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Familial Pathways to Early-Onset Suicide Attempt:

A 5.6-Year Prospective Study

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Abstract

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IMPORTANCE—Suicide attempts are strong predictors of suicide, a leading cause of adolescent mortality. Suicide attempts are highly familial, although the mechanisms of familial transmission are not understood. Better delineation of these mechanisms could help frame potential targets for prevention.

OBJECTIVE—To examine the mechanisms and pathways by which suicidal behavior is transmitted from parent to child.

DESIGN, SETTING, AND PARTICIPANTS—In this prospective study conducted from July 15, 1997, through June 21, 2012, a total of 701 offspring aged 10 to 50 years (mean age, 17.7 years) of 334 clinically referred probands with mood disorders, 191 (57.2%) of whom had also made a suicide attempt, were followed up for a mean of 5.6 years.

MAIN OUTCOMES AND MEASURES—The primary outcome was a suicide attempt. Variables were examined at baseline, intermediate time points, and the time point proximal to the attempt. Participants were assessed by structured psychiatric assessments and self-report and by interview measures of domains hypothesized to be related to familial transmission (eg, mood disorder and impulsive aggression).

RESULTS—Among the 701 offspring, 44 (6.3%) had made a suicide attempt before participating in the study, and 29 (4.1%) made an attempt during study follow-up. Multivariate logistic regression revealed that proband suicide attempt was a predictor of offspring suicide attempt (odds ratio [OR], 4.79; 95% CI, 1.75–13.07), even controlling for other salient offspring variables: baseline history of mood disorder (OR, 4.20; 95% CI, 1.37–12.86), baseline history of suicide attempt (OR, 5.69; 95% CI, 1.94–16.74), and mood disorder at the time point before the attempt (OR, 11.32; 95% CI, 2.29–56.00). Path analyses were consistent with these findings, revealing a direct effect of proband attempt on offspring suicide attempt, a strong effect of offspring mood disorder at each time point, and impulsive aggression as a precursor of mood disorder.

CONCLUSIONS AND RELEVANCE—Parental history of a suicide attempt conveys a nearly 5-fold increased odds of suicide attempt in offspring at risk for mood disorder, even after adjusting for the familial transmission of mood disorder. Interventions that target mood disorder and impulsive aggression in high-risk offspring may attenuate the familial transmission of suicidal behavior.

According to a review article,[1] adoption, twin, and family studies have established that suicidal behavior is familial. Moreover, the phenotype that is transmitted is a suicide attempt or suicide rather than suicidal ideation.[2,3] However, few studies[4–6] have addressed the pathways by which suicidal behavior is transmitted in families.

To address this gap in the literature, we began the Familial Pathways to Early-Onset Suicidal Behavior study, in which we followed up the offspring of parents with a mood disorder, with approximately half the parents in the study having a history of a suicide attempt. Previous studies[7–11] have indicated that offspring of suicide attempters had a 4- to 6-fold greater risk of a suicide attempt and that possible mediators of familial transmission included the intrafamilial transmission of impulsive aggression, mood disorder, and childhood maltreatment. However, these reports were cross-sectional or covered 1 to 2 years of follow-up with relatively few suicide attempts among offspring.

In contrast, we report on offspring of parents with mood disorders who were followed up for a mean of 5.6 years. Consequently, a much larger proportion of this cohort is past the peak age at onset of mood disorder and suicidal behavior. On the basis of previous work and the extant literature, we hypothesized that proband suicide attempt would predict offspring suicide attempt, even after controlling for the familial transmission of mood disorders, and that the familial transmission of suicidal behavior would be mediated by the familial transmission of mood disorder, impulsive-aggressive traits, and childhood physical or sexual abuse.

Methods

Sample

This study was reviewed and approved by the University of Pittsburgh Institutional Review Board and the New York State Psychiatric Institute Institutional Review Board, and written informed consent or assent was obtained from all participants. The sample consisted of 701 offspring of 334 probands with mood disorders, with 191 (57.2%) of the probands having made a suicide attempt and a mean (SD) number of offspring siblings per proband of 2.1 (1.0) (Table 1). Most pro-bands were clinically referred to the Western Psychiatric Institute or the New York State Psychiatric Institute, the 2 sites of this study, from July 15, 1997, through September 6, 2005, and followed through June 21, 2012.

