



Original Investigation | Psychiatry

# Prevalence and Family-Related Factors Associated With Suicidal Ideation, Suicide Attempts, and Self-injury in Children Aged 9 to 10 Years

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## Abstract

**IMPORTANCE** Although suicide is a leading cause of death for children in the United States, and the rate of suicide in childhood has steadily increased, little is known about suicidal ideation and behaviors in children.

**OBJECTIVE** To assess the overall prevalence of suicidal ideation, suicide attempts, and nonsuicidal self-injury, as well as family-related factors associated with suicidality and self-injury among preadolescent children.

**DESIGN, SETTING, AND PARTICIPANTS** Cross-sectional study using retrospective analysis of the baseline sample from the Adolescent Brain Cognitive Development (ABCD) study. This multicenter investigation used an epidemiologically informed school-based recruitment strategy, with consideration of the demographic composition of the 21 ABCD sites and the United States as a whole. The sample included children aged 9 to 10 years and their caregivers.

**MAIN OUTCOMES AND MEASURES** Lifetime suicidal ideation, suicide attempts, and nonsuicidal self-injury as reported by children and their caregivers in a computerized version of the Kiddie Schedule for Affective Disorders and Schizophrenia.

**RESULTS** A total of 11 814 children aged 9 to 10 years (47.8% girls; 52.0% white) and their caregivers were included. After poststratification sociodemographic weighting, the approximate prevalence rates were 6.4% (95% CI, 5.7%-7.3%) for lifetime history of passive suicidal ideation; 4.4% (95% CI, 3.9%-5.0%) for nonspecific active suicidal ideation; 2.4% (95% CI, 2.1%-2.7%) for active ideation with method, intent, or plan; 1.3% (95% CI, 1.0%-1.6%) for suicide attempts; and 9.1% (95% CI, 8.1-10.3) for nonsuicidal self-injury. After covarying by sex, family history, internalizing and externalizing problems, and relevant psychosocial variables, high family conflict was significantly associated with suicidal ideation (odds ratio [OR], 1.12; 95% CI, 1.07-1.16) and nonsuicidal self-injury (OR, 1.09; 95% CI, 1.05-1.14), and low parental monitoring was significantly associated with ideation (OR, 0.97; 95% CI, 0.95-0.98), attempts (OR, 0.91; 95% CI, 0.86-0.97), and nonsuicidal self-injury (OR, 0.95; 95% CI, 0.93-0.98); these findings were consistent after internal replication. Most of children's reports of suicidality and self-injury were either unknown or not reported by their caregivers.

**CONCLUSIONS AND RELEVANCE** This study demonstrates the association of family factors, including high family conflict and low parental monitoring, with suicidality and self-injury in children. Future research and ongoing prevention and intervention efforts may benefit from the examination of family factors.

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## Key Points

**Question** How common is suicidality among preadolescent children, and are certain family factors associated with children's suicidality?

**Findings** In a cross-sectional analysis of 11 814 children and their caregivers from the baseline sample from the Adolescent Brain Cognitive Development study, the prevalence of suicidal ideation and behaviors among preadolescent children was higher than previously estimated. Family conflict and low parental monitoring were associated with children's suicidality after statistically controlling for relevant sociodemographic and clinical variables.

**Meaning** These findings highlight the association between family factors and children's suicidal ideation and behaviors.

## + Supplemental content

Author affiliations and article information are listed at the end of this article.

## Introduction

The rate of death by suicide among children in the United States has tripled within the last decade.<sup>1</sup> However, little is known about the prevalence and correlates of suicidal ideation and behaviors in children, as most suicide research has focused on adolescent and adult populations.<sup>2-6</sup> The identification of risk factors associated with suicidality in childhood may enable clinicians to more effectively intervene on behalf of at-risk individuals as early as possible (ie, before they progress to adolescence and incur additional risk<sup>4</sup>), which may prevent death by suicide among children and reduce risk of death by suicide later in life.

Prior literature<sup>6-9</sup> suggests that the family environment may be associated with suicidality in preadolescent children. However, generalizability of these findings is limited by the use of smaller samples and a narrow focus on specific psychiatric presentations. Additionally, much of prior research has examined dichotomous outcomes in isolation (eg, the presence or absence of suicide attempts or suicidal ideation), despite indication that suicidality occurs on a continuum that includes passive suicidal ideation, nonspecific active suicidal ideation, and active suicidal ideation.<sup>10,11</sup>

There is also evidence to suggest that factors related to the family and parent-child relationship are associated with the development of nonsuicidal self-injury (NSSI; ie, intentional self-inflicted damage to the body done without suicidal intent, such as burning or scratching one's own skin).<sup>12,13</sup> Although NSSI does not fall strictly within the suicidality continuum,<sup>14</sup> the presence of NSSI is associated with considerable risk for future suicidality,<sup>15</sup> and early identification of children who engage in NSSI may improve suicide prevention efforts. Much of prior research on NSSI has focused on adolescents and young adults, despite evidence that these behaviors can emerge in younger children.<sup>16</sup>

Therefore, the aim of the current study was to examine the prevalence of suicidality and NSSI using a large sample of preadolescent children recruited from across the United States as part of the Adolescent Brain Cognitive Development (ABCD) study. A secondary aim was to identify factors related to children's immediate family environments associated with suicidality and NSSI.

