To our knowledge, this is the first systematic review and meta-analysis estimating the prevalence of suicidal ideation and self-harm behaviours in children aged 12 years and younger in the general population. We estimated a prevalence of 7·5% for suicidal ideation, 2·2% for suicide planning, 1·4% for self-harm, 1·3% for suicide attempts, and 21·9% for non-suicidal self-injury. Studies asking children about suicidal ideation yielded a higher prevalence than those asking parents. Overall, the prevalence of suicidal ideation and self-harm behaviour was similar in boys and girls.

Implications of all the available evidence

In the general population, suicidal ideation and, to a lesser extent, self-harm behaviours are common among children aged 12 years and younger. Existing strategies have shown some benefits in preventing suicidal ideation and self-harm behaviours in adolescents (eg, awareness and skills training) and for at-risk youths (eg, dialectical behavioural therapy, cognitive behavioural therapy, and youth-nominated support teams). It is unclear, however, whether such interventions are developmentally appropriate for younger children and therefore this should be investigated.

suicide attempts).[4–6] To our knowledge, there are no systematic reviews documenting the prevalence of suicidal ideation and self-harm behaviours in children aged 12 years and younger, as it was assumed to be very low.

The aim of this study was to conduct a systematic review of the literature on the prevalence of suicidal ideation (including suicide planning), self-harm, suicide attempt, and non-suicidal self-injury (NSSI, also known as self-harm without suicidal intent) in community samples of children aged 12 years and younger. We aimed to calculate pooled prevalence estimates via meta-analysis methods and, where possible, compare subgroups on the basis of sex (boys *vs* girls), timeframe (ever *vs* past 12 months), informant source (child *vs* child and parent combined *vs* parent only), assessment type (questionnaire *vs* interview), and continent (North America *vs* Europe *vs* Asia). These data will inform decision making and help to guide future research, including surveillance and prevention of childhood suicide and mental health problems.

Methods

Search strategy and selection criteria

This systematic review and meta-analysis was performed in accordance with the Preferred Reporting Items for Systematic reviews and Meta-Analyses (PRISMA) 2020 guidelines.[7] The study protocol was registered with PROSPERO, CRD42020179041.

See Online for appendix

Studies were eligible for inclusion in this study if they: (1) included children aged 12 years and younger from the community; (2) reported prevalence of suicidal ideation (including suicide planning) and self-harm behaviours, specifically self-harm, suicide attempt, and NSSI; (3) were published in peer-reviewed journals in French or in English; and (4) included original data. Studies reporting prevalence from samples combining children and adolescents were included only if the mean age of the sample was less than 12 years (eg, 7–16 years; mean age 11·9 years). Case studies, qualitative studies, and health-care visit studies were excluded. Grey literature were not included. There were no other restrictions on study design.

One author (MP) searched MEDLINE, PsycINFO, and Web of Science via OVID for published articles (from database inception to Feb 28, 2022) reporting on the prevalence of suicidal ideation and self-harm in children. Reference lists of all included papers were searched manually, as were studies citing the included articles.

In our search, we combined terms related to suicide (eg, suicidal ideation, self-harm, suicide attempt, and NSSI, including by self-poisoning) and children (eg, child, preadolescent, school-aged) in the title. These search terms were based on those used in previous systematic reviews on suicide.[8] Our search terms were initially developed for MEDLINE and translated for the other databases. A complete list of search terms for MEDLINE is included in the appendix (p 1).

Four authors (EC, SB, MP, and M-CG) determined the eligibility of titles and abstracts after duplicates were removed, using a masked standardised protocol. In pairs,

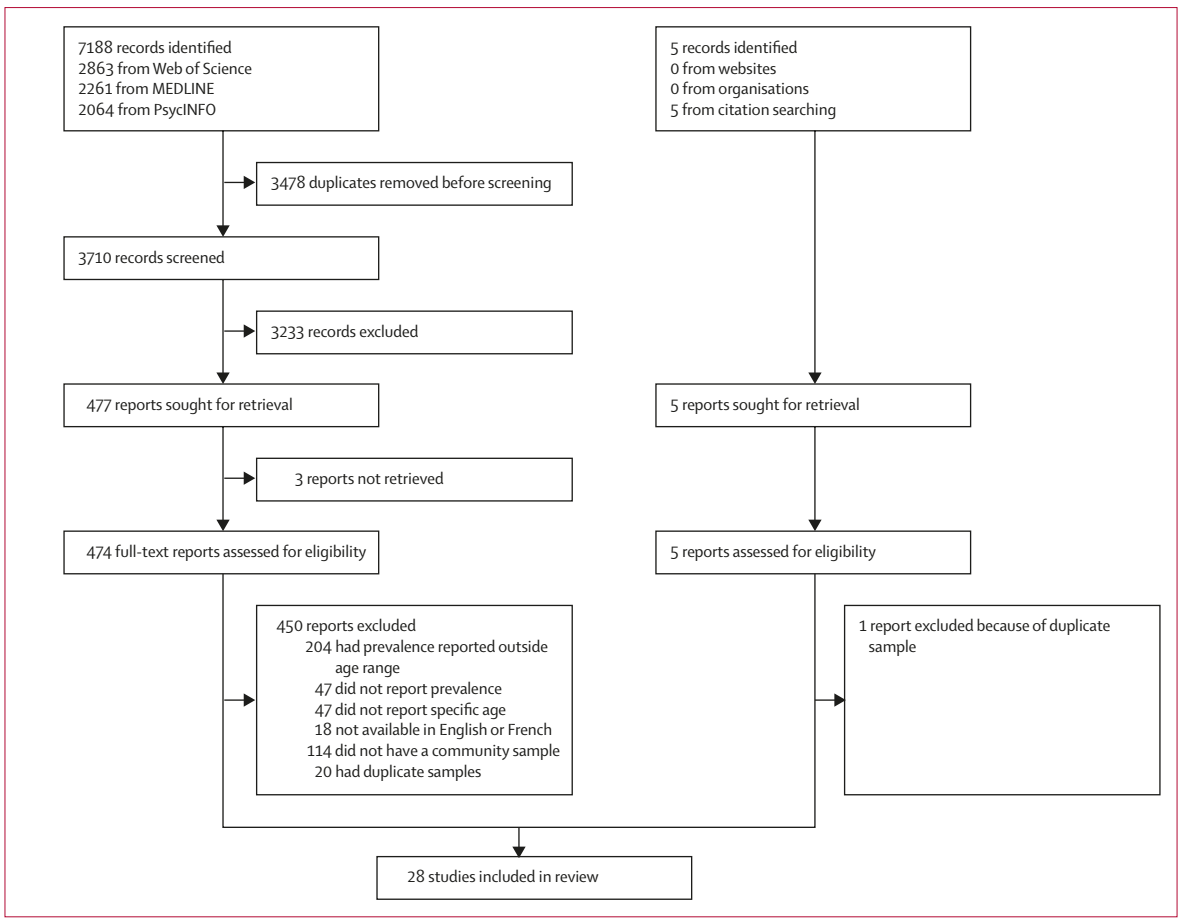

Figure 1: **Study selection**

authors independently reviewed 50% of the records, with an abstract screening tool consisting of a list of eligibility criteria that was based on best practice guidelines for abstract screening for large-evidence systematic reviews and meta-analysis.[9] The pairs of authors (EC and M-CG; MP and SB) independently screened the full text of all eligible abstracts for inclusion in a concealed manner, using Rayyn with a blind filter. Disagreements between researchers were resolved through discussion and, if necessary, consultation with a fifth author (MO).

Data collection process, outcomes, and risk of bias assessment

The primary investigator (M-CG) developed a data extraction form on Microsoft Excel. Three authors (SB, EC, and M-CG) extracted the data, and three others (IC, BK, and MO) verified the accuracy of data extraction; discrepancies were resolved through discussion. Extracted data included: first author of the paper, year of publication, study location, year of data collection, sample characteristics (eg, total number in sample within our age range, mean age, and proportion of female individuals), type of suicide-related outcomes (ie, suicidal ideation, self-harm, suicide attempt, or NSSI), assessment method (ie, interview or questionnaire), timeframe (ie, ever, past 12 months, past 6 months, past 2 weeks, or current), and informant (ie, child, parent, or child and parent combined). Outcomes of interest were suicidal ideation (including suicide planning) and self-harm behaviours (self-harm, NSSI, and suicide attempt), which were defined using the recommended nomenclature of suicidal behaviours from the International Association for Suicide Prevention; definitions are provided in the appendix (p 2).[10]

We used the Joanna Briggs Institute Critical Appraisal tool[11] to evaluate the risk of bias in each of the included studies. This tool consists of nine criteria rated as yes (1 point), no (0 points), not applicable (0 points), or unclear (0 points), with a global score for each study ranging from 0 to 9. Higher scores represent higher quality studies.

Statistical analysis

Analyses were conducted using the Meta package in R, version 4.1.2. We used meta-analysis to calculate the prevalence of suicidal ideation and self-harm behaviours across all available non-overlapping studies. When more