Follow-up

Offspring were followed up for a mean (SD) of 5.6 (3.8) years, with retention rates of 88.6%, 81.7%, 60.1%, 61.1%, and 58.6% of the sample from intake for years 1 through 5, respectively; probands were also followed up prospectively. No baseline differences were found between those who were retained and those who were lost to follow-up after correction for the false discovery rate (FDR) and there was no difference in the rate of follow-up of offspring of suicide attempters vs nonattempters (hazard ratio, 1.10; 95% CI, 0.66–1.82; $z = 0.35$; $P = .73$).

Site Differences

At baseline, after FDR correction, offspring in Pittsburgh, compared with offspring in New York, were younger (mean [SD], 15.4 [6.8] vs 19.1 [10] years; $t_{210.7} = 4.09$; $P < .001$; q < .001), less likely to be Hispanic (1.6% vs 25.6%; $\chi^2_1 = 101.97$; $P < .001$; q < .001), and followed up for a longer period of time (mean [SD], 6.1 [3.7] vs 4.9 [3.8] years; $t_{699} = 4.06$; $P < .001$).

Assessment

Probands and offspring were assessed by separate, masked clinical interviewers (C.B.). Baseline interviews covered lifetime occurrence of suicidal ideation and behavior, aggression, and psychiatric disorders. Subsequent annual interviews covered these domains since the last assessment. These interviews, along with self-report questionnaires, targeted known contributors to suicidal risk, namely, previous attempt and suicidal ideation; mood, anxiety, and behavioral disorders; impulsive aggression; Cluster B personality disorders (ie,

borderline, antisocial, or narcissistic); family discord; history of head trauma; and history of abuse.[12–14] eTable 1 in the Supplement lists all assessments, targeted domains, and periods covered.

Suicidal behavior was assessed using the Columbia History of Suicide Form and classified as suicidal ideation, suicide attempt, interrupted attempt, or aborted attempt as per the Columbia Classification Algorithm for Suicide Attempts.[15,16] Interrater reliability with the Columbia History of Suicide Form is high ($\kappa = 0.97$), as was the convergent validity with the Columbia Suicide Severity Rating Scale.[17,18] A *suicide attempt* was defined as a self-destructive act that resulted in potential or actual tissue damage with inferred or explicit intent to die.[15] Suicide-related behavior included interrupted and aborted attempts and emergency referrals for suicidal ideation but not suicide attempts. Suicidal ideation was assessed by the Scale for Suicidal Ideation[19] or the downward extension for youth younger than 14 years.[20] Nonsuicidal self-injury (NSSI) was assessed consistent with its definition in the Columbia Classification Algorithm for Suicide Attempts.[15]

Aggression was measured using the Brown-Goodwin Lifetime History of Aggression in all participants.[21] Axis I disorders were assessed by the Structured Clinical Interview for *DSM-IV* for participants 18 years and older[22] and by the Schedule for Affective Disorders and Schizophrenia for School-Age Children, Present and Lifetime Version, in youth.[23] The Structured Clinical Interview for *DSM-IV* was augmented with a module for the assessment of attention-deficit/hyperactivity disorder derived from the Schedule for Affective Disorders and Schizophrenia for School-Age Children, Present and Lifetime Version. Interrater reliability on depressive diagnoses for specific ($\kappa = 0.96$; 95% CI, 0.90–1.00) and the full range of diagnoses ($\kappa = 0.65$–0.96) was high. Personality disorders in pro-bands and offspring 18 years or older were assessed using the Structured Clinical Interview for *DSM-IV* Axis II disorders.[24] Socioeconomic status of the head of household was assessed using Hollingshead's Four Factor Index of Social Status.[25] Race and ethnicity were based on the respondent's self-assessment.

Self-reported Questionnaires

For those 14 years and older vs younger offspring, depressive symptoms were assessed using the Beck Depression Inventory or the Children's Depression Inventory,[26,27] hopelessness with the Beck Hopelessness Scale or the Children's Hopelessness Scale,[28,29] and impulsive aggression by the Buss Durkee Hostility Inventory or the Children's Hostility Inventory.[30,31] For those 18 years and older vs those younger than 18 years, impulsivity was assessed with the Barratt Impulsivity Scale or the impulsivity subscale of the Conners' Teacher Rating Scale,[32,33] negative life events in the previous 12 months were assessed with the shortened version of the Social Readjustment Rating Scale or the Life Events Checklist,[34,35] social support was assessed with the Multidimensional Scale of Perceived Social Support[36] or the Survey of Children's Social Support,[37] and reasons for staying alive were assessed with the Reasons for Living Inventory[38] or the Reasons for Living Inventory for Adolescents.[39] Family climate was assessed using the child-reported Family Assessment of Cohesion Evaluation Scale.[40] In all participants, child maltreatment was assessed using the Abuse Dimensions Inventory[41] and the Childhood Trauma Questionnaire.[42] When the

same domain was assessed with different instruments for different age groups, scores were *z*-transformed.

Statistical Analysis

We conducted univariate analyses examining the association of demographic, clinical, and psychological characteristics with suicide attempt, using logistic regression to include a cluster effect to account for sibling pairs in the sample. For the purpose of these analyses, we categorize the longitudinal data into (1) baseline clinical variables at study intake; (2) intermediate variables, which covered all time points between baseline and the one before the proximal time point; and (3) proximal, which covered the time point immediately before the onset of an actual attempt or maximum time point for suicide nonattempters. All 3 of these time points were before the assessed outcome (actual suicide attempt), thus maintaining the temporal sequence for predictive models. Self-reports of symptom severity were not included with other baseline variables to reduce the number of variables examined. Dichotomous variables, such as diagnosis, were counted as present if they occurred during at least one of the intermediate time points, and the most severe rating of suicidal ideation was reported, whereas self-report data were averaged across intermediate time points. We also examined proband lifetime diagnoses up to the time point of offspring's suicide attempt or maximum time point. We controlled *a priori* for proband lifetime suicide attempts in all models.

Variables that were significant after using the FDR with the Yekutieli and Benjamini[43] method to account for correlations among variables (qqvalue package in STATA statistical software, version 11.2, Stata Corp) were included in multivariate analyses to select the most salient predictors of suicide attempt at the baseline, intermediate, and proximal time points. A final multivariate model included all salient variables from these 3 time points, followed by backward stepwise regression to identify the most parsimonious set of predictors overall. All multivariate models adjusted for offspring age, sex, ethnicity, and site. Fit of the multivariate logistic regression models was evaluated using the area under the curve of the receiver operating characteristic curve of the predicted probabilities and the classification table. Similar findings emerged after conducting analogous univariate and multivariate analyses with time to onset of attempt using Cox proportional hazards regression models, so we present the former approach in this article. In this sample of 701 offspring, 25 offspring of suicide attempters and 4 offspring of suicide nonattempters made suicide attempts during follow-up, resulting in a greater than 0.99 power to detect a Cohen effect size of 0.26 for 2-sided tests with $\alpha = .05$.[44]

Multivariate analyses were performed with actual and imputed data obtained with the Multiple Imputation by Chained Equations technique (ice command in STATA statistical software, version 11.2). Sensitivity analyses based on actual data yielded similar results. Path analyses, including the variables significant in the final multivariate analyses, were conducted using Mplus statistical software, version 7.11.[45]

Results

Suicide Attempts in Offspring

Of the 701 offspring, 44 (6.3%) had made a suicide attempt before participating in the study, and 29 (4.1%) made an attempt during study follow-up, of whom 19 (65.5%) made first-time attempts.

Baseline Variables—Proband suicide attempt, as an a priori hypothesis, was not subject to FDR correction but was related to risk of offspring suicide attempt (odds ratio [OR], 4.49; 95% CI, 1.56–12.90; $t = 2.79$; $P = .005$; q = 0.12). Similarly, with a survival analysis, the hazard of a suicide attempt was higher in offspring whose parent had a history of attempt (hazard ratio, 4.13; 95% CI, 1.45–11.77; $z = 2.66$; $P = .008$), with a mean (SD) age at onset of 20.1 (6.1) years (Figure 1). The risk of offspring suicide attempt was similar in the offspring of probands with unipolar depression (OR, 4.02; 95% CI, 1.39–11.65; $z = 2.56$; $P = .01$) and probands with bipolar depression (OR, 4.71; 95% CI, 0.24–93.06; $z = 1.02$; $P = .31$) but tended to be higher in the offspring of female pro-bands (OR, 5.10; 95% CI, 1.51–17.19; $z = 2.63$; $P = .008$) compared with the offspring of male probands (OR, 2.50; 95% CI, 0.30–21.19; $z = 0.84$; $P = .40$). As indicated in Table 2, offspring baseline mood disorder, history of a previous suicide attempt, impulsive aggression, and history of NSSI were related to a suicide attempt. Logistic regression revealed that the most parsimonious set of baseline variables associated with a suicide attempt was offspring mood disorder, history of NSSI, and history of a suicide attempt.

Intermediate Time Points—At the intermediate time points, offspring mood disorder, post-traumatic stress disorder, anxiety, behavioral or antisocial disorder, self-reported depressive symptoms, impulsivity, impulsive aggression, negative life events, NSSI, suicidal ideation, and suicide-related behavior were all related to an outcome of a suicide attempt. Logistic regression found that the most parsimonious set of variables at intermediate time points associated with suicide attempt were offspring negative life events and suicidal ideation (Table 2).

Proximal Time Point—At the proximal time point (ie, the one immediately before the attempt), offspring mood disorder, negative life events, aggression, and NSSI were associated with suicide attempt. Logistic regression identified offspring mood disorder and aggression at the proximal time as being the most parsimonious variables associated with suicide attempt (Table 2).

Multivariate Model—The most salient variables predicting offspring suicide attempt at each time block were entered into a logistic regression model along with offspring age, sex, Hispanic ethnicity, site, and proband suicide attempt. Using backward stepwise regression, the most parsimonious set of variables associated with offspring suicide attempt were offspring mood disorder at baseline, a history of an offspring suicide attempt before entry into the study, offspring mood disorder at the time point before the suicide attempt, and proband suicide attempt. There were no main effects of offspring age, offspring or proband

sex, or offspring or proband polarity of mood disorder on offspring suicide attempt and no significant interactions of any variables with proband attempt (Table 3).

Predictors of Mood Disorder at the Proximal Time Point—Because offspring mood disorder at the proximal time point to the attempt was among the strongest predictors of a suicide attempt, we tried to deconstruct this variable by identifying those baseline and intermediate variables most closely associated with it (eTable 2 in the Supplement), which were baseline proband Cluster B disorder and offspring age, as well as the following offspring variables assessed at intermediate time points: mood disorder, anxiety disorder, eating disorder, and impulsive aggression.

Path Model—Path analyses were conducted that included predictors of offspring mood disorder at a proximal time point (eTable 1 in the Supplement) and predictors of offspring suicide attempt (Table 3 and Figure 2). We report the path coefficients and statistical significance for the entire path being described. Proband suicide attempt had a direct effect on offspring attempt (β = 0.52, SE = 0.20, z = 2.64, P = .008). However, the indirect pathway from proband attempt via proband Cluster B, offspring impulsive aggression, and mood disorder before the attempt was not statistically significant (β = 0.03, SE = 0.02, P = .08). Offspring history of a previous suicide attempt had a direct path to offspring suicide attempt (β = 0.74, SE = 0.26, z = 2.87, P = .004). The effects of previous attempts and previous suicide-related behavior in offspring were also mediated via offspring impulsive aggression and mood disorder (β = 0.05, SE = 0.02, z = 2.20, P = .03, and β = 0.05, SE = 0.03, z = 1.95, P = .05, respectively). A final pathway was a consistent effect of offspring mood disorder at baseline and each follow-up point on offspring suicide attempt (β = 0.30, SE = 0.10, z = 2.86, P = .004).

Discussion

In this longitudinal study of the familial transmission of suicidal behavior, parental suicide attempt conveyed a nearly 5-fold increased odds of suicide attempts in offspring, even after accounting for a history of previous suicide attempt in offspring and the familial transmission of mood disorder. In addition, impulsive aggression was an important precursor of mood disorder in offspring, which in turn increased the risk of an offspring suicide attempt.

We hypothesized that suicidal behavior would be familially transmitted via the transmission of impulsive aggression.[3,5,6,8] However, the pathway from proband to offspring attempt via proband Cluster B disorder, offspring impulsive aggression, and mood disorder to offspring attempt was not statistically significant (P = .08). One possible explanation for the difference between previous and current findings in this study is that as participants aged, the incidence of depression in offspring increased, from 29.6% after a 1- to 2-year follow-up[11] to 48.2% in the current study. In fact, impulsive aggression played an important role in increasing the likelihood of an offspring suicide attempt, but it did so by increasing the risk of the subsequent development of a mood disorder, which in turn increased the risk of an attempt. This link between impulsive aggression and onset of mood disorder is consistent with longitudinal studies[46–49] of youth with attention-deficit/hyperactivity disorder,

oppositional defiant disorder, or high irritability scores, in which impulsive aggression and the related constructs (eg, irritability) predicted the onset of depression and suicide attempts. The transition from impulsive aggression to mood disorder may be particularly salient to understanding recurrent suicidal behavior because this pathway from offspring suicide attempt at baseline to an attempt at follow-up was mediated by offspring impulsive aggression and mood disorder.

Although the familial transmission of attempts occurs independently of the transmission of mood disorder, the transmission of mood disorder was also a significant pathway to early-onset suicidal behavior. Mood disorders are prominent among adolescents who attempt or die by suicide.[50–52] Therefore, the prevention and treatment of mood disorders in youth are logical approaches for reducing the incidence of suicide attempts. The sequencing of risk factors over time is consistent with the stress-diathesis model of suicidal risk, with the diathesis being parental history of suicidal attempt and more proximal stressors that contribute to imminent suicidal risk, such as negative life events and mood disorder, at the time point immediately before the suicide attempt.[13]

We failed to find a role for child maltreatment in the intrafamilial transmission of suicidal behavior, in contradistinction to earlier reports.[9–11] Offspring abuse was related to onset of mood disorder and suicidal behavior, but after correction for multiple comparisons, this association was not statistically significant. Differences between this and previous reports might be because previous reports were cross-sectional or covered relatively short periods, had relatively few suicide attempts among offspring, or because of the increased cumulative risk of depression in offspring.

This study, to our knowledge, is one of the few prospective studies to examine the familial transmission of suicidal behavior, with a large, well-characterized sample. Limitations include the lack of data on most biological coparents and participant attrition. Fortunately, no baseline characteristics are associated with attrition, and the results using Cox proportional hazards regression analyses were similar to those obtained by logistic regression, suggesting that our findings are not accounted for by differential retention. Probands are mostly female, so we lack power to detect whether the effect of maternal suicide attempt is greater than the effect of paternal suicide attempt, as is suggested by some studies.[53,54] One-third of our probands had bipolar disorder. However, our risk models were similar regardless of offspring or proband polarity, consistent with other studies[55–57] that found similar risk factors for suicidal behavior in individuals with unipolar and bipolar disorders.

Clinical implications of these results include the importance of assessment and early intervention in the families of parents with mood disorders and a history of a suicide attempt. The prevention of the onset of depression may attenuate the familial transmission of suicidal behavior, which could be tested with efficacious preventive interventions to reduce the risk of onset of depression in high-risk youth.[58,59] Given that many of the parental suicide attempters had Cluster B disorder, efficacious interventions for this condition may also have beneficial effects on the parent-child relationship and offspring functional outcome.[60] Because impulsive aggression can be a precursor to mood disorder, which in

turn elevates suicidal risk, helping youth with prominent irritability and impulsive aggression to achieve better emotion regulation may reduce suicidal risk by diminishing the risk for mood disorder and the likelihood of acting on suicidal impulses.[52,61] The primary school classroom-based preventive intervention, the Good Behavior Game, has promise in reducing the risk of adolescent-onset suicidal ideation and behavior.[62]

Conclusions

In this high-risk longitudinal study, we found that parental suicide attempt conveyed a nearly 5-fold increased risk of offspring attempt, even controlling for the familial transmission of mood disorder. Impulsive aggression was an important precursor of mood disorder and could be targeted in interventions designed to prevent youth at high familial risk from making a suicide attempt. Future work should focus on the deconstruction of suicidal behavior into intermediate biobehavioral phenotypes to further elucidate mechanisms by which suicidal behavior is transmitted from parent to child.[63] Promising intermediate phenotypes include impaired decision making and executive function, difficulty with emotion regulation, and alterations in the hypothalamic-pituitary-adrenal axis at baseline and in response to social stress.[63]

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

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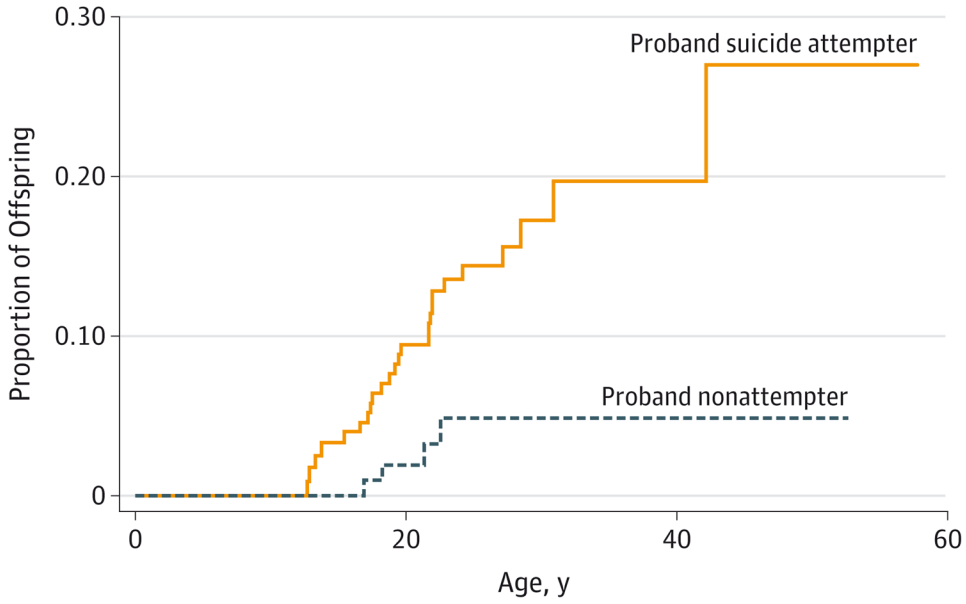

Figure 1.
Risk of Offspring Suicide Attempt by Proband History of Attempts

Wilcoxon test: $\chi^2_1=7.01$, *P* = .008; log-rank test: $\chi^2_1=8.19$, *P* = .004.

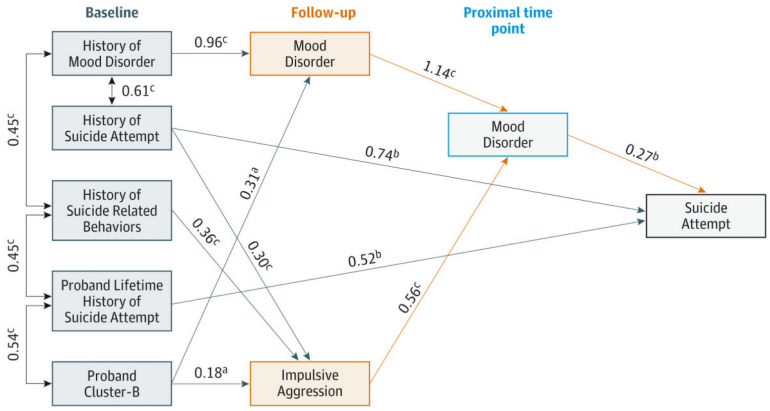

Figure 2.

Path Analysis Including Predictors of Suicide Attempt and Mood Disorder at the Prior Time Point

Black line indicates baseline variables; red line, follow-up variables; and blue line, variables at proximal time points. Numbers are path coefficients. All paths are statistically significant. The root mean square error of approximation = 0.04, the weighted root mean square residual = 0.77, the comparative fit index = 0.97, and $R^2 = 0.62$.

[a]$P < .05$.

[b]$P < .01$.

[c]$P < .001$.

Table 1

Demographic and Clinical Characteristics of Offspring and Probands at Baseline Assessment[a]

Characteristic	Proband		Offspring of Proband	
	Suicide Nonattempter (n = 143)	Suicide Attempter (n = 191)	Suicide Nonattempter (n = 285)	Suicide Attempter (n = 416)
Offspring per family, mean (SD) [range], No.	2.0 (0.8) [1–4]	2.2 (1.0) [1–7]	NA	NA
Age, mean (SD) [range], y	45.4 (9.8) [24–74]	44.0 (10.4) [23–80]	17.9 (8.9) [10–47]	17.5 (8.3) [10–50]
Age ≥18 y	143 (100)	191 (100)	98 (34.4)	156 (37.5)
Female sex	123 (86.0)	161 (84.3)	147 (51.6)	190 (45.7)
White race	110 (80.3)	126 (68.5)	214 (79.3)	263 (65.4)
Hispanic ethnicity[b]	20 (14.0)	19 (9.9)	37 (13.1)	33 (8.0)
Married or sustained conjugal status ≥6 mo	75 (52.4)	81 (42.4)	33 (33.7)	45 (28.7)
Hollingshead's Four Factor Index of Social Status score, mean (SD) [range]	43.6 (13.1) [14–66]	42.5 (11.3) [22–66]	39.7 (12.9) [11–66]	36.4 (12.9) [19–66]
Lifetime mood disorder	143 (100)	191 (100)	84 (30.0)	143 (34.7)
MDD	116 (81.1)	153 (80.1)	76 (27.1)	128 (31.0)
Bipolar disorder	28 (19.7)	40 (21.5)	10 (3.6)	17 (4.1)
Anxiety disorder	81 (57.4)	130 (70.7)	60 (21.4)	102 (24.9)
Panic	34 (24.1)	70 (38.5)	5 (5.1)	7 (4.5)
PTSD	31 (22.0)	66 (35.9)	8 (2.9)	36 (8.7)
OCD	4 (2.8)	10 (5.3)	5 (1.8)	6 (1.5)
Lifetime ADHD	Not assessed	Not assessed	24 (13.2)	55 (21.4)
Lifetime conduct, antisocial, or oppositional disorder	4 (2.9)	8 (4.5)	23 (8.2)	49 (12.0)
Lifetime alcohol or substance abuse	52 (36.6)	108 (58.7)	41 (41.8)	73 (17.7)
Cluster B personality disorder[c]	12 (8.8)	50 (28.2)	6 (2.1)	18 (4.4)
Nonsuicidal self-injurious behavior	NA	NA	13 (6.8)	33(12.9)
History				
Physical or sexual abuse	80 (69.0)	118 (83.1)	61 (29.2)	100 (32.4)
Head trauma	41 (29.3)	58 (30.7)	63 (23.5)	94 (23.3)

Characteristic	Proband		Offspring of Proband	
	Suicide Nonattempter (n = 143)	Suicide Attempter (n = 191)	Suicide Nonattempter (n = 285)	Suicide Attempter (n = 416)
Suicide attempt	NA	NA	16 (5.6)	27 (6.5)
Suicide-related behavior	NA	NA	5 (1.8)	17 (4.1)
Follow-up, mean (SD), y	6.3 (3.3)	6.8 (3.8)	5.3 (3.6)	5.9 (3.9)
New York site	63 (44.1)	67 (35.1)	118 (41.4)	132 (31.7)

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; MDD, major depressive disorder; NA, not applicable; OCD, obsessive-compulsive disorder; PTSD, posttraumatic stress disorder.

[a] Data are presented as number (percentage) of study participants unless otherwise indicated. No statistically significant differences between groups were found except for offspring race, proband Cluster B personality disorder, and proband lifetime alcohol or substance abuse ($P < .001$, $q < .001$).

[b] On the basis of participant's self-report.

[c] Only assessed in those 18 years or older.

Table 2

Demographic and Clinical Characteristics of Offspring and Proband and Risk of Suicide Attempt in Offspring

	Time Points					
	Baseline		Intermediate		Proximal[a]	
Characteristic	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
Offspring						
Age	0.99 (0.96–1.02)	.37	NA	NA	NA	
Sex	1.56 (0.74–3.27)	.24	NA	NA	NA	
White	0.77 (0.34–1.72)	.52	NA	NA	NA	
Hispanic	1.46 (0.51–4.16)	.48	NA	NA	NA	
Site	0.90 (0.42–1.92)	.79	NA	NA	NA	
Mood disorder	8.68 (3.41–22.11)	<.001[b]	5.88 (2.55–13.57)	<.001[b]	16.77 (3.59–78.33)	<.001[b]
ADHD	2.76 (0.99–7.64)	.05	2.90 (1.28–6.57)	.01	7.03 (1.65–29.91)	.008
PTSD	3.36 (1.34–8.45)	.01	3.81 (1.45–10.03)	.007	6.87 (1.73–27.27)	.006
Anxiety disorder	1.51 (0.69–3.26)	.30	3.36 (1.63–6.93)	.001[c]	1.61 (0.41–6.27)	.49
Eating disorder	4.94 (1.33–18.37)	.02	NA	NA	NA	NA
Alcohol or substance abuse	2.40 (1.04–5.52)	.04	2.59 (1.18–5.71)	.02	0.47 (0.06–3.77)	.48
Behavioral or antisocial disorder	2.91 (1.26–6.71)	.01	3.19 (1.38–7.35)	.007	5.28 (1.36–20.44)	.02
Depression, self-report	NA	NA	1.89 (1.43–2.51)	<.001[b]	1.72 (1.12–2.63)	.01
Hopelessness	NA	NA	1.45 (1.07–1.98)	.02	1.68 (1.10–2.58)	.02
Impulsivity	1.95 (1.31–2.90)	.001[c]	2.61 (1.77–3.84)	<.001[b]	1.82 (0.94–3.50)	.07
Impulsive aggression	2.16 (1.35–3.44)	.001[c]	2.40 (1.47–3.91)	<.001[b]	2.65 (0.97–7.24)	.06