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## Methods

### Study Protocol

The present study used the National Data Archive ABCD 2.01 baseline data set<sup>17</sup> collected between 2016 and 2018 from the ABCD study, a longitudinal study that will track children in the United States from 21 different research sites over the course of 10 years.<sup>18</sup> Procedures<sup>18,19</sup> and sampling and recruitment<sup>20</sup> for the ABCD study have been described previously. Caregivers provided written informed consent and children provided assent for participation in the study. All procedures were approved by a central institutional review board, and each site has a detailed protocol in place to address reported self-harm, suicidal ideation, or suicidal behavior. The University of California, San Diego, institutional review board has indicated that analyses using the publicly released ABCD Study data are not human subjects research and therefore do not require their own approval. All children who reported current suicidality or self-harm underwent additional risk assessment by a site-designated clinician to ensure their safety; in cases involving concern for safety, information regarding suicidality or self-harm was disclosed to the child's caregiver, and the child was referred to a local hospital for further evaluation. Reporting of this study follows the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) reporting guideline.

### Measures

#### Outcomes

Parent and child reports of current and/or past suicidality and NSSI were gathered from a computerized version of the Kiddie Schedule for Affective Disorders and Schizophrenia–Present and Lifetime Version using *Diagnostic and Statistical Manual of Mental Disorders* (Fifth Edition) criteria

(K-SADS-PL DSM-5<sup>21,22</sup>). The following categories on the spectrum of suicidality were examined: (1) passive suicide ideation (ie, a wish to be dead); (2) nonspecific active suicidal ideation (ie, wanting to end one's own life without consideration of a suicide method, intent, or plan); (3) active suicidal ideation (ie, a desire to die by suicide and  $\geq 1$  of the following: a consideration of a specific suicide method, expression of the intent to act on suicidal thoughts, and/or formulation of a plan to commit suicide in the future); or (4) suicide attempts. Additional information regarding these categories is provided in the eTable 1 in the [Supplement](#). For all outcomes included in the current analysis, if the child or his or her caregiver reported the item in question, the child was included in the current analysis as having endorsed the given item. Participants were classified into suicide-related subgroups hierarchically based on the most severe form of suicidality endorsed (eg, if a participant endorsed a lifetime history of nonspecific active ideation and specific active ideation, he or she was included in the specific active ideation subgroup). Nonsuicidal self-injury was considered its own distinct category, such that a child endorsing a suicide attempt as well as NSSI would be included in both groups.

### Clinical Variables

The parent-reported Child Behavior Checklist<sup>23</sup> was used to assess children's internalizing problems (eg, anxiety, depression, withdrawal, somatic complaints) and externalizing problems (eg, rule breaking, aggressive behavior). Raw scores on this measure were converted to *t* scores, with a *t* score less than 60 representing normal functioning. The Child Behavior Checklist assesses problems over the prior 6 months; thus, the scores reported here may not reflect the degree of problems present during an episode of suicidality.

### Sociodemographic and Family History Variables

A caregiver-completed demographic questionnaire was used to gather information regarding participants' sex, race/ethnicity, and family history of depressive disorders and suicide. Financial adversity was assessed using a checklist that assesses the inability to meet basic needs owing to income disparity. The scores on this questionnaire reflect the total number of items endorsed of 7 possible items (ie, inability to access medical care, inability to access dental care, lack of sufficient access to food, inability to pay for telephone services, having gas or electricity shut off for nonpayment, inability to pay rent or mortgage, and/or being evicted for nonpayment).

### Family and Home Environment

The extent to which the children in the study were tracked and supervised by their parents was assessed using the Parental Monitoring Questionnaire.<sup>24</sup> Perceived caregiver acceptance was measured using 5 items from the caregiver acceptance subscale of the Children's Report of Parent Behavior Inventory.<sup>25</sup> Children's reports of family conflict were assessed using the 9-item family conflict subscale of the Family Environment Scale.<sup>26,27</sup> Items on this measure assess the extent of fighting, anger, criticism, competitiveness, yelling, and/or loss of temper within the family.

### Statistical Analysis

All data were analyzed using R version 3.5.1 (R Project for Statistical Computing).<sup>28</sup> Population-level prevalence rates of suicidal ideation, suicide attempts, NSSI, and discordant parent-child reporting were approximated using the "survey" package in R<sup>29</sup> after adjusting the data by raked propensity weights included in the ABCD data set. This allows for evaluation of less biased estimates to compensate for underrepresentation or overrepresentation within the ABCD sample on the basis of sex, single vs multiple birth, race/ethnicity, income, household size, and region.<sup>20</sup> The raked propensity weight was computed using the American Community Survey data, which was merged with ABCD data (with missing data imputed as described in the eMethods in the [Supplement](#)) to estimate the propensity model, compute the propensity weight for each participant, and rake the scaled weights to total American Community Survey controls. The "survey" package was also used to

examine differences in these rates by sociodemographic and clinical features using 2-sided *t* tests and second-order Rao-Scott tests of independence.

Using the unweighted data, factors associated with suicidal ideation, suicide attempts, and NSSI were examined using generalized linear mixed-effects models (GLMM) using R package “lme4,”<sup>30</sup> with respondent family and study site included as nested random effects. The GLMM analyses were conducted in an initial sample (70%) and a validation sample (30%), with participants randomly assigned to either set. All continuous variables were mean centered. Within the initial and replication data sets, caregiver acceptance, parental monitoring, and family conflict were examined as cross-sectional predictors after covarying for the effects of sex, financial adversity, family history of depression and suicide, and total internalizing and externalizing problems. The variance inflation factor and correlations between all covariates and predictor variables were examined to detect potential problems related to multicollinearity. These correlations are reported in the eFigure in the Supplement. Unadjusted outcomes are reported in eTable 2 and eTable 3 in the Supplement. Models using the imputed raked propensity-weighted data were also examined and are reported in eTable 4 of the Supplement. A post hoc GLMM analysis with the inclusion of pubertal status was also conducted and is reported in eTable 5 in the Supplement.