	Population					Suicide-related outcomes						
	Study location	Year of data collection	Sample size	Age, years*	Proportion of female individuals, %	Suicidal ideation (including planning)	Self-harm	Suicide attempt	Non-suicidal self-injury	Assessment method	Timeframe	Informant source
Aitken et al (2016)[13]	USA	1999	911	6–12	47%	Yes	Yes	No	No	Questionnaire	Past 6 months	Parent
Bal et al (2021),[34] sample 1	South Korea	2006–09	14337	9·3 (1·7); 7–12	50·3%	Yes	No	No	No	Questionnaire	Ever	Parent
Bal et al (2021),[34] sample 2	South Korea	NA	3702	10·9 (1·0); 6–14	49·5%	Yes	No	No	No	Questionnaire	Ever	Parent
Bal et al (2021),[34] sample 3	South Korea	NA	4837	8·8 (1·5);	48·0%	Yes	No	No	No	Questionnaire	Ever	Parent
Bauer et al (2018)[14]	USA	NA	235	8·9 (1·5); 7–12	49%	Yes	No	No	No	Interview and questionnaire	Ever	Parent and child
Chavez-Hernandez et al (2018)[15]	Mexico	NA	83	9·3 (1·8); 6–12	31%	Yes	No	No	No	Questionnaire	Past 2 weeks	Child
Cho (2020)[16]	South Korea	2015	297	11–12	NA	No	No	Yes	No	Questionnaire	Ever	Child
DeVille et al (2020)[17]	USA	2016–18	11814	9·9 (0·6); 9–10	52%	Yes	No	Yes	Yes	Questionnaire	Ever	Parent and child
Eggermont et al (2021)[35]	Belgium	NA	215	9–12	NA	No	No	No	Yes	Questionnaire	Ever	Child
Feng et al (2016)[18]	Canada	2010–11	3639	<11–12	NA	Yes	No	No	No	Questionnaire	Past 12 months	Child
Finzi et al (2001)[19]	Israel	NA	35	6–12	NA	Yes	No	No	No	Interview	Past 6 months	Child
Freeman et al (1993)[37]	USA	NA	223	6–12	47%	Yes	No	No	No	Interview	Past 2 weeks	Child
Fujiwara, et al (2017)[20]	Japan	2013–14	77	6–9	56%	Yes	No	No	No	Interview	Ever	Child
Gould et al (1998)[38]	USA	NA	593	7–12	51%	Yes	No	Yes	No	Interview	Past 6 months	Parent
Herba et al (2007)[21]	Netherlands	1983–87	1297	9·2 (1·8); 4–11	51%	Yes	No	No	No	Questionnaire	Past 6 months	Parent
James et al (2021)[22]	USA	NA	353	9·3 (1·5); 7–11	48%	Yes	No	No	No	Interview	Ever	Parent and child
Kahsani et al (1989)[23]	USA	NA	140	10·0 (NA); 8–12	50%	Yes	No	No	No	Interview	Ever	Child
Klimes-Dougan et al (1999)[24]	USA	NA	60	9·3 (1·1)	NA	Yes	No	No	No	Interview	Ever	Child
Kovess-Masfety et al (2015)[25]	Europe	2010	7062	6–12	48–50%	Yes	No	No	No	Questionnaire	Current	Child
Larsson et al (1992)[40]	Europe	NA	471	10·6 (1·3); 8–13	51%	Yes	No	No	No	Questionnaire	Past 2 weeks	Child
Lincoln et al (2017)[26]	USA	NA	30	11·2 (3·3); 6–16	50%	Yes	No	Yes	No	Interview and questionnaire	Ever	Parent and child
MacMullin et al (2020)[27]	Canada	2016	1923	6–12	49%	Yes	Yes	No	No	Questionnaire	Past 6 months	Mother
Mayes et al (2014)[28]	USA	NA	658	8·7 (1·7); 6–13	48%	Yes	Yes	No	No	Questionnaire	Past 12 months	Parent
Miller et al (2017)[29]	USA	NA	682	11·8 (2·4); 7–18	NA	Yes	No	No	No	Interview	Ever	Child
Min et al (2012)[30]	South Korea	2007	707	6·3 (0·5)	51%	Yes	No	No	No	Questionnaire	Past several months	Mother
Pfeffer et al (1986)[31]	USA	1981–82	101	9·7 (NA); 6–12	30%	Yes	No	Yes	No	Interview	Past 6 months	Parent and child
Riesch et al (2008)[32]	USA	NA	169	11·5 (0·8); 10–14·5	46%	Yes	No	No	No	Questionnaire	Ever	Child

(Table 1 continues on next page)

	Population					Suicide-related outcomes						
	Study location	Year of data collection	Sample size	Age, years*	Proportion of female individuals, %	Suicidal ideation (including planning)	Self-harm	Suicide attempt	Non-suicidal self-injury	Assessment method	Timeframe	Informant source
(Continued from previous page)												
Shin et al (2009)[33]	South Korea	1998–2000	1857	6·9 (0·4)	51%	Yes	Yes	No	No	Questionnaire	Past 6 months	Parent
Van Hove et al (2021)[36]	Belgium	2005	1177	9·5 (0·5)	49·6%	Yes	No	No	No	Questionnaire	Ever	Parent
Walsh et al (2021)[39]†	USA	2010	40 359	11–12	51%	Yes	No	Yes	No	Questionnaire	Past 12 months	Child

NA=not available. *Data are presented as mean (SD); range. †Study included the 2007 and 2010 surveys of the Minnesota Departments of Education, Health, Human Services, and Public Safety. As both surveys are based on the same populations, we selected the 2010 survey; results from 2007 and 2010 were similar. ‡ Article by Bal and colleagues[34] includes three different samples.

Table 1: **Characteristics of the 28 included articles‡**

than one article used data for the same suicide-related outcomes from the same sample, the article reporting the most detailed prevalence and the largest sample size was retained in data synthesis. Forest plots were used to represent results graphically. We assessed heterogeneity across studies using Cochran's Q test (a statistically significant test that suggests the presence of heterogeneity) and the I^2 index (in which higher values represent higher heterogeneity). Given the many observed and expected differences (eg, study design, sample size, quality, and participant characteristics), we used a random-effects model to calculate the overall pooled prevalence of suicidal ideation and self-harm behaviours (ie, a generalised linear model with mixed-effects on logit-transformed proportions), with 95% CIs.[12]

The prevalence of suicidal ideation and self-harm behaviours was calculated for all timeframes combined, as well as for timeframe subgroups (ever *vs* past 12 months) for suicidal ideation (because of the number of studies within each subgroup). Risk of publication bias was assessed with visual inspection of the funnel plots and further explored using the Egger test and the Duval and Tweedie trim-and-fill method. We also used the leave-one-out analysis, sequentially removing one study at a time to compute the pooled estimates, to explore whether any of the included studies substantially influenced the final pooled estimates.

We used meta-regression and subgroup analysis to explore the heterogeneity in suicidal ideation and behaviour prevalence. Meta-regression was used for continuous variables: study risk of bias score, child's mean age, and year of publication. Subgroup analyses were used to explore the role of categorical variables. We considered timeframe (ever *vs* past 12 months), sex (boys *vs* girls), informants (child only *vs* child and parent combined *vs* parent only), method of assessment (interview *vs* questionnaire), and continent (North America *vs* Europe *vs* Asia) as factors of interest.

This systematic review and meta-analysis is registered with PROSPERO, CRD42020179041.

Role of the funding source

The funders of the study had no role in study design, data collection, data analysis, data interpretation, or writing of the report.

Results

We identified 7188 records through database searches. After removing duplicates, we screened 3710 records, of which we reviewed 474 full-text articles, and retained 24 articles for analysis (figure 1).[13–36] We searched for documents that cited any of the included studies as well as references listed in the included studies and identified four additional articles.[37–40] 28 articles were included in the final analysis; one of these articles[34] reported prevalence for three individual samples, resulting in 30 studies being included overall (table 1).

Information on suicidal ideation and self-harm behaviours in the included articles was from research conducted between 1980 and 2018, but 16 studies published between 1989 and 2021 did not specify the time of data collection. Overall, 17 studies reported from North America (14 from the USA, two from Canada, and one from Mexico), seven from Asia (six from South Korea and one from Japan), five from European countries (including Belgium and the Netherlands), one from Israel, and none from low-income countries. A total of 98 044 children aged 6–12 years were included in this review (46 980 [50·5%] were girls and 46 136 [49·5%] were boys [six articles did not report sex or gender]; mean age 9·5 years [SD 1·4]), with sample sizes ranging from 30 in one study[26] to 40 359 in another.[39] Suicidal ideation was an outcome in 28 (93%) studies, self-harm in four (13%), suicide attempt in six (20%), and NSSI in two (7%). Of the 30 studies, self-harm behaviours were assessed by questionnaire in 19 (63%), by interview in nine (30%), and by questionnaire and interview in two (7%); 14 (47%) were addressed to the child, 11 (37%) to the parent, and five (17%) to both the child and parent. For prevalence of suicidal ideation, we included three (11%) of 28 studies estimating prevalence in the past

	Item 1*	Item 2†	Item 3‡	Item 4§	Item 5¶	Item 6‖	Item 7**	Item 8††	Item 9‡‡	Total
Aitken et al (2016)[13]	Yes	Unclear	Yes	No	Unclear	No	NA	Yes	Unclear	3
Bal et al (2021),[34] sample 1	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	No	6
Bal et al (2021),[34] sample 2	Unclear	Unclear	Yes	Yes	Yes	No	NA	Yes	Unclear	4
Bal et al (2021),[34] sample 3	Unclear	Unclear	Yes	Yes	Yes	No	NA	Yes	Unclear	4
Bauer et al (2018)[14]	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	7
Chavez-Hernandez et al (2018)[15]	Yes	No	No	Yes	No	No	NA	Yes	Unclear	3
Cho (2020)[16]	Yes	Yes	No	Yes	Yes	No	NA	Yes	Unclear	5
DeVille et al (2020)[17]	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Yes	7
Eggermont et al (2021)[35]	Yes	No	Yes	No	Unclear	No	NA	Yes	Yes	4
Feng et al (2016)[18]	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	No	6
Finzi et al (2001)[19]	Yes	No	No	No	No	Yes	Yes	Yes	Unclear	4
Freeman et al (1993)[37]	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Unclear	7
Fujiwara et al (2017)[20]	Yes	No	No	No	Yes	Yes	Yes	Yes	No	5
Gould et al (1998)[38]	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	9
Herba et al (2007)[21]	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Unclear	6
James et al, 2021[22]	Yes	No	Yes	Yes	Yes	Yes	Unclear	Yes	Unclear	6
Kashani et al (1989)[23]	Yes	Unclear	No	Yes	Unclear	Yes	Yes	Yes	Unclear	5
Klimes-Dougan et al (1999)[24]	Unclear	No	No	No	Unclear	Yes	Unclear	Yes	Unclear	2
Kovess-Masfety et al (2015)[25]	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Unclear	6
Larsson et al (1992)[40]	No	Yes	Yes	Yes	No	No	NA	Yes	No	4
Lincoln et al (2017)[26]	No	No	No	Yes	Yes	Yes	Unclear	Yes	Unclear	4
MacMullin et al (2020)[27]	Yes	No	Yes	Yes	Yes	No	NA	Yes	Unclear	5
Mayes et al (2014)[28]	No	Yes	Yes	Yes	Yes	No	NA	Yes	Unclear	5
Miller et al (2017)[29]	No	No	Yes	No	Yes	Yes	Yes	Yes	Unclear	5
Min et al (2012)[30]	Unclear	Yes	Yes	Yes	Yes	No	NA	Yes	No	5
Pfeffer et al (1986)[31]	Yes	No	No	Yes	No	Yes	Yes	Yes	Unclear	5
Riesch et al (2008)[32]	No	No	No	Yes	Unclear	No	NA	Yes	Unclear	2
Shin et al (2009)[33]	Unclear	No	Yes	Yes	Yes	No	NA	Yes	No	4
Van Hove et al (2021)[36]	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	No	6
Walsh et al (2021)[39]§§	Yes	Yes	Yes	Yes	Yes	No	NA	Yes	Yes	7

The Joanna Briggs Institute Critical Appraisal tool, consisting of nine criteria, was used to assess the risk of bias of each included study. NA=not applicable. *Item 1: was the sample frame appropriate to address the target population? †Item 2: were study participants sampled in an appropriate way? ‡Item 3: was the sample size adequate? §Item 4: were the study subjects and the setting described in detail? ¶Item 5: was the data analysis conducted with sufficient coverage of the identified sample? ||Item 6: were valid methods (ie, a clinical interview) used for the identification of the condition? **Item 7: was the condition measured in a standard reliable way? ††Item 8: was there appropriate statistical analysis? §§Item 9: was the response rate adequate, and if not, was the low response managed appropriately? §§Study included the 2007 and 2010 surveys of the Minnesota Departments of Education, Health, Human Services, and Public Safety. As both surveys are based on the same populations, we selected the 2010 survey; results from 2007 and 2010 were similar.

Table 2: **Risk of bias assessment**

12 months, seven (25%) studies estimating prevalence in the past 6 months, three (11%) studies in the past 2 weeks, and one (4%) study for current estimates; for the study reporting on current suicidal ideation, we contacted the authors because the period of reference was not clearly indicated. Within the four studies assessing self-harm prevalence, we included one (25%) study estimating prevalence for the past 12 months and three (75%) studies for the past 6 months. Of the six studies assessing suicide attempt prevalence, we included one (17%) study estimating prevalence in the past 12 months, two (33%) studies for the past 6 months, and three (50%) studies for ever. No study reported the past 12 months' prevalence of NSSI.

The list and frequency of suicide-related assessment tools used in the included studies are shown in the appendix (p 3). Most studies assessed suicidal ideation using a single item from the Child Behavior Checklist

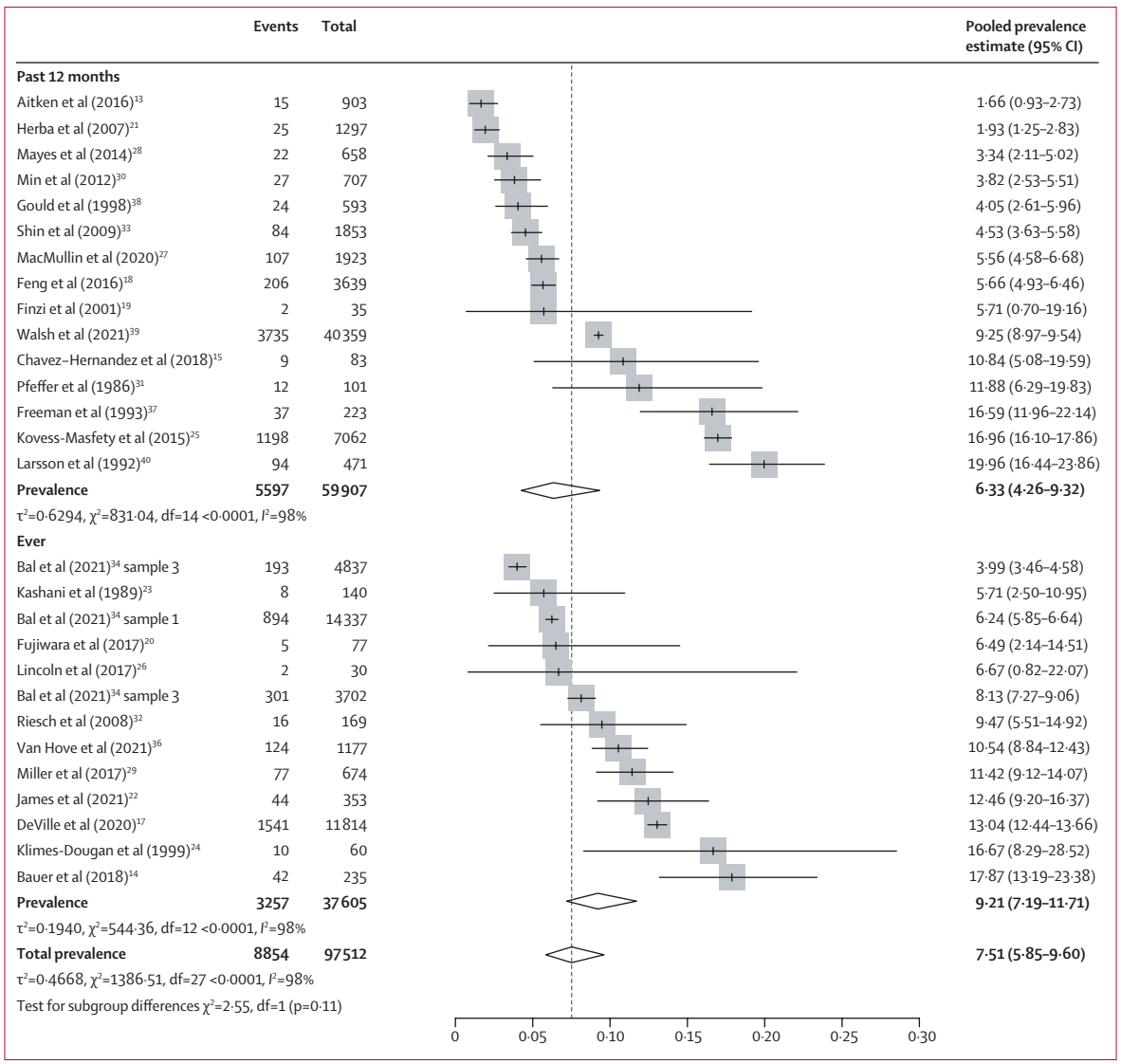

Figure 2: **Pooled prevalence of suicidal ideation**

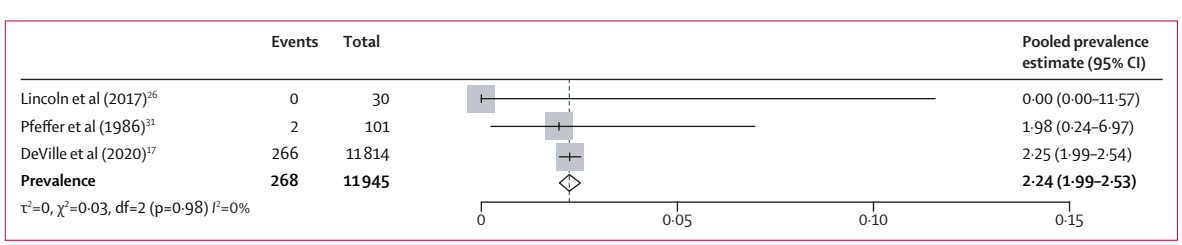

Figure 3: **Pooled prevalence of suicidal ideation with suicide plan**

("talks about killing self")[13,21,27,33] or from the Behavior Assessment System for Children ("I want to die", "I wish I were dead", or "I want to kill myself").[30,34,36] Self-harm included suicidal and non-suicidal intent rated by a parent using one item ("deliberately harms self or attempts suicide") in four studies.[13,27,28,33] Half of the studies assessing suicide attempt assessed it using a single item rated by the child or by a parent ("ever attempted to commit suicide in their lives"[16,38] or "have you ever tried to kill yourself"[39]). The validated Suicidal Behavior Questionnaire,[41]

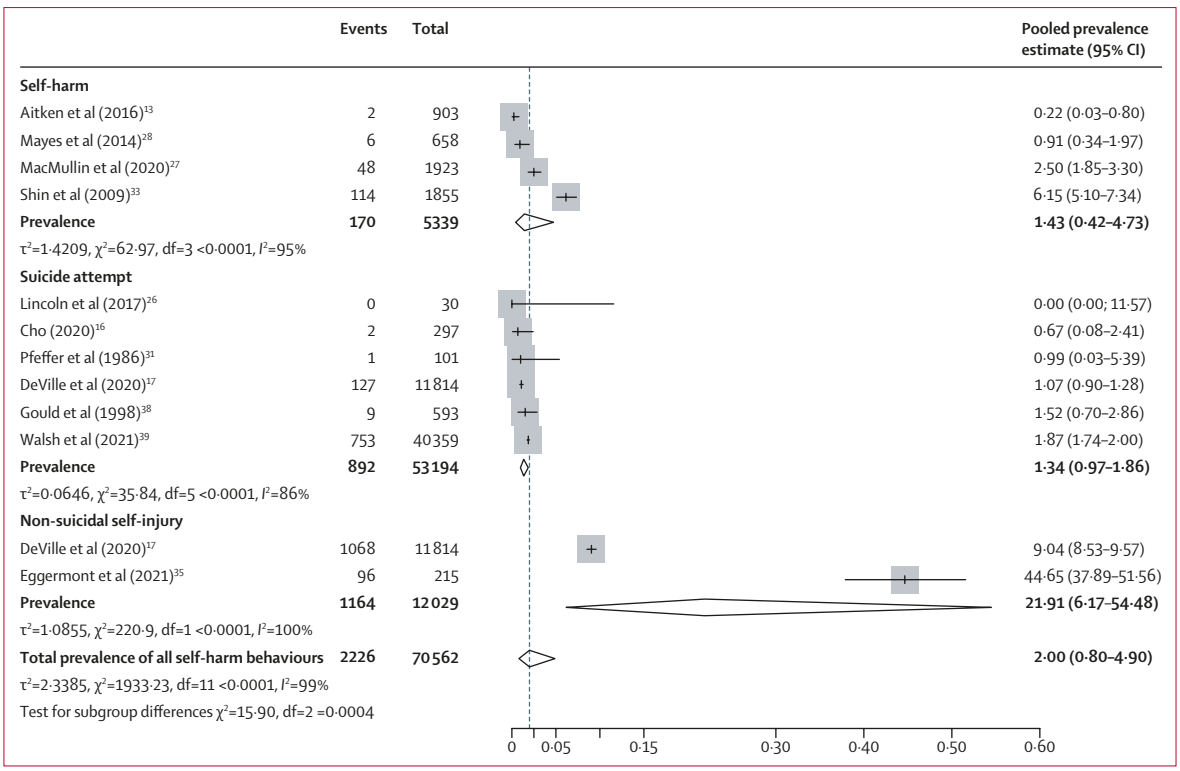

Figure 4: **Pooled prevalence of self-harm behaviours, including self-harm, suicide attempt, and non-suicidal self-injury**

comprising four items, was used in only one study.[26] NSSI was rated by both parents and child using one item, engaging "in purposeful behaviours (eg, hitting, cutting, burning oneself, head banging) in order to experience physical injury for reasons other than dying by suicide (eg, to feel better or relieve emotional pain)" in one study,[17] and by the child with five items of NSSI (eg, self-cutting) from the Self Harm Inventory in another study.[35] In terms of diagnostic interview, the Kiddie Schedule for Affective Disorders and Schizophrenia interview[42] was used in four studies[14,17,22,26] (one study[17] used a computerised version) and eight other studies used different diagnostic interview instruments.[19,20,23,24,29,31,37,38]

For the risk of bias assessment, only 12 (40%) of the 30 studies met the criteria for sample representativeness (table 2). In 21 (70%) studies, the sample size was adequate to calculate prevalence. 11 (37%) studies evaluated suicide-related outcomes using a clinical interview (item 6 in the critical appraisal; table 2).

In the 28 studies (n=97 512 participants) in which prevalence of suicidal ideation was reported, the pooled estimate from the random-effects meta-analysis was 7·5% (95% CI 5·9–9·6; figure 2). The analysis showed high heterogeneity (I^2=98·1% [95% CI 97·7–98·4]). Subgroup analyses are presented in the appendix (p 4).

Timeframe analysis showed similar prevalence estimates for suicidal ideation (6·3% [95% CI 4·3–9·3] for the past 12 months *vs* 9·2% [7·2–11·7] for ever). For subgroup analysis by sex, data were available for ten studies and generally showed similar prevalence estimates (7·9% [95% CI 5·2–12·0] for boys *vs* 6·4% [3·7–10·7] for girls). For subgroup analyses based on informant source, the prevalence of suicidal ideation was higher when children were specifically interviewed (10·9% [95% CI 8·1–14·5] for child only; 10·4% [6·8–15·5] for child and parent combined) compared with when parents alone were interviewed (4·7% [3·4–6·6]; p=0·0004). Comparing prevalence estimates by assessment method, a slightly higher prevalence of suicidal ideation was reported for interviews (10·0% [95% CI 7·3–13·5]) than for questionnaires (6·5% [4·7–9·0]). Prevalence estimates by continent were slightly lower for Asia (5·3% [95% CI 4·1–6·7]) than for North America (8·1% [6·0–11·0]) and Europe (8·7% [3·9–18·4]). For meta-regression analysis, the risk of bias score and year of publication did not significantly account for heterogeneity in prevalence estimates of suicidal ideation. An association was shown for mean age, with higher prevalence in studies involving older children (β-coefficient=0·23, p=0·028), but heterogeneity remained high (I^2=97·6%; appendix p 5).

The prevalence of suicide plan was reported in three (n=11 945 participants) studies[17,26,31] and the pooled estimate from the random-effects meta-analysis was 2·2% (95% CI 2·0–2·5; figure 3).The prevalence of self-

harm behaviours was reported in 11 (n=70 562 participants) studies,[13,16,17,26–28,31,33,38,39] in which its pooled estimate from the random-effects meta-analysis was 2·0% (95% CI 0·8–5·0; figure 4), with high heterogeneity (I^2=99·4%; 95% CI 99·3–99·5). The prevalence of suicide attempts was 1·3% (95% CI 1·0–1·9) from six studies,[16,17,26,31,38,39] and the prevalence of self-harm was 1·4% (0·4–4·7) from four studies.[13,27,28,33] Only two studies[17,35] reported on NSSI, the pooled prevalence of which was 21·9% (95% CI 6·2–54·4), but variation between studies was high (9·1%[17] and 44·6%, respectively[35]). The prevalence of self-harm behaviours overall did not significantly differ according to sex (3·5% [95% CI 1·6–7·2] for boys *vs* 3·0% (1·4–6·4] for girls), timeframe, informant source, method of assessment, or continent (appendix p 6). Further, in meta-regression, risk of bias score, child's mean age, and year of publication did not significantly account for heterogeneity in prevalence estimates of self-harm behaviours (appendix p 7).

For all pooled estimates, we found little evidence that publication bias could have influenced our results (appendix shows funnel plots [p 11], risk of bias for suicidal ideation and self-harm behaviours [p 8], leave-one-out analysis for suicidal ideation [p 9], and leave-one-out analysis for self-harm behaviours [p 10]). However, the trim-and-fill method indicated that six studies were potentially missing for suicidal ideation and four studies were potentially missing for self-harm behaviours. When accounting for these studies, the pooled prevalence of suicidal ideation would be 9·9% (95% CI 7·5–13·0), and the pooled prevalence of self-harm behaviours would be 4·3% (1·9–9·6).

For sensitivity analyses, we found that the pooled prevalence of suicidal ideation was similar for large (mean n=7465) population-based samples (7·0% [95% CI 4·6–10·6]) and small (mean n=906) convenience samples (7·9% [5·8–10·6]). The pooled prevalence of self-harm behaviours was also similar for large (mean n=10 923) population-based samples (1·7% [95% CI 0·1–3·5]) and small (mean n=838) convenience samples (2·2% [0·4–12·1]).

Discussion

To our knowledge, this is the first systematic review on the prevalence of suicidal ideation and self-harm behaviours in community samples of children aged 12 years and younger. In the subsequent meta-analysis of the study results, we estimated that 7·5% of children presented with suicidal ideation before reaching their 13th birthday, 2·2% had made a suicide plan, 1·3% had attempted suicide, and 1·4% had engaged in self-harm. These prevalences were similar in boys and girls. Studies that asked the children about their suicidal thoughts, rather than the parents, yielded a higher number of answers.

The prevalence of suicidal ideation and self-harm behaviours in children from the general population was greater than we expected. There is a general belief that children rarely think about suicide because they do not understand or fathom their own death, although a previous study has suggested that children with depression and who think about suicide have a more mature understanding of death at an earlier age than do healthy controls or those with depression and no suicidal ideation.[43] We found that, in the general population, children aged 6–12 years can experience suicidal ideation at notable levels. Measures of suicidal ideation in the studies analysed for pooled prevalence sometimes included items related to a desire for death, in addition to suicidal ideation, with the desire for death possibly indicating psychological distress rather than the actual desire to kill oneself. Further, few studies considered suicide plan—a step that suggests greater severity.[17,26,31] These studies tended to report a prevalence of suicide plan lower than that for suicidal ideation, as expected based on epidemiological studies with adolescents.[4] The prevalence of suicidal ideation and self-harm behaviours in children aged 12 years and younger is expected to be higher in those with a mental health disorder;[31,44] children with known mental health disorder were not included in our meta-analysis.

We did not find that the prevalence of suicidal ideation and self-harm behaviours varied according to year of publication. This finding contrasts with previous studies conducted largely in the USA,[2] which report an increase in emergency visits and hospitalisation for suicidal ideation and self-harm behaviours in recent years among children. Reasons for such discrepancies are unclear: the discrepancies could reflect regional variation or methodological issues, or both (we used year of study publication rather than year of data collection, as the data collection year was not reported in 16 of 28 studies). It is also possible that increased emergency and hospital visits reflect a declining availability of mental health services in the community or an increased consciousness for help-seeking behaviours.