	Time Points					
	Baseline		Intermediate		Proximal[a]	
Characteristic	**OR (95% CI)**	***P* Value**	**OR (95% CI)**	***P* Value**	**OR (95% CI)**	***P* Value**
Aggression	2.01 (1.43–2.83)	<.001[b]	1.45 (1.03–2.04)	.04	1.81 (1.38–2.37)	<.001[b]
Negative life events	NA	NA	2.00 (1.51–2.65)	<.001[b]	2.61 (1.50–4.52)	.001[c]
Reasons for living	NA	NA	0.92 (0.54–1.56)	.76	0.56 (0.24–1.29)	.17
Social support	NA	NA	0.74 (0.50–1.11)	.15	0.73 (0.36–1.50)	.39
Family adaptability or cohesion	NA	NA	0.93 (0.87–0.99)	.02	0.96 (0.90–1.2)	.20
Nonsuicidal self-injurious behavior	6.98 (2.41–20.24)	<.001[b]	7.67 (2.02–29.15)	.003[c]	11.02 (3.03–40.11)	<.001[b]
Lifetime history of physical or sexual abuse	2.12 (0.97–4.62)	.06	NA	NA	NA	NA
History of suicide attempt[d]	11.03 (4.87–24.99)	<.001[b]	NA	NA	NA	NA
History of suicide-related behaviors[d]	3.64 (0.88–15.04)	.07	NA	NA	NA	NA
Suicidal ideation	1.18 (1.05–1.33)	.007	1.27 (1.16–1.39)	<.001[b]	0.98 (0.76–1.26)	.87
Suicide-related behaviors	NA	NA	5.88 (2.09–16.56)	.001[c]	7.96 (0.80–79.46)	.08
Proband						
Mood	1.05 (0.31–3.56)	.94	1.41 (0.49–4.04)	.52	1.68 (0.69–4.10)	.25
Alcohol or substance abuse	1.88 (0.86–4.14)	.12	1.25 (0.54–2.89)	.60	0.38 (0.09–1.66)	.20
PTSD	1.33 (0.57–3.16)	.51	1.49 (0.70–3.20)	.30	2.17 (0.91–5.16)	.08
Anxiety	1.26 (0.59–2.85)	.58	0.74 (0.36–1.51)	.40	0.76 (0.35–1.67)	.50
Cluster B personality disorder	2.19 (0.98–4.91)	.06	NA	NA	NA	NA
Lifetime history of physical or sexual abuse	0.83 (0.29–2.39)	.73	NA	NA	NA	NA
Lifetime history of suicide	4.49 (1.56–12.90)	.005	NA	NA	NA	NA

	Time Points					
	Baseline		Intermediate		Proximal[a]	
Characteristic	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value	OR (95% CI)	*P* Value
Impulsivity	1.02 (0.99–1.04)	.18	1.01 (.99–1.03)	.44	1.01 (0.97–1.05)	.70
Impulsive aggression	1.02 (0.99–1.06)	.24	1.02 (0.98–1.07)	.29	1.05 (0.97–1.14)	.26
Aggression	1.26 (0.92–1.74)	.15	1.11 (0.73–1.70)	.62	1.06 (0.78–1.44)	.71

Abbreviations: ADHD, attention-deficit/hyperactivity disorder; NA, not applicable; OR, odds ratio; PTSD, posttraumatic stress disorder.

[a] Time point immediately before the onset of an actual suicide attempt or maximum time point for suicide nonattempters.

[b] q < .001.

[c] q < .05.

[d] Compared with no event.

Table 3

Multivariate Model for Onset of Suicide Attempts[a]

Characteristic	OR (95% CI)	*t*-Test	*P* Value
Baseline mood disorder	4.20 (1.37–12.86)	2.51	.01
History[b]			
Suicide attempt	5.69 (1.94–16.74)	3.16	.002
Suicide-related behavior	0.97 (0.21–4.49)	−0.04	.97
Mood disorder at proximal time point[c]	11.32 (2.29–56.00)	3.04	.004
Proband lifetime history of suicide	4.79 (1.75–13.07)	3.06	.002
Offspring			
Age at baseline	0.94 (0.87–1.01)	−1.68	.09
Sex	0.80 (0.33–1.96)	−0.49	.62
Hispanic	1.06 (0.29–3.93)	0.09	.93
Site[d]	0.81 (0.30–2.14)	−0.43	.67

Abbreviation: OR, odds ratio.

[a] Goodness-of-fit statistics: area under the curve = 0.89 (95% CI, 0.81–0.96); 96.3% were correctly classified.

[b] Compared with no event.

[c] Time point immediately before the onset of an actual suicide attempt or maximum time point for suicide nonattempters.

[d] New York is the reference site.