Additionally, an exploratory post hoc GLMM analysis was conducted in the unweighted sample to examine factors associated with parent-child discordant reporting of suicidal ideation. Statistical significance was set at 2-sided *P* < .05.

## Results

### Participants

After excluding 39 participants with missing K-SADS data, data from 11 814 children (47.8% female; 52.0% white) and 1 of their caregivers were included for analyses. All children were 9 to 10 years old. Detailed demographic information is reported in **Table 1**. A small proportion (<1%) of participants were missing data on certain measures (Table 1, **Table 2**, **Table 3**, and **Table 4**).

### Prevalence of Suicidal Thoughts and Behaviors

The estimated prevalence rates of suicidality and NSSI are illustrated in Table 2. The approximate prevalence rates were 6.4% (95% CI, 5.7%-7.3%) for passive suicidal ideation; 4.4% (95% CI, 3.9%-5.0%) for nonspecific active suicidal ideation; 2.4% (95% CI, 2.1%-2.7%) for active ideation with method, intent, or plan; 1.3% (95% CI, 1.0%-1.6%) for suicide attempts; and 9.1% (95% CI, 8.1%-10.3%) for NSSI.

### Parent-Child Discordance

Discordance between children's reports of suicidal ideation and caregivers' reports of their child's suicidal ideation was high. Of the children who reported suicidal ideation, 77% (95% CI, 73%-80%) were lacking caregiver agreement (ie, parents denied all forms of suicidal ideation or attempts). Of the children who reported suicide attempts, 88% (95% CI, 81%-93%) lacked overall caregiver concordance, with 38% (95% CI, 28%-49%) reporting knowledge of ideation but no knowledge of attempts, and 50% (95% CI, 41%-60%) reporting no knowledge of attempts and no knowledge of ideation. The parent-child discordance for NSSI was 84% (95% CI, 80%-87%).

A post hoc GLMM analysis in the unweighted baseline sample examining factors associated with discordant parent-child reporting of suicidal ideation revealed that higher levels of internalizing and externalizing problems were associated with a lower likelihood of discordant reporting (internalizing: odds ratio [OR], 0.92; 95% CI, 0.91-0.95; *P* < .001; and externalizing: OR, 0.97; 95% CI, 0.95-0.99; *P* = .003). This may be attributed to the fact that Child Behavior Checklist scores are based on parent reports, and parents who report more mental health symptoms in their children are more likely to identify suicidal ideation. Boys were less likely to have discordant parent reports (OR, 0.66; 95% CI,

**Table 1. Unweighted Sample Demographic Characteristics of 11 814 Participants**

Characteristic	No. (%)
Age, mean (SD), mo	118.9 (7.5)
Sex <sup>a</sup>	
Male	6159 (52.1)
Female	5649 (47.8)
Race/ethnicity <sup>a</sup>	
White	6140 (52.0)
African American	1770 (15.0)
Hispanic	2396 (20.3)
Asian	251 (2.1)
Other	1239 (10.5)

<sup>a</sup> Six children were missing data indicating sex; 18 children did not have data describing race/ethnicity.

0.45-0.96;  $P = .03$ ). Interestingly, family history of depression was associated with lower parent-child discordance (OR, 0.55; 95% CI, 0.36-0.84;  $P = .006$ ). Caregiver acceptance, parental monitoring, and family conflict were not associated with discordance.

**Sociodemographic Variables**

Boys had higher rates of suicidal ideation and NSSI (Table 2), but there were no significant differences in suicide attempts by sex. There were no significant differences observed in any of the outcome variables by race/ethnicity. Significantly greater levels of financial adversity were observed among children who endorsed suicidal ideation, suicide attempts, and NSSI (Table 3).

**Clinical Variables**

As shown in Table 3, internalizing and externalizing problems were significantly more common among children who endorsed all forms of suicidal ideation, suicide attempts, and NSSI. Family

**Table 2. Prevalence Estimates of Suicidal Ideation, Suicide Attempts, and Nonsuicidal Self-injury**

Problem	Unweighted Count, No. (%) <sup>a</sup>	Weighted Population Estimate, No.	Prevalence Estimate, % (95% CI) <sup>b</sup>
Ideation			
Passive	763 (6.46)	526 098	6.44 (5.71-7.26)
Active			
Nonspecific	512 (4.32)	358 693	4.39 (3.85-5.00)
Specific	266 (2.25)	194 983	2.39 (2.13-2.68)
Suicide attempt	127 (1.08)	102 896	1.26 (1.01-1.57)
Nonsuicidal self-injury	1068 (9.04)	746 612	9.14 (8.13-10.3)

<sup>a</sup> The unweighted sample included 11 814 participants after excluding 39 participants without data on suicide-related outcome variables.

<sup>b</sup> Prevalence estimates were calculated using imputed raked propensity weights from the Adolescent Brain Cognitive Development data set, with an overall estimated population of 8 166 456.

**Table 3. Estimated Prevalence of Suicidality and Self-injury by Sex, Race/Ethnicity, and Family History in Population Estimates After Weighting by Raked Propensity Scores and Nesting Within Study Site**

Characteristic <sup>a</sup>	Ideation		Active		Suicide Attempt		Nonsuicidal Self-injury			
	Rate (95% CI), %	Adjusted F <sup>b</sup>	Rate (95% CI), %	Adjusted F <sup>b</sup>	Rate (95% CI), %	Adjusted F <sup>b</sup>	Rate (95% CI), %	Adjusted F <sup>b</sup>		
Sex										
Female	6.2 (5.4-7.0)	5.4 <sup>c</sup>	3.9 (3.0-4.8)	10.9 <sup>c</sup>	2.1 (1.7-2.5)	13.5 <sup>c</sup>	1.2 (0.8-1.6)	0.7	7.5 (6.7-8.3)	28.5 <sup>c</sup>
Male	7.8 (6.5-9.1)		5.8 (5.0-6.6)		3.3 (2.8-3.4)		1.3 (1.1-1.6)		10.7 (9.3-12.2)	
Race/ethnicity										
White	7.6 (6.6-8.6)	3.2	4.9 (4.2-5.6)	1.3	2.9 (2.3-3.4)	1.4	1.0 (0.7-1.3)	2.2	9.7 (8.5-10.9)	2.0
African American	5.0 (3.7-6.2)		4.9 (3.9-5.9)		2.2 (1.2-3.1)		2.0 (1.1-2.8)		7.7 (6.6-8.8)	
Hispanic	6.4 (5.2-7.5)		4.3 (4.0-5.5)		2.5 (2.1-3.0)		1.5 (0.8-2.2)		9.3 (7.7-11.0)	
Asian	7.7 (4.0-11.4)		6.2 (3.3-9.2)		4.7 (1.1-8.4)		0.3 (0.0-0.7)		6.0 (2.9-9.0)	
Other	8.7 (6.8-10.7)		6.3 (4.7-7.7)		2.3 (1.6-3.2)		1.5 (0.5-2.5)		8.7 (5.6-12.0)	
Family history										
Depression										
Yes	8.6 (7.9-9.3)	48.9 <sup>c</sup>	6.9 (5.8-8.1)	22.2 <sup>c</sup>	4.5 (3.6-5.4)	21.3 <sup>c</sup>	1.6 (1.2-2.0)	7.3 <sup>c</sup>	11.0 (9.6-12.3)	77.4 <sup>c</sup>
No	4.9 (4.0-5.8)		4.2 (3.5-4.9)		2.2 (1.9-2.6)		0.8 (0.5-1.2)		6.8 (5.9-7.6)	
Suicide										
Yes	9.4 (8.1-10.7)	25.9 <sup>c</sup>	6.9 (5.4-7.4)	19.0 <sup>c</sup>	3.8 (3.0-4.6)	18.4 <sup>c</sup>	2.5 (1.8-3.2)	30.4 <sup>c</sup>	13.0 (10.9-15.1)	37.7 <sup>c</sup>
No	6.1 (5.4-6.9)		4.0 (3.3-4.6)		2.0 (1.7-2.3)		0.9 (0.7-1.2)		8.0 (7.2-8.9)	

<sup>a</sup> Six children were missing data indicating sex; 18 children did not have data describing race/ethnicity; for family history of depression and suicide, 509 and 518 caregivers, respectively, did not provide data and/or indicated that they did not have knowledge about health history of biological relatives.

<sup>b</sup> The adjusted F statistic is a variant of the second-order Rao-Scott adjusted  $\chi^2$  statistic.

<sup>c</sup> Statistically significant at  $P < .05$  after Benjamini-Hochberg correction.

history of depression and family history of suicide were more common among children with suicidal ideation, suicide attempts, and NSSI.

### Family and Home Environment

Parental monitoring, caregiver acceptance, and family conflict were examined as factors potentially associated with suicidal ideation, suicide attempts, and NSSI after adjusting for sex, financial adversity, family history of depression and suicide, and children's internalizing and externalizing problems (Table 5). Caregiver acceptance was not associated with ideation, attempts, or NSSI. Although family conflict was associated with suicide attempts in the initial analysis, this finding was not replicated in the validation data. In the initial analysis, family conflict was associated with ideation (OR, 1.12; 95% CI, 1.07-1.16) and NSSI (OR, 1.09; 95% CI, 1.05-1.14), and low parental monitoring was associated with ideation (OR, 0.97; 95% CI, 0.95-0.98), NSSI (OR, 0.95; 95% CI, 0.93-0.98), and suicide attempts (OR, 0.91; 95% CI, 0.86-0.97). These findings were consistent in the validation analysis (Table 5).

### Discussion

Despite the increasing rate of death by suicide in children younger than 14 years,<sup>1</sup> little is known about suicidal ideation and behavior in preadolescents. One aim of the current study was to examine the prevalence of suicidal ideation, suicide attempts, and NSSI using baseline data from the ABCD study. A small number of studies have attempted to elucidate the factors associated with suicidality in childhood.<sup>6-8</sup> To this end, an additional aim of the current study was to examine the relationship between family factors and suicidality and self-harm among children.

Table 4. Estimated Mean Differences in Psychosocial, Family, and Clinical Variables Across Groups After Weighting by Raked Propensity Scores

Characteristic <sup>a</sup>	Mean (95% CI)			Suicide Attempt	Nonsuicidal Self-injury
	Ideation				
	Passive	Active	Specific		
Financial adversity	0.68 (0.54-0.82) <sup>b</sup>	0.73 (0.59-0.86) <sup>b</sup>	0.89 (0.66-1.12) <sup>b</sup>	1.20 (0.88-1.52) <sup>b</sup>	0.84 (0.65-1.03) <sup>b</sup>
Internalizing problems	54.5 (53.6-55.5) <sup>b</sup>	55.3 (53.7-56.9) <sup>b</sup>	56.3 (54.5-58.0) <sup>b</sup>	59.1 (57.4-61.0) <sup>b</sup>	55.0 (53.9-56.2) <sup>b</sup>
Externalizing problems	51.4 (50.5-52.3) <sup>b</sup>	53.4 (52.1-54.6) <sup>b</sup>	52.5 (50.6-54.3) <sup>b</sup>	57.1 (54.3-60.0) <sup>b</sup>	52.2 (50.8-53.6) <sup>b</sup>
Parental monitoring	25.4 (25.0-25.8) <sup>b</sup>	24.7 (24.3-25.2) <sup>b</sup>	23.8 (23.1-24.6) <sup>b</sup>	23.4 (22.7-24.1) <sup>b</sup>	24.4 (24.0-24.8) <sup>b</sup>
Caregiver acceptance	10.8 (10.6-11.0)	10.6 (10.4-10.8) <sup>b</sup>	10.2 (9.8-10.5) <sup>b</sup>	10.3 (9.9-10.7) <sup>b</sup>	10.5 (10.3-10.6) <sup>b</sup>
Family conflict	2.6 (2.4-2.7) <sup>b</sup>	2.9 (2.6-3.1) <sup>b</sup>	3.2 (3.0-3.5) <sup>b</sup>	3.5 (3.1-4.0) <sup>b</sup>	2.9 (2.7-3.0) <sup>b</sup>

<sup>a</sup> A total of 133 participants did not provide financial adversity scores, 11 did not have scores on internalizing or externalizing problems, 23 did not have parental monitoring scores, 34 did not have data on caregiver acceptance, and 24 did not have family conflict scores.

<sup>b</sup> A significant difference was found between those endorsing the suicide or self-injury variable and those who did not at  $P < .05$  in a 2-sided test after Benjamini-Hochberg familywise error adjustment.

Table 5. Factors Associated With Suicidal Ideation, Suicide Attempts, and Nonsuicidal Self-injury<sup>a</sup>

Predictor	Odds Ratio (95% CI)					
	Suicidal Ideation		Suicide Attempts		Nonsuicidal Self-injury	
	Initial	Replication	Initial	Replication	Initial	Replication
Caregiver acceptance	0.96 (0.92-1.01)	0.97 (0.90-1.05)	1.03 (0.90-1.18)	0.97 (0.78-1.2)	0.96 (0.91-1.02)	0.94 (0.86-1.02)
Parental monitoring	0.97 (0.95-0.98) <sup>b</sup>	0.96 (0.93-0.99) <sup>b</sup>	0.91 (0.86-0.97) <sup>b</sup>	0.90 (0.82-0.99) <sup>b</sup>	0.95 (0.93-0.98) <sup>b</sup>	0.96 (0.92-0.99) <sup>b</sup>
Family conflict	1.12 (1.07-1.16) <sup>b</sup>	1.18 (1.11-1.24) <sup>b</sup>	1.28 (1.16-1.43) <sup>b</sup>	1.11 (0.94-1.31)	1.09 (1.05-1.14) <sup>b</sup>	1.11 (1.05-1.19) <sup>b</sup>

<sup>a</sup> Results displayed are fixed effects of general linear mixed models, nested by family and Adolescent Brain Cognitive Development study site, after controlling for financial adversity, family history of depression, family history of suicide, and total internalizing and externalizing problem scores on the Child Behavior Checklist.

<sup>b</sup> Statistically significant at  $P < .05$ .



The lack of prior research on the prevalence of suicidality in children limits our ability to contextualize the rates observed in the current sample. However, prior epidemiological research that used adolescents' retrospective self-reports to estimate suicidality age at onset suggested that rates of suicidal ideation and behaviors are less than 1% prior to age 12 years.<sup>3</sup> Relative to this estimate, the prevalence of suicidal ideation observed in the current study was greater than expected. The prevalence of NSSI among children in the current study is comparable with rates demonstrated by prior research.<sup>16</sup>

Although there is consistent evidence to suggest that a sex difference exists among suicidal adolescents and adults,<sup>31,32</sup> research on sex differences in suicidality among children has been comparatively inconclusive. In the current sample, boys exhibited higher rates of ideation, with no sex differences in the prevalence of suicide attempts. Prior literature demonstrates higher rates of NSSI among boys in childhood, followed by increased NSSI among girls in adolescence.<sup>16</sup> Our findings were consistent with this, suggesting higher rates of NSSI among preadolescent boys.

Prior literature suggests that children who belong to racial minority groups, particularly African American boys, are more likely to die by suicide.<sup>33,34</sup> However, there have been no prior investigations of racial differences in suicidal ideation or nonfatal suicide attempts among children. There was no evidence for differences in suicidal ideation, attempts, or NSSI associated with race/ethnicity among children in the current study. Therefore, our findings introduce the possibility that racial differences in fatal suicide attempts may not necessarily translate to differences in ideation or attempts. Rather, there may be racial differences in access to suicide means or other factors influencing suicidal capacity. This may become clearer with longitudinal investigation of the children enrolled in this study.

We demonstrated a high rate of discordance between parent and child reports of suicidal ideation and behavior. A lack of caregiver agreement was observed in more than 75% of children reporting suicidal ideation or behaviors, indicating that most caregivers of suicidal children were unaware of or otherwise unable to report information regarding their child's suicidality. High rates of parent-child discordant reporting of suicidality have been demonstrated previously,<sup>35</sup> although to a lesser extent and using data collected more than a decade ago. High parent-child discordance has been reported across a range of other mental health variables and is thought to be associated with negative outcomes.<sup>36,37</sup> In the present study, family history of depression was associated with lower rates of discordant reporting of suicidal ideation, introducing the possibility that parents are either more alert for signs of children's suicidality or more likely to engage their children in conversations about suicide if there has been a significant family history of depression. To our knowledge, the association between family history and concordance has not been previously reported.

In the current study, family conflict was associated with a higher likelihood of suicidal ideation and NSSI, and low parental monitoring was associated with suicidal ideation, suicide attempts, and NSSI. This association with suicidality and NSSI remained after adjusting for family history, internalizing and externalizing problems, financial adversity, and sex. This extends prior research on the association between family factors and suicide<sup>6-9,33</sup> and NSSI,<sup>7</sup> although the findings reported here are, to our knowledge, the first to demonstrate and replicate these associations in a broader, more representative sample of children.

### Implications for Suicide Prevention

The high levels of parent-child discordance in the reporting of ideation, suicide attempts, and NSSI observed in the current study may have important clinical implications. Our findings highlight the need to ensure that suicide assessments are conducted with children directly rather than solely with the child's caregivers. If possible, assessment of suicidal ideation should occur within a one-on-one interaction with the child. This may enhance clinicians' ability to identify at-risk children and may maximize opportunities for early intervention.

Although many factors that influence a child's risk for suicide may not necessarily be directly modifiable, family conflict and parental monitoring present targets for intervention. Adaptation of

existing upstream programs that aim to address family conflict and improve the parent-child relationship may be a worthwhile area of investigation. For example, the Family Check-Up program,<sup>38</sup> which was designed to decrease substance abuse and behavior problems through interventions involving parental monitoring and parent-child communication, has been shown to reduce suicidal ideation in early adulthood.<sup>39-41</sup> Further research on family intervention programs may benefit from the inclusion of suicide-related variables as outcomes of interest.

### Limitations

This study has some limitations, including the cross-sectional nature of the analyses. Longitudinal evaluation of children enrolled in ABCD will be necessary to examine factors associated with the development of suicidality over time. It should also be noted that while the K-SADS has been validated for children between the ages of 6 and 18 years and has been widely used in research on suicide,<sup>7,42-45</sup> the computerized version of the K-SADS is a newer measure. At this time, this version has been validated in children aged 11 years or older<sup>22</sup> but is implemented in the ABCD study using children between the ages of 9 and 10 years. Therefore, comprehension difficulty cannot be entirely ruled out. All children had the support of trained research assessment staff during K-SADS administration. Furthermore, we acknowledge our effect sizes were relatively small, although given the large, representative community-based sample and use of internal replication of regression analyses, our findings are likely robust. In addition, it should be noted that suicide is an exceedingly complex phenomenon that likely results from interactions between numerous developmental, psychological, sociocultural, interpersonal, biological, and environmental factors.<sup>46</sup> Although we focus on the association between suicidality and family factors in the current study, large-scale data-driven approaches are necessary for a more complete understanding of suicide. Regardless of causal mechanisms, there may be pragmatic clinical value to the examination of the association between family factors and children's suicidality.

### Conclusions

This study demonstrates that certain family factors are associated with increased reports of suicidal ideation, suicide attempts, and NSSI. Although causal mechanisms cannot be inferred from these findings, follow-up analyses using longitudinal ABCD data may benefit from the examination of family factors in the development of suicidality. Such findings may inform the development of early intervention efforts directed toward the improvement of the caregiver-child relationship and the reduction of family conflict.

### ARTICLE INFORMATION

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**Author Contributions:** Mss DeVille and Breslin had full access to all of the data in the study and take responsibility for the integrity of the data and the accuracy of the data analysis.

**Concept and design:** Whalen, Breslin, Morris, Barch.

**Acquisition, analysis, or interpretation of data:** DeVille, Whalen, Breslin, Khalsa, Paulus, Barch.

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**Statistical analysis:** DeVille, Whalen, Paulus, Barch.

**Obtained funding:** Paulus, Barch.

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## REFERENCES

1. Curtin SC, Heron M. Death rates due to suicide and homicide among persons aged 10–24: United States, 2000–2017. *NCHS Data Brief*. 2019;(352):1–8.
2. Nock MK, Borges G, Bromet EJ, et al. Cross-national prevalence and risk factors for suicidal ideation, plans and attempts. *Br J Psychiatry*. 2008;192(2):98–105. doi:10.1192/bjp.bp.107.040113
3. Nock MK, Green JG, Hwang I, et al. Prevalence, correlates, and treatment of lifetime suicidal behavior among adolescents: results from the National Comorbidity Survey Replication Adolescent Supplement. *JAMA Psychiatry*. 2013;70(3):300–310. doi:10.1001/2013.jamapsychiatry.55
4. Nock MK, Hwang I, Sampson N, et al. Cross-national analysis of the associations among mental disorders and suicidal behavior: findings from the WHO World Mental Health Surveys. *PLoS Med*. 2009;6(8):e1000123. doi:10.1371/journal.pmed.1000123
5. Beautrais AL. Suicide and serious suicide attempts in youth: a multiple-group comparison study. *Am J Psychiatry*. 2003;160(6):1093–1099. doi:10.1176/appi.ajp.160.6.1093

6. An H, Ahn JH, Bhang SY. The association of psychosocial and familial factors with adolescent suicidal ideation: a population-based study. *Psychiatry Res*. 2010;177(3):318-322. doi:10.1016/j.psychres.2010.03.007
7. Goldstein TR, Birmaher B, Axelson D, et al. Family environment and suicidal ideation among bipolar youth. *Arch Suicide Res*. 2009;13(4):378-388. doi:10.1080/1381110903266699
8. King RA, Schwab-Stone M, Flisher AJ, et al. Psychosocial and risk behavior correlates of youth suicide attempts and suicidal ideation. *J Am Acad Child Adolesc Psychiatry*. 2001;40(7):837-846. doi:10.1097/00004583-200107000-00019
9. Gould MS, Fisher P, Parides M, Flory M, Shaffer D. Psychosocial risk factors of child and adolescent completed suicide. *Arch Gen Psychiatry*. 1996;53(12):1155-1162. doi:10.1001/archpsyc.1996.01830120095016
10. Kessler RC, Borges G, Walters EE. Prevalence of and risk factors for lifetime suicide attempts in the National Comorbidity Survey. *Arch Gen Psychiatry*. 1999;56(7):617-626. doi:10.1001/archpsyc.56.7.617
11. Svetcic J, De Leo D. The hypothesis of a continuum in suicidality: a discussion on its validity and practical implications. *Ment Illn*. 2012;4(2):e15. doi:10.4081/mi.2012.e15
12. Bureau JF, Martin J, Freynet N, Poirier AA, Lafontaine MF, Cloutier P. Perceived dimensions of parenting and non-suicidal self-injury in young adults. *J Youth Adolesc*. 2010;39(5):484-494. doi:10.1007/s10964-009-9470-4
13. Wichstrøm L. Predictors of non-suicidal self-injury versus attempted suicide: similar or different? *Arch Suicide Res*. 2009;13(2):105-122. doi:10.1080/1381110902834992
14. Muehlenkamp JJ. Self-injurious behavior as a separate clinical syndrome. *Am J Orthopsychiatry*. 2005;75(2):324-333. doi:10.1037/0002-9432.75.2.324
15. Whitlock J, Muehlenkamp J, Eckenrode J, et al. Nonsuicidal self-injury as a gateway to suicide in young adults. *J Adolesc Health*. 2013;52(4):486-492. doi:10.1016/j.jadohealth.2012.09.010
16. Barrocas AL, Hankin BL, Young JF, Abela JR. Rates of nonsuicidal self-injury in youth: age, sex, and behavioral methods in a community sample. *Pediatrics*. 2012;130(1):39-45. doi:10.1542/peds.2011-2094
17. Yang R, Jernigan TL. *Adolescent Brain Cognitive Development Study (ABCD) 2.0.1 Release* [data set]. Rockville, MD: National Institute of Mental Health Data Repositories; 2019. doi:10.15154/1504041.
18. Volkow ND, Koob GF, Croyle RT, et al. The conception of the ABCD study: from substance use to a broad NIH collaboration. *Dev Cogn Neurosci*. 2018;32:4-7. doi:10.1016/j.dcn.2017.10.002
19. Barch DM, Albaugh MD, Avenevoli S, et al. Demographic, physical and mental health assessments in the adolescent brain and cognitive development study: rationale and description. *Dev Cogn Neurosci*. 2018;32:55-66. doi:10.1016/j.dcn.2017.10.010
20. Garavan H, Bartsch H, Conway K, et al. Recruiting the ABCD sample: design considerations and procedures. *Dev Cogn Neurosci*. 2018;32:16-22. doi:10.1016/j.dcn.2018.04.004
21. Kaufman J, Birmaher B, Brent D, et al. Schedule for affective disorders and schizophrenia for school-age children-present and lifetime version (K-SADS-PL): initial reliability and validity data. *J Am Acad Child Adolesc Psychiatry*. 1997;36(7):980-988. doi:10.1097/00004583-199707000-00021
22. Townsend L, Kobak K, Kearney C, et al. Development of three web-based computerized versions of the Kiddie Schedule for Affective Disorders and Schizophrenia child psychiatric diagnostic interview: preliminary validity data [published online May 18, 2019]. *J Am Acad Child Adolesc Psychiatry*. doi:10.1016/j.jaac.2019.05.009
23. Achenbach TM, Ruffle TM. The Child Behavior Checklist and related forms for assessing behavioral/emotional problems and competencies. *Pediatr Rev*. 2000;21(8):265-271. doi:10.1542/pir.21-8-265
24. Chilcoat HD, Anthony JC. Impact of parent monitoring on initiation of drug use through late childhood. *J Am Acad Child Adolesc Psychiatry*. 1996;35(1):91-100. doi:10.1097/00004583-199601000-00017
25. Schaefer ES. A configurational analysis of children's reports of parent behavior. *J Consult Psychol*. 1965;29(6):552-557. doi:10.1037/h0022702
26. Moos RH, Moos BS. *Family Environment Scale Manual*. Mountain View, CA: Consulting Psychologists Press; 1994.
27. Boyd CP, Gullone E, Needleman GL, Burt T. The Family Environment Scale: reliability and normative data for an adolescent sample. *Fam Process*. 1997;36(4):369-373. doi:10.1111/j.1545-5300.1997.00369.x
28. R: A Language and Environment for Statistical Computing. Vienna, Austria: R Core Team; 2018.
29. Lumley T. Analysis of complex survey samples. *J Stat Softw*. 2004;9(1):1-19. doi:10.18637/jss.v009.i08
30. Bates D, Maechler M, Bolker B, Walker S. Fitting linear mixed-effects models using lme4. *J Stat Softw*. 2015;67(1):1-48. doi:10.18637/jss.v067.i01

31. Lewinsohn PM, Rohde P, Seeley JR, Baldwin CL. Gender differences in suicide attempts from adolescence to young adulthood. *J Am Acad Child Adolesc Psychiatry*. 2001;40(4):427-434. doi:10.1097/00004583-200104000-00011
32. Hawton K. Sex and suicide: gender differences in suicidal behaviour. *Br J Psychiatry*. 2000;177(6):484-485. doi:10.1192/bjp.177.6.484
33. Bridge JA, Asti L, Horowitz LM, et al. Suicide trends among elementary school-aged children in the United States from 1993 to 2012. *JAMA Pediatr*. 2015;169(7):673-677. doi:10.1001/jamapediatrics.2015.0465
34. Sheftall AH, Asti L, Horowitz LM, et al. Suicide in elementary school-aged children and early adolescents. *Pediatrics*. 2016;138(4):e20160436. doi:10.1542/peds.2016-0436
35. Foley DL, Goldston DB, Costello EJ, Angold A. Proximal psychiatric risk factors for suicidality in youth: the Great Smoky Mountains Study. *Arch Gen Psychiatry*. 2006;63(9):1017-1024. doi:10.1001/archpsyc.63.9.1017
36. Ferdinand RF, van der Ende J, Verhulst FC. Parent-adolescent disagreement regarding psychopathology in adolescents from the general population as a risk factor for adverse outcome. *J Abnorm Psychol*. 2004;113(2):198-206. doi:10.1037/0021-843X.113.2.198
37. Salbach-Andrae H, Klinskowski N, Lenz K, Lehmkuhl U. Agreement between youth-reported and parent-reported psychopathology in a referred sample. *Eur Child Adolesc Psychiatry*. 2009;18(3):136-143. doi:10.1007/s00787-008-0710-z
38. Dishion TJ, Kavanagh K. *Intervening in Adolescent Problem Behavior: A Family-Centered Approach*. New York, NY: Guilford Press; 2003.
39. Brent D. Prevention programs to augment family and child resilience can have lasting effects on suicidal risk. *Suicide Life Threat Behav*. 2016;46(suppl 1):S39-S47. doi:10.1111/sltb.12257
40. Connell AM, McKillop HN, Dishion TJ. Long-term effects of the family check-up in early adolescence on risk of suicide in early adulthood. *Suicide Life Threat Behav*. 2016;46(suppl 1):S15-S22. doi:10.1111/sltb.12254
41. Reider EE, Sims BE. Family-based preventive interventions: can the onset of suicidal ideation and behavior be prevented? *Suicide Life Threat Behav*. 2016;46(suppl 1):S3-S7. doi:10.1111/sltb.12252
42. Tuisku V, Pelkonen M, Karlsson L, et al. Suicidal ideation, deliberate self-harm behaviour and suicide attempts among adolescent outpatients with depressive mood disorders and comorbid axis I disorders. *Eur Child Adolesc Psychiatry*. 2006;15(4):199-206. doi:10.1007/s00787-005-0522-3
43. Isohookana R, Riala K, Hakko H, Räsänen P. Adverse childhood experiences and suicidal behavior of adolescent psychiatric inpatients. *Eur Child Adolesc Psychiatry*. 2013;22(1):13-22. doi:10.1007/s00787-012-0311-8
44. Goldstein TR, Ha W, Axelson DA, et al. Predictors of prospectively examined suicide attempts among youth with bipolar disorder. *Arch Gen Psychiatry*. 2012;69(11):1113-1122. doi:10.1001/archgenpsychiatry.2012.650
45. Freudenstein O, Zohar A, Apter A, Shoval G, Weizman A, Zalsman G. Parental bonding in severely suicidal adolescent inpatients. *Eur Psychiatry*. 2011;26(8):504-507. doi:10.1016/j.eurpsy.2011.01.006
46. Franklin JC, Ribeiro JD, Fox KR, et al. Risk factors for suicidal thoughts and behaviors: a meta-analysis of 50 years of research. *Psychol Bull*. 2017;143(2):187-232. doi:10.1037/bul0000084

#### SUPPLEMENT.

**eMethods.** Imputation of Demographic Data for Propensity Weighting

**eTable 1.** Description of Each Suicide Domain Assessed in the K-SADS

**eTable 2.** Unadjusted Results for All Covariates and Predictors Regressed on Suicidal Ideation, Suicide Attempts, and Non-suicidal Self-injury (NSSI) From the Initial Dataset

**eTable 3.** Unadjusted Results for All Covariates and Predictors Regressed on Suicidal Ideation, Suicide Attempts, and Non-suicidal Self-injury (NSSI) From the Replication Dataset

**eTable 4.** Predictors of Suicidal Ideation, Suicide Attempts, and Non-suicidal Self-injury Using the Imputed Raked Propensity-Weighted Data for Population Estimates

**eTable 5.** Models With Pubertal Status Included as an Additional Covariate

**eFigure.** Pearson Correlations Between All Continuous Covariates and Predictor Variables