Sex differences in suicidal ideation and self-harm behaviours are well documented from adolescence to adulthood, with more female individuals than male individuals reporting suicidal thoughts or attempts.[4,5,45,46] This finding has not been corroborated in studies on children.[47] Our pooled prevalence of suicidal ideation and self-harm behaviours in children was similar in boys and girls, in line with evidence of sex differences in depression starting to emerge during adolescence.[48] Puberty, along with other factors, might have a differential role in the emergence of mental health problems and suicidal ideation and attempts.[49]

The prevalence of suicidal ideation was higher for child-reported outcomes than for adult-reported outcomes. This finding is in line with a few studies highlighting low concordance between young people's and parental reports of suicidal ideation and attempts.[50,51] Similar discrepancies have been observed for other distress indicators, such as depression.[51] It is important to better understand the

reasons for and barriers to non-disclosure of suicidal ideation, given that many children thinking about suicide probably do not receive professional help.[52] With facilitation, parents could intercede in obtaining the required mental health services.

No information was given in our included studies regarding the severity of suicide attempts and whether hospital care was required. All four studies on self-harm[13,27,28,33] relied on parental report only, perhaps understating the true prevalence of self-harm. For NSSI, one study based on the Adolescent Brain Cognitive Development (also known as ABCD) cohort reported a prevalence of 9% in children aged 9–10 years,[17] whereas another study from a small convenience sample reported a prevalence of 44·5%,[35] suggesting that the prevalence of NSSI can vary considerably depending on how questions are formulated. Further research on the assessment of NSSI in young children is, therefore, warranted. Although most people engage in NSSI to manage emotional distress, engagement in NSSI is nevertheless a warning for suicide attempts during adolescence.[53] Considering that these children are aged 12 years and younger, and from community samples, the numbers on self-harm and NSSI are important.

Several limitations should be noted when interpreting the results. First, we identified important heterogeneity across studies, with high I^2 values. Heterogeneity was not explained by study characteristics explored in our subgroup and meta-regression analyses. Furthermore, measures and items used to assess suicidal ideation and self-harm behaviours varied considerably across studies. In some, children were classified with suicidal ideation if the child or parent noted "wish to be dead" or "want to kill self", or both. Therefore, the pooled prevalence might include children with an expressed desire for death reflecting fantastical thinking but not actual suicidal ideation. Second, several studies were of low quality, based on small convenience samples, or were not specifically designed to estimate prevalence. However, the pooled prevalence of suicidal ideation and self-harm behaviours estimated in large population-based samples was similar to that estimated in smaller convenience samples. Third, our pooled estimates within the past 12 months included several studies based on a shorter timeframe (eg, past 3 months or current), impeding greater precision. Fourth, although year of publication did not explain heterogeneity, the pooled prevalence estimates spanned data collected over almost four decades. Results reflect that suicidal thinking and self-harm are, unfortunately, not new. Fifth, and importantly, although it might be statistically appropriate to combine data for children who are aged 6–12 years, developmental differences might have been overlooked. Information on mean age was available for 15 studies reporting on suicidal ideation and for six studies reporting on suicide attempt, and this information did statistically explain some heterogeneity in the results, but not all. Unfortunately, our data were not amenable to subgroup analysis by age. Further, by limiting our systematic review to studies published in French and English, we might have missed other studies. Seventh, all included studies were conducted in high-income or upper-middle-income countries, and ethnicity data were not available; the prevalences in lower-income countries and within different ethnic groups are therefore unknown.

Research on suicidal ideation and self-harm behaviours in childhood is scarce, especially in younger children and preteens. In summary, our study emphasises the unexpectedly high prevalence of suicidal thoughts and self-harm behaviours in children in the community, even before they reach adolescence. It highlights the urgent need for more research and for prevention and intervention efforts on this highly sensitive issue. Implementable steps are needed to establish ethical guidelines and address safety aspects[54] for conducting suicide research with children, and to establish gold standards for assessment and intervention that are developmentally appropriate. Existing strategies have shown some benefits in preventing suicidal ideation and self-harming behaviours in school during adolescence[55,56] (eg, awareness and skills training) and for at-risk youths (eg, dialectical behavioural therapy, cognitive behavioural therapy, and youth-nominated support teams), but it is unclear whether such interventions are developmentally appropriate for children younger than 12 years. In the meantime, our study, in line with others,[57] highlights the need for further support staff in schools, as well as awareness among paediatricians and others working with children, to recognise and address suicidal risk. Children might not disclose to their parents and might therefore not receive adequate and appropriate professional support. Moreover, as a systematic review and meta-analysis of studies published to date, these data amalgamate all strata of the studied populations. At-risk families and disadvantaged communities might need even greater attention. Further research should investigate factors associated with suicidal ideation and self-harming behaviours in children, including relational conflicts and psychopathology.[44] It is important to begin suicide prevention efforts early in the life-course.

Contributors

M-CG, BK, IC, and MO developed the concept. M-CG, MP, BK, and MO did the literature search. M-CG, SB, MP, and EC screened records. M-CG, SB, MP, and EC extracted and verified the data. M-CG and MO did the formal analysis. M-CG acquired funding. M-CG and EC wrote the original draft. M-CG, MP, BK, JR, GT, IC, and MO contributed to writing and editing the manuscript. M-CG, EC, and MO had full access to all the data in the study and M-CG had final responsibility for the decision to submit for publication.

Declaration of interests

We declare no competing interests.

Data sharing

Data that are not included in this Article or the appendix can be requested from the corresponding author.

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