

Risk of Suicide Attempt in Adopted and Nonadopted Offspring

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KEY WORDS

suicide attempt, adoption, adjustment

ABBREVIATIONS

ADHD—attention-deficit/hyperactivity disorder

ANOVA—analysis of variance

CD—conduct disorder

df—degrees of freedom

DSM-IV—*Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition*

F1—first follow-up

MDD—major depressive disorder

ODD—oppositional defiant disorder

OR—odds ratio

SIBS—Sibling Interaction and Behavior Study

Dr Keyes carried out the initial analyses, interpreted the data, and drafted the initial manuscript; Dr Malone carried out additional analyses, interpreted the data, and reviewed and revised the manuscript; Drs Sharma and Iacono conceptualized and designed the study and reviewed and revised the manuscript; Dr McGue conceptualized and designed the study, coordinated and supervised data collection, and reviewed and revised the manuscript; and all of the authors approved the final manuscript as submitted.

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WHAT'S KNOWN ON THIS SUBJECT: Adoptees living in Sweden are at increased risk of suicide attempt compared with nonadopted individuals, although factors mediating this risk are largely unknown. Whether adoption status represents a risk for adoptees living in the United States remains unresolved.



WHAT THIS STUDY ADDS: The odds for reported suicide attempt are elevated in US adoptees relative to nonadoptees, the first demonstration of increased risk in US adoptees placed in nonrelative families. This risk is partially mediated by other established risk factors for suicide attempt.

abstract



OBJECTIVE: We asked whether adoption status represented a risk of suicide attempt for adopted and nonadopted offspring living in the United States. We also examined whether factors known to be associated with suicidal behavior would mediate the relationship between adoption status and suicide attempt.

METHODS: Participants were drawn from the Sibling Interaction and Behavior Study, which included 692 adopted and 540 nonadopted offspring and was conducted at the University of Minnesota from 1998 to 2008. Adoptees were systematically ascertained from records of 3 large Minnesota adoption agencies; nonadoptees were ascertained from Minnesota birth records. Outcome measures were attempted suicide, reported by parent or offspring, and factors known to be associated with suicidal behavior including psychiatric disorder symptoms, personality traits, family environment, and academic disengagement.

RESULTS: The odds of a reported suicide attempt were ~4 times greater in adoptees compared with nonadoptees (odds ratio: 4.23). After adjustment for factors associated with suicidal behavior, the odds of reporting a suicide attempt were reduced but remained significantly elevated (odds ratio: 3.70).

CONCLUSIONS: The odds for reported suicide attempt are elevated in individuals who are adopted relative to those who are not adopted. The relationship between adoption status and suicide attempt is partially mediated by factors known to be associated with suicidal behavior. Continued study of the risk of suicide attempt in adopted offspring may inform the larger investigation of suicidality in all adolescents and young adults. *Pediatrics* 2013;132:639–646

In 2009, ~2% of US adolescents made a suicide attempt serious enough to warrant medical attention.¹ Moreover, previous suicide attempts increase the odds for adolescent suicide death by >10-fold.² Lifetime prevalence estimates for youth suicide attempt range from 1.3% to 3.8% in males and 1.5% to 10.1% in females³; however, this risk is not uniformly distributed across young people. For example, risk of suicide attempt may be elevated in individuals who are adopted.^{4–6}

Although the majority of adopted individuals are well adjusted, adolescent adoptees experience a greater risk for disruptive behavior disorders and, to a lesser extent, internalizing disorders than comparably aged nonadopted individuals.^{7,8} Furthermore, in young adulthood, adoptees have increased odds of being diagnosed with substance use and other psychiatric disorders relative to nonadoptees.^{4,9,10} Examining Swedish national cohorts, researchers^{4,6} reported that both intercountry and domestic adoptees were at increased risk for even more serious indicators of maladjustment, including suicide attempt and suicide death, compared with nonadopted individuals. In the US National Longitudinal Study of Adolescent Health, Slap et al⁵ found that attempted suicide was more common among adopted relative to nonadopted adolescents, although subsequent analyses suggested no increased risk for nonrelative adoptions.¹¹ Thus, whether adoption status represents a risk of suicide attempt in US nonrelative adoptions remains unresolved.

Many other risk factors for adolescent suicide attempt have been clearly delineated.^{3,12} Most frequently cited are risks posed by substance use disorders and other psychopathology, especially depression and disruptive behavior disorders.^{13–15} Bridge et al³ noted the presence of comorbid psychopathology in >80% of those attempting suicide.

Personality traits have also been implicated in suicidal behavior, specifically impulsivity, aggression, neuroticism, and low self-esteem.^{16–18} Finally, difficulties in family and school settings have been frequently associated with suicidality in young people.^{14,17,19–22}

The current study examined risk of suicide attempt in a contemporary US sample of adopted and nonadopted participants in the Sibling Interaction and Behavior Study (SIBS).²³ SIBS participants were also assessed on factors associated with suicidal behavior, including personality traits, family environment, and psychiatric disorder symptoms. Thus, we could investigate whether these factors mediate elevated risk for suicidal behavior in adopted adolescents. We addressed the following 3 questions:

1. Does adoption status represent a risk of suicide attempt among SIBS participants?
2. Are known risk factors for suicidal behavior elevated in SIBS participants who have reported suicide attempts compared with those who have not reported attempts?
3. Do these factors mediate the potential relationship between adoption status and suicide attempt?

METHODS

Participants

The SIBS intake assessment was conducted at the University of Minnesota from 1998 through 2004 and included 409 adoptive and 208 nonadoptive families, each consisting of an adolescent sibling pair and their rearing parents. Adoptive families were systematically ascertained from records of 3 large Minnesota adoption agencies to include an adopted adolescent between 11 and 21 years of age and a second adolescent who was not biologically related to the adopted adolescent; nonadoptive families were ascertained

from Minnesota birth records to generally match adoptee age and gender. Thus, eligibility was a function of family configuration and did not reflect background characteristics of the parents or offspring. All adopted offspring were permanently placed in their adoptive homes before 2 years of age (mean: 4.7 months; SD: 3.4 months); 96% were placed before 1 year. Parents provided both offspring country of birth and ethnicity; this information was not used in recruitment. Participation rate at intake was 63% among adoptive and 57% among nonadoptive families, which was a nonsignificant difference. Participating and nonparticipating families did not differ significantly on father's education, mother's and father's occupational status, percentage of original parents who remained married, or the number of parent-reported behavioral disorders (learning disability, substance abuse, attention-deficit disorder, and depression) in their offspring. Among nonadoptive families only, participating and nonparticipating families differed significantly on rate of college education among participating (43.8%) versus nonparticipating (28.6%) mothers (χ^2 [1 degree of freedom (*df*)] = 10.0, $P = .002$).²³ Two adolescents were ruled ineligible after intake; therefore, the SIBS offspring sample included 692 adopted (44.7% male; mean age = 14.95 years, SD = 1.9 years) and 540 nonadopted (45.9% male; mean age = 14.89 years, SD = 1.9 years) adolescents. The adoptee sample reflects adoption practice in Minnesota during relevant birth years, that is, 74% were born outside the United States, most of whom were female (60%) and from South Korea (90%). Both offspring and 1 rearing parent were eligible to participate in the first follow-up (F1), conducted at a mean interval of 3.36 years (SD = 0.45 years) after intake. A total of 1158 offspring completed F1; information was provided on an additional 29 nonparticipating

offspring by participating parents. Thus, we have information on 672 adopted (44.6% male; mean age = 18.33 years, SD = 2.2 years) and 515 non-adopted (46.0% male; mean age = 18.20 years, SD = 2.0 years) offspring at F1, 96% of the intake sample. We found no significant differences between these participants and those with no F1 information on gender, age at intake, adoption status, ethnicity, and intake symptoms of attention-deficit/hyperactivity (ADHD), oppositional defiant (ODD), conduct (CD), major depressive (MDD), and separation anxiety disorders.

Procedure

Participants were assessed by using protocols approved by the University of Minnesota institutional review board. All intake and most F1 assessments were completed in person; individuals not available for in-person F1 assessments were interviewed by phone (14%). Written informed consent was obtained from adult offspring. For minor offspring, written consent was provided by parents with assent from offspring. Within a family, participants were interviewed independently by different interviewers. Interviewers had an MA or BA in psychology, participated in intensive training, and satisfied proficiency criteria.

Measures

Suicide Attempt

At intake and F1, interviewers completed a comprehensive mental health assessment. Each parent was asked, "Has your child ever made a suicide attempt?" Parents at F1 were asked if their children had made a suicide attempt since the last assessment. Offspring at F1 were asked, "Have you tried to kill yourself?" These questions were part of a Life Events Inventory that included queries involving stressful life events (eg, parental discord or divorce; family financial, legal, and mental health

problems). When an event was endorsed, interviewers probed for the frequency of event occurrence and ages when event(s) occurred. Interviewers did not probe further unless there was some indication of current suicidal ideation. In that case, additional questions were meant to clarify reporting and/or referral obligations and did not become part of any permanent database.

Offspring were coded as having attempted suicide if they or their parents reported a suicide attempt that occurred between intake and F1. At intake, we also measured risk factors for suicidal behavior including the following: psychiatric disorder symptoms, teacher reports of current behavior, personality traits, family environment, and academic disengagement. All measures were keyed to consistently reference the high-risk end of the continuum.

Clinical Disorders

Adolescents were interviewed with the revised Diagnostic Interview for Children and Adolescents,^{24,25} modified to include *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV), criteria. Childhood disruptive disorders assessed over the lifetime included ODD, ADHD, and CD. Adolescents aged 15 or younger were also assessed for MDD and substance use disorders by using the revised Diagnostic Interview for Children and Adolescents. For participants aged 16 or older, MDD was assessed with the Structured Clinical Interview for the *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition*,²⁶ updated for the DSM-IV. Substance use disorders were assessed by using the expanded Substance Abuse Module,²⁷ which supplements the Composite International Diagnostic Interview.²⁸ For nonsubstance diagnoses, questions asked of offspring were also asked of mothers as they pertained to offspring. Only offspring were interviewed about substance disorder symptoms.

Every interview was reviewed by 2 individuals with advanced clinical training, blind to diagnoses of other family members, who coded by consensus, relevant DSM-IV symptoms and diagnostic criteria. For childhood disruptive disorders and MDD, symptoms endorsed by either mothers or offspring were summed to create childhood disruptive disorder (ADHD + CD + ODD) and MDD symptom counts. Substance disorder symptom counts were created from offspring reports. κ Coefficients demonstrating the reliability of our diagnostic procedures were as follows: ADHD (0.77), ODD (0.71), CD (0.81), and MDD (0.82); κ coefficients for substance use disorders exceeded 0.91.

Teacher Ratings

Teacher ratings included items adapted from the Conners Teacher Rating Scale²⁹ and the Rutter Child Scale B.³⁰ These data were returned for 78% of eligible adolