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Original Investigation | Psychiatry

Risk and Protective Factors for Suicide Mortality in Youths
A Systematic Review and Meta-Analysis

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Abstract

IMPORTANCE Risk and protective factors for suicide mortality in youths remain poorly synthesized, as prior reviews have focused on all ages or nonfatal outcomes.

OBJECTIVE To systematically assess factors associated with risk of suicide mortality in youths.

DATA SOURCES MEDLINE, PsycINFO, Embase, and CINAHL from inception to March 7, 2025.

STUDY SELECTION Case-control and cohort studies of youths (aged ≤24 years) examining risk and/or protective factors associated with suicide mortality vs living general-population controls were included. Two independent reviewers screened 9497 records.

DATA EXTRACTION AND SYNTHESIS Following Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, 2 reviewers independently screened reports; 1 extracted data, verified by a second. Evidence was synthesized using vote counting and random-effects meta-analysis in April 2026.

MAIN OUTCOMES AND MEASURES The primary outcome was suicide mortality at age 24 years or younger.

RESULTS Ninety reports from 68 studies, mostly from high-income countries, identified distinct risk and/or protective factors; 54 reports contributed to 30 meta-analyses. The factors associated with the highest odds of suicide risk included schizophrenia (odds ratio [OR], 22.23; 95% CI, 12.05-41.03; I^2 = 85.4%; 7 reports), mood disorders (OR, 11.32; 95% CI, 6.11-20.97; I^2 = 64.6%; 7 reports), and self-harm (OR, 14.06; 95% CI, 5.58-35.39; I^2 = 90.1%; 10 reports). Clinical indicators of health care use were also associated with higher risk, including mental health services use in preceding year (OR, 7.39; 95% CI, 6.45-8.47; I^2 = 0.0%; 5 reports) and psychiatric admission (OR, 31.96; 95% CI, 13.83-73.86; I^2 = 94.8%; 6 reports). At the socioecological level, several indicators were associated with higher risk, including maltreatment (OR, 4.03; 95% CI, 1.41-11.50; I^2 = 67.1%; 5 reports), out-of-home placement (OR, 4.47; 95% CI, 2.15-9.28; I^2 = 42.1%; 5 reports), youth justice system involvement (OR, 2.70; 95% CI, 1.94-3.75; I^2 = 64.2%; 7 reports), and low educational attainment (OR, 2.95; 95% CI, 1.66-5.24; I^2 = 76.0%; 5 reports). In contrast, indicators of family stability were associated with lower risk, including living with both parents (OR, 0.55; 95% CI, 0.48-0.62; I^2 = 12.1%; 11 reports). Heterogeneity was substantial across analyses, while Newcastle-Ottawa ratings indicated moderate-to-high study quality.

(continued)

Key Points

Question What factors are associated with risk of suicide mortality among individuals aged 24 years and younger?

Findings In this systematic review and meta-analysis of 90 reports (68 reports), mental disorders—particularly acute conditions such as schizophrenia and mood disorders—and prior self-harm were associated with suicide mortality. Prior health care contact (eg, psychiatric admission) and a range of social determinants (eg, maltreatment, out-of-home placement, and social disadvantage) were also associated with higher risk, whereas family stability (eg, living with both parents) was associated with lower risk.

Meaning Suicide mortality in youths reflects both psychiatric vulnerability and social adversity, supporting the need for integrated prevention strategies combining early intervention with population-level prevention approaches targeting social determinants.

+ Supplemental content

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Abstract (continued)

CONCLUSIONS AND RELEVANCE In this systematic review and meta-analysis, suicide mortality in youths was associated with mental disorders, health care contact, and adversity, supporting both clinical care and population-level prevention, with future research needed in underrepresented populations.

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Introduction

Suicide remains one of the leading causes of death among young people aged 10 to 24 years worldwide. Recent World Health Organization mortality data from 52 countries indicate an upward trend in many high-income countries—especially among girls—whereas boys continue to die by suicide at 2 to 5 times the rate of girls.[1] Yet the risk and protective factors for suicide mortality remain insufficiently documented in youths, limiting our ability to identify developmentally specific targets for prevention.

Youth-focused reviews have largely examined suicidal ideation and self-harm rather than suicide mortality, typically focusing on a limited set of factors,[2,3] whereas only a few capture a broader range of risk and protective factors.[4,5] Given that suicidal ideation and self-harm are far more prevalent than suicide death, findings from these reviews may not fully inform suicide mortality prevention efforts. Conversely, reviews of suicide mortality typically pool evidence across all ages,[6-8] overlooking key developmental differences in youth.[9] One prior review examined sex-stratified risk and protective factors for suicidal behaviors in youths and included suicide death, but was based on a very limited number of studies.[10]

Youth suicide mortality may reflect the convergence of mental disorders—captured through psychiatric diagnoses or health care contact—and accumulated social adversity, such as abuse and poverty. However, to our knowledge, no prior systematic review and meta-analysis has synthesized the breadth of risk and/or protective factors for suicide mortality among young people aged 24 years or younger. To directly inform prevention strategies targeting youth suicide deaths, we systematically reviewed and meta-analyzed risk and protective factors for suicide mortality among individuals aged 24 years or younger.

Methods

In this systematic review and meta-analysis, we included primary studies that (1) employed case-control studies (psychological autopsy or registered-based studies) or cohort (retrospective or prospective) studies, (2) quantitatively assessed risk and/or protective factors by comparing youths aged 24 years or younger who died by suicide with living controls, and (3) reported suicide mortality separate from other outcomes such as nonfatal self-harm. The review was preregistered with PROSPERO (CRD420251008539) and reported in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) reporting guidelines. We deviated from the initial protocol by not applying a lower age restriction of 10 years for suicide, because age-specific information was not consistently reported across studies. Studies with broad age ranges were included if at least 80% of participants were aged younger than 25 years and the full sample fell within a 0- to 30-year range, or if the mean age was younger than 25 years.

A health sciences librarian (J.B.) searched MEDLINE (Ovid), PsycINFO (Ovid), Embase (Ovid), and CINAHL (EBSCO) for articles published from inception to March 7, 2025. The search combined terms related to suicide mortality, child, adolescent, and/or young adult and case-control or cohort studies with no restrictions applied to language or publication date. It was peer-reviewed by a second librarian (not a coauthor of this study) using the Peer Review of Electronic Search Strategies; see Boruff[11] for the search strategy.

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Titles and abstracts were uploaded into Covidence; duplicates were removed. Two independent reviewers (M.C.G or E.B.S.; and N.J.N, A.C., K.M., or L.A.) evaluated titles and abstracts and then full text review. Any discrepancies were resolved through consensus, with a third investigator (M.C.G or E.B.S.) consulted as necessary. Standardized screening guides (eAppendixes 1 and 2 in Supplement 1) were developed and refined through an iterative process to ensure consistency and accuracy. All team members received training across multiple sessions. Because articles in all languages were eligible, non-English records were assessed using Google Translate or fluent speakers. As this study is a systematic review of previously published literature, no new ethical approval was required.

Data Extraction

Data were extracted from the full text and supplementary materials. Extracted information included first author, publication year, country, number of suicide deaths and controls (or total living cohort), mean age and age range at the time of suicide death, year(s) in which suicide deaths occurred, the proportion of suicide deaths among male youths, and all risk and protective factors, with no a priori selection of factors. We used World Bank classifications for country income and region. Procedures used to handle duplicate and/or overlapping risk and protective factors across reports are described in the eMethods in Supplement 1. Study quality was assessed using the Newcastle-Ottawa Scale, which evaluates studies across 3 dimensions: selection of study groups, comparability of groups, and ascertainment of exposure or outcome,[12] for both cohort and case-control studies (eAppendixes 3 and 4 in Supplement 1). Data extracted for synthesis are described below. For all extractions, 1 reviewer (M.C.G or E.B.S.) extracted data using a standardized form, and a second reviewer (A.C., E.C., or N.J.N.) independently verified their accuracy and completeness.

Statistical Analysis

First, all risk and protective factors were grouped into 5 broad a priori domains: mental health and self-harm, physical disorders, health care service contacts, prenatal and perinatal factors, and socioecological determinants (classified using the American Psychiatric Association Social Determinants of Mental Health framework).[13] Second, within each domain, factors examined in at least 2 reports of 2 different studies (eg, completed or current level of education and highest grade completed) were grouped into comparable risk and protective factors for narrative synthesis (eTables 1-5 in Supplement 1). When a report included more than 1 related measure for the same risk and protective factors (eg, continuous score and yes vs no), we retained the measure that was most similar to those used in other reports (eMethods in Supplement 1). Third, for factors examined in at least 2 reports, we used vote counting based on the direction of association in line with Cochrane Handbook guidance.[14] This narrative synthesis approach summarizes evidence by counting studies according to whether associations were harmful, protective, or null, based on direction, with factors for which direction could not be determined (ie, no estimates reported) coded as not reported. Fourth, for factors examined in at least 5 reports and that could be harmonized (eTables 6-15 in Supplement 1), we performed random-effects meta-analyses using restricted maximum likelihood estimation in the meta package in R statistical software version 4.1.2 (R Project for Statistical Computing) in April 2026. For both vote-counting and meta-analysis, we prioritized unadjusted or minimally adjusted estimates for sex and age. Estimates extracted included odds ratios (ORs), hazard ratios (HRs), and risk ratios (RRs), or ORs were calculated from 2 × 2 tables, with corresponding 95% CIs (eMethods in Supplement 1). ORs were retained for meta-analyses, with RRs and HRs approximated to ORs.[15,16] Statistical significance was defined as a 95% CI that did not include the null value of 1. Forest plots were used to represent results graphically. We assessed heterogeneity using the I^2 statistic and 95% prediction intervals, calculated from the random-effects model and representing the expected range of effect estimates in a new study. Potential publication bias was evaluated using funnel plots. Sensitivity analyses included stratification by study design (case-control vs cohort).

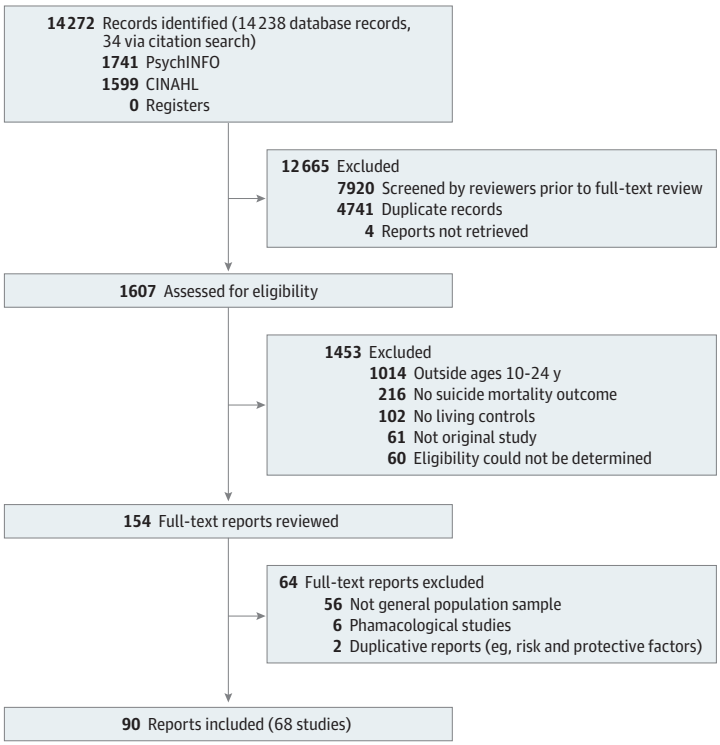
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Results

We identified 14 238 records through database searches, screened 9497 after removing duplicates, and reviewed 1573 full-text documents, with an additional 34 retrieved from the reference lists of secondary sources (eg, reviews and commentaries). In total, 154 reports from 120 studies met our inclusion criteria. We further excluded 56 reports due to limited generalizability of selected populations (eg, youth involved in child welfare or in contact with health care services) to enhance generalizability to the broader population, and 6 reports on pharmacological treatments, as these were beyond the scope of this review and are summarized elsewhere, and 2 duplicate reports (eAppendix 5 in Supplement 1 for full list of excluded articles after full-text screening). Ultimately, we included 90 reports[17-106] from 68 studies in the systematic review (**Figure 1**).

The 68 included studies were conducted primarily in high-income countries (78 reports for 58 studies[17-33,38-62,65-67,69,73,75-105]) across 3 World Bank regions (North America, Europe and Central Asia, and East Asia and Pacific) with most from Sweden (17 reports of 15 studies[19, 23, 24, 39, 45, 47, 48, 62, 66, 75, 87, 96, 98, 101, 102, 104, 105]) and the US (27 reports of 13 studies[17, 18, 26-31, 42, 49-53, 56-58, 60, 67, 73, 77, 79, 90-94]). An additional 10 studies were from upper-income and lower-middle-income countries, mainly China (including Taiwan and Hong Kong, 11 reports of 9 studies[34-37,63,64,70-72,74,106]) and Sri Lanka (1 study[68]). We identified 36 case-control studies (27 reports of 12 psychological autopsy studies[19, 22, 26-31, 34, 42, 55-58, 61, 70, 83-85, 89-94, 102, 106] and 26 reports of 24 registered-based studies[18, 20, 21, 32, 35, 36, 38, 41, 43, 44, 60, 63, 64, 67, 72-74, 76, 77, 79-82, 86, 95, 100]) and 37 reports of 32 cohort studies[17, 23-25, 33, 37, 39, 40, 45-54, 59, 62, 65, 66, 68, 69, 71, 75, 78, 87, 88, 96-99, 101, 103-105] (mostly retrospective). Among these, 16 reports of 7 studies[18,26-31,42,57,58,61,77,90-93] were published before 2000. The number of suicides ranged from 4 to 4828, with only 2 studies[17,18] including fewer than 10 suicides. Study characteristics are summarized in eTable 16 in Supplement 1.

Figure 1. Flowchart of the Identification and Selection of Studies on Risk and/or Protective Factors for Youth Suicide Mortality



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Narrative Synthesis

Of 846 extracted factors, 106 distinct factors examined in at least 2 reports were included in vote counting: 25 mental health disorders and self-harm, 8 physical health disorders, 8 health care service contact factors, 6 prenatal and perinatal factors, and 59 socioecological determinants spanning socioeconomic opportunities for youths, families, and communities, the physical environment, highly detrimental societal problems, stigma and discrimination, stresses and traumas associated with immigration, and protective factors in accordance with American Psychiatric Association framework. Factors included and excluded from vote counting are reported per domain in eTables 1 to 5 in Supplement 1. The most frequently studied risk factors (each examined in more than 10 studies) were depression, self-harm, substance abuse, and any mental health disorders. Across factors, most associations were in a harmful direction, whereas only 2 were clearly protective within the social determinant's domain—living with both parents and having married parents (see **Figure 2** for social determinants, and eFigure 1 and eTable 17 in Supplement 1 for other factors).

Meta-Analyses

Overall, 54 reports[17-20,22-27,29,31,34-42,49,50,55,58-61,64,66,67,72,75-81,83,84,86,89,91-95,97,99-101,105,106] from 45 unique studies were included in the meta-analysis, comprising 29 case-control studies (including 19 reports of 12 psychological autopsy studies[19,22,26,27,29,31,34,42,55,58,61,83,84,89,91-94,106] and 18 reports of 17 register-based studies[18,20,35,36,38,41,60,64,67,72,76,77,79-81,86,95,100]) and 17 reports of 16 cohort studies[17,23-25,37,39,40,49,50,59,66,75,78,97,99,101,105] from 13 countries (0 in lower-middle-income countries). Together, they examined 30 distinct risk factors and protective factors across 4 broad domains: mental disorders, physical disorders, health care contacts, and socioecological determinants. Study quality was rated as moderate in 7 reports of 5 case-control studies,[18,42,55,67,83,84,89] high in 30 reports of 24 case-control studies,[19,20,22,26,27,29,31,34-36,38,41,58,60,61,64,72,76,77,79-81,86,91-95,100,106] and high in 17 reports of 16 cohort studies.[17,23-25,37,39,40,49,50,59,66,75,78,97,99,101,105] Reports included in the meta-analysis are in bold in eTable 16 in Supplement 1, and risk of bias assessments are summarized in eTables 18 and 19 in Supplement 1. Funnel plots were visually inspected for asymmetry (eFigure 2 in Supplement 1). However, given the small number of reports for most meta-analyses (<10), funnel plot interpretation was limited.[107] Sensitivity analyses stratified by study design (case-control vs cohort) showed no clear differences between designs (eTable 20 in Supplement 1).

Mental Disorders and Self-Harm

Among mental disorder domains, 11 disorders were meta-analyzed (≥5 reports each). Associations with youth suicide mortality existed across nearly all disorders, with particularly elevated odds for schizophrenia (OR, 22.23; 95% CI, 12.05-41.03; I^2 = 85.4%; 7 reports),[26,37,64,72,80,89,91] bipolar disorder (OR, 12.40; 95% CI, 3.17-48.47; I^2 = 75.4%; 5 reports),[26,64,72,83,91] any unspecified mood disorders (OR, 11.32; 95% CI, 6.11-20.97; I^2 = 64.6%; 7 reports),[22,26,34,61,89,91,93] and depression (OR, 8.34; 95% CI, 3.44-20.19; I^2 = 94.3%; 10 reports),[18,19,26,41,64,72,76,83,91,93] but heterogeneity was high. Borderline personality disorder was examined in only 1 psychological autopsy study in youths aged 18 to 25 years (OR, 12.66; 95% CI, 4.46-35.94).[19] Alcohol abuse (OR, 5.13; 95% CI, 4.44-5.93; I^2 = 0.0%; 6 reports)[19,26,67,83,91,94] and drug use (OR, 6.35; 95% CI, 2.98-13.52; I^2 = 0.0%; 5 reports)[19,26,49,83,91] were also associated with suicide mortality, with no observed heterogeneity, in addition to substance use (OR, 7.21; 95% CI, 3.85-13.50; I^2 = 90.2%; 9 reports).[19,26,34,38,61,64,83,91,93] Associations were observed for all other disorders. Prior self-harm was also associated with suicide mortality (OR, 14.06; 95% CI, 5.58-35.39; I^2 = 90.1%; 10 reports)[22,23,31,41,50,61,84,91,92,94] (**Figure 3**; eTable 21 in Supplement 1).

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Figure 2. Bar Graphs of Number of Reports Reporting Harmful, Protective, Null, or Unreported Associations Between Social Determinants and Youth Suicide Mortality (Vote-Counting Synthesis)



Factors are grouped by domain. See eFigure 1 in Supplement 1 for other risk and protective factors.

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Physical Disorders

Across 5 reports,[34,38,72,93,106] any physical disorder was associated with higher suicide mortality risk (OR, 1.46; 95% CI, 0.68-3.12). However, the estimate was imprecise and highly heterogeneous (I^2 = 67.2%) (eTable 22 in Supplement 1).

Health Care Service Contacts

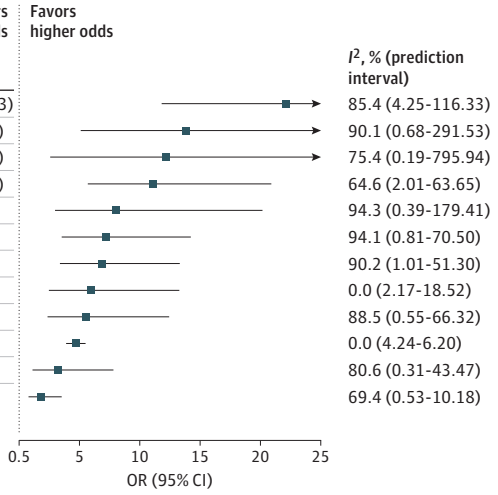
Among health care service contacts, 3 exposures were meta-analyzed. Associations with youth suicide mortality were observed for any inpatient psychiatric admission (OR, 31.96; 95% CI, 13.83-73.86; I^2 = 94.8%; 6 reports).[19,20,26,72,86,94] Any contact with mental health care was also associated with increased odds of suicide mortality, particularly when occurring within the year preceding death (OR, 7.39; 95% CI, 6.45-8.47; I^2 = 0.0%; 5 reports)[26,84,86,91,94] compared with lifetime exposure (OR, 3.56; 95% CI, 2.71-4.67; I^2 = 0.1%; 9 reports)[19,22,26,50,55,84,91,92,94] (**Figure 4** and eTable 23 in Supplement 1).

Socioecological Determinants

Among the 59 socioecological determinants, 14 were meta-analyzed. Most focused on socioeconomic adversity. The highest odds of youth suicide mortality were observed for maltreatment (OR, 4.03; 95% CI, 1.41-11.50; I^2 = 67.1%; 5 reports)[19,31,38,58,92] and out-of-home-placement (OR, 4.47; 95% CI, 2.15-9.28; I^2 = 42.1%; 5 reports).[19,40,49,61,79] Justice system involvement for youths (OR, 2.70; 95% CI, 1.94-3.75; I^2 = 64.2%; 7 reports)[17,19,27,50,58,60,100] and parents (OR, 2.53; 95% CI, 1.38-4.64; I^2 = 60.4%; 5 reports)[19,24,29,40,58] were also associated with

Figure 3. Forest Plot of Pooled Associations of Mental Disorders and Prior Self-Harm With Youth Suicide Mortality (Meta-Analysis)

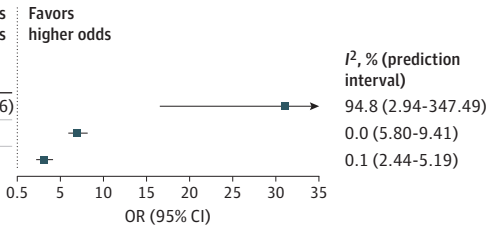
Mental disorders and self–harm	No. of reports	OR (95% CI)	I^2, % (prediction interval)
Schizophrenia	7	22.23 (12.05-41.03)	85.4 (4.25-116.33)
Self-harm	10	14.06 (5.58-35.39)	90.1 (0.68-291.53)
Bipolar disorder	5	12.40 (3.17-48.47)	75.4 (0.19-795.94)
Mood disorders	7	11.32 (6.11-20.97)	64.6 (2.01-63.65)
Depression	10	8.34 (3.44-20.19)	94.3 (0.39-179.41)
Any mental health disorder	9	7.58 (3.99-14.39)	94.1 (0.81-70.50)
Substance abuse	9	7.21 (3.85-13.50)	90.2 (1.01-51.30)
Drug abuse	5	6.35 (2.98-13.52)	0.0 (2.17-18.52)
Anxiety disorder	7	6.02 (2.87-12.65)	88.5 (0.55-66.32)
Alcohol abuse	6	5.13 (4.44-5.93)	0.0 (4.24-6.20)
Conduct disorder	5	3.70 (1.67-8.18)	80.6 (0.31-43.47)
ADHD	7	2.33 (1.36-3.99)	69.4 (0.53-10.18)



ADHD indicates attention-deficit/hyperactivity disorder; OR, odds ratio.

Figure 4. Forest Plot of Pooled Associations of Health Care Contact With Youth Suicide Mortality (Meta-Analysis)

Health care service contracts	No. of reports	OR (95% CI)	I^2, % (prediction interval)
Any psychiatric inpatient admission	6	31.96 (13.83-73.86)	94.8 (2.94-347.49)
Any mental health care contact (year prior)	5	7.39 (6.45-8.47)	0.0 (5.80-9.41)
Any mental health care contact (ever)	9	3.56 (2.71-4.67)	0.1 (2.44-5.19)



OR indicates odds ratio.

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higher risk. Indicators of family stability were consistently associated with lower risk, including living with both parents (OR, 0.55; 95% CI, 0.48-0.62; I^2 = 12.1%; 11 reports)[26,39,42,50,55,58,59,61,84,97,101] and parental marriage (OR, 0.58; 95% CI, 0.51-0.66; I^2 = 40.6%; 9 reports).[19,20,35,36,59,77,78,94,97] All indicators of socioeconomic disadvantage were associated with higher risk, including lower youth education, with pooled ORs ranging from 1.25 to 5.24 (**Figure 5**; eTable 24 in Supplement 1).

Discussion

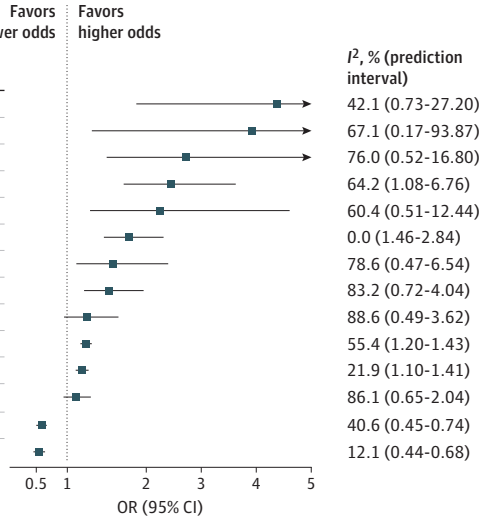
In this systematic review and meta-analysis on protective and risk factors for suicide mortality in children to young adults aged 24 years, we synthesized evidence from 68 observational cohort or case-control studies, including 90 reports. We found that the greatest odds of death by suicide were aspects of the individual's mental health (mental health disorders and recent contact with mental health services), underscoring the role of psychiatric vulnerability. At the socioecological level, suicide mortality was associated with maltreatment, out-of-home placement, justice-system involvement, lower education, and overall socioeconomic disadvantage. Although protective factors were rarely examined, the available evidence suggested that growing up in a stable home, such as living with both parents and parental marriage, was associated with lower suicide risk. Taken together, these findings suggest that death by suicide could occur at the interface of psychiatric vulnerability and social adversity. However, existing evidence remains fragmented and disproportionately focused on downstream risk markers, with limited attention to modifiable protective factors and upstream prevention targets.

Youths with a diagnosis of any mental disorder had almost 10-fold higher odds of death by suicide than youths without a diagnosis. Our findings are in line with a prior systematic review and meta-analysis by Too et al[108] that covered all ages. On the basis of administrative health records, they reported a pooled RR of 7.5 for all mental disorders combined. They also found particularly high risks for psychotic disorders (RR, 13.2) and mood disorders (RR, 12.3). Our results for mood disorders in youths were similar (OR, 11.32). Combined with our results in youths, findings suggest that mental health disorders are associated with substantially elevated suicide risk across the life course.

Nevertheless, effect sizes for some disorders were somewhat larger than those of Too et al[108] in our youth-focused review, particularly schizophrenia (OR, 22.23), possibly reflecting methodological differences. Furthermore, personality disorders in adult populations, particularly

Figure 5. Forest Plot of Pooled Associations of Socioecological Determinants With Youth Suicide Mortality (Meta-Analysis)

Socioecological determinants	No. of reports	OR (95% CI)	I^2, % (prediction interval)
Out-of-home placement	5	4.47 (2.15-9.28)	42.1 (0.73-27.20)
Child maltreatment	5	4.03 (1.41-11.50)	67.1 (0.17-93.87)
Lower youth education	5	2.95 (1.66-5.24)	76.0 (0.52-16.80)
Youth justice involvement	7	2.70 (1.94-3.75)	64.2 (1.08-6.76)
Parental justice involvement	5	2.53 (1.38-4.64)	60.4 (0.51-12.44)
Residential mobility	5	2.03 (1.61-2.57)	0.0 (1.46-2.84)
Maternal psychiatric history	7	1.75 (1.16-2.66)	78.6 (0.47-6.54)
Younger maternal age at birth	8	1.70 (1.29-2.24)	83.2 (0.72-4.04)
Lower parental income	7	1.34 (0.97-1.84)	88.6 (0.49-3.62)
Lower paternal education	5	1.31 (1.23-1.39)	55.4 (1.20-1.43)
Lower maternal education	7	1.25 (1.16-1.34)	21.9 (1.10-1.41)
Rural residence	7	1.15 (0.95-1.38)	86.1 (0.65-2.04)
Parents married	9	0.58 (0.51-0.66)	40.6 (0.45-0.74)
Living with both parents	11	0.55 (0.48-0.62)	12.1 (0.44-0.68)



OR indicates odds ratio.

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borderline personality disorder, have been associated with elevated suicide risk.[108,109] In our review, borderline personality disorder was examined in only 1 psychological autopsy study in youths aged 18 to 25 years (OR, 12.66),[19] highlighting a major evidence gap that may reflect ongoing controversy on diagnosing personality disorders during adolescence.[110]

A key clinical marker of elevated risk was prior self-harm. Although not a mental disorder in itself, self-harm was associated with death by suicide in youths (OR, 14.06). Other clinical markers in youths included recent contact with mental health care services, with especially high odds for the year prior to death (>7-fold elevated odds) rather than lifetime contacts (>3-fold elevated odds). We observed even higher odds of suicide mortality risk associated with psychiatric admission to hospital, but were unable to examine timing. Prior studies in adult populations have indicated that risk was particularly elevated in the period immediately following psychiatric discharge,[111] highlighting this transition as a critical window for prevention. Although our data cannot directly examine this period, this elevated risk may reflect a mismatch between ongoing vulnerability and the reduction or discontinuity of care following discharge. Evidence from our narrative synthesis suggests that service contact can occur across multiple settings. Future studies should therefore broaden their resources to include community-based and school-based contexts to better identify potentially missed prevention opportunities. Notably, service contact may reflect opportunities for intervention across the full continuum of care.

Of the 59 socioecological determinants vote-counted and 14 meta-analyzed, most reflected family-level socioeconomic status, such as parental education and household income. Heterogeneity was high, likely because of inconsistencies in exposure definitions across studies (eg, varying thresholds for low education). Socioeconomic disadvantage is a well-established risk factor for death by suicide in adulthood,[7,112] and parental disadvantage is associated with suicidal distress in youths, including higher rates of emergency department visits for suicidal ideation and attempts.[113] Studies clarifying the mechanisms whereby family-level and individual-level socioeconomic disadvantage is linked to death by suicide in youths could provide critical insights for prevention.

Adverse childhood experiences—such as maltreatment and bullying—are documented risk factors associated with suicidal distress in youths.[3] Consistent with the literature, maltreatment and out-of-home placement emerged as the strongest socioecological determinants of death by suicide in our review. Evidence for bullying remained limited, however, and needs further elucidating. The juvenile justice system also arose as an essential element in targeted prevention. Youths involved in the system had an associated increased risk for suicide mortality. Adverse experiences tend to begin early in life and tend to recur, all while initiating developmental cascades that increase vulnerability, particularly with repeated exposure and disrupted access to protective factors. An in-depth understanding of these pathways is necessary to effect change and to identify points of preventive intervention to avoid long-term sequelae.

Protective factors were rarely examined in the studies we analyzed, consistent with findings from umbrella reviews of systematic reviews on social determinants of health.[8] Of protective factors meta-analyzed, only 2 were consistently associated with lower suicide mortality: living with both parents and parental marriage. Although they are imperfect proxies of stability and social support, their consistent protective associations with suicide risk underscore the importance of strengthening family ties and relationship-based supports as part of youth suicide prevention efforts.

We noted a striking lack of research in populations known to be highly vulnerable, such as Indigenous youths, sexually and gender-diverse youths, and youths in low- and middle-income countries. Targeted epidemiological studies and prevention research are crucial for these underserved groups.

Our systematic review suggests that many of the risk and protective factors identified for suicide mortality may overlap with those reported for suicidal ideation and self-harm.[5] The literature on death by suicide, however, appears more strongly focused on severe psychiatric disorders and less on socioecological determinants. This focus may reflect methodological differences, as studies of suicidal ideation and self-harm typically rely on self-reports, which are better suited to capturing

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socioecological exposures such as maltreatment and bullying, whereas suicide mortality studies more frequently use psychological autopsies or register-based data, which provide more limited contextual information.

Avenues for suicide prevention among youths may concentrate on upstream strategies, including promoting stability in childhood environments and friendship building through engagement in schools and extracurricular activities; fostering positive attitudes toward learning and academic performance, and increased educational resources and support staff, for lifetime achievement; a reduction in childhood adversity and social disadvantage across the life course; and a rethinking of child protection such as out-of-home placement and youth justice involvement.[110-113] Downstream strategies should focus on early detection, treatment, and continuity of care for special needs and mental health disorders, across all settings including school and health care services, and picking up on clinical cues such as self-harm.

Limitations and Strengths

Several limitations should be considered when interpreting these findings. First, we observed substantial heterogeneity (high I^2 values) among studies for most risk and protective factors, likely reflecting variations in design, time period, country, and exposure. Because of the small number of reports in each category, we could not conduct subgroup analyses (except by study design) to investigate sources of heterogeneity and interpretation of publication bias was limited. We were also unable to examine sex and gender differences, as most studies did not stratify by sex and gender. Second, the evidence originated largely from high-income and upper-middle-income countries, with very limited data from low-income and lower-middle-income settings. Similarly, vulnerable populations such as Indigenous or sexually and gender-diverse youths, were underrepresented. As a result, the identified risk and protective factors may not fully reflect context-specific determinants of suicide mortality in regions or communities with different social, cultural, and health care characteristics. Third, despite rigorous and systematic extraction of data into defined domains and factors, certain items may have been missed or incorrectly classified. Although all extracted data were verified by a second reviewer, extraction was not performed independently. Fourth, given the number and heterogeneity of factors, we relied on vote counting and minimally adjusted meta-analyses (age and sex). Findings are descriptive and do not capture independent associations or developmental pathways or interactions between factors. Fifth, we included only confirmed suicide deaths; deaths classified as other or as undetermined cause were excluded. In fact, some may have been suicides misclassified. Sixth, several factors associated with suicidal ideation and self-harm in young people, such as bullying,[113] could not be meta-analyzed due to the paucity of available studies. Seventh, protective factors such as access to mental health care, faith and spirituality, and community belonging, were not documented.

The strengths of the present systematic review include the most comprehensive meta-analysis of current deaths by suicide in youth to date. Previously, most research focused on suicidal ideation or self-harm, or a combination thereof, but not strictly mortality. Many studies also examined various age ranges, but not strictly children to young adults younger than 25 years. With almost 100 high-quality reports from about 70 studies, we examined key risk and protective factors across all domains, from studies published in any language, worldwide.

Conclusions

In this systematic review and meta-analysis of risk and/or protective factors for suicide mortality in youth, the strongest risk factors that emerged were mental health disorders, contact with mental health care services in the previous year, maltreatment, out-of-home placement, and youth justice involvement. The strongest protective factor, or positive social determinant, was family stability. Further research is needed to clarify developmental pathways linking socioecological determinants to suicide mortality, including their interplay with mental health disorders and with bullying.

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Research should also prioritize underrepresented Indigenous and sexually and gender-diverse populations for innovative preventive initiatives.

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Data Sharing Statement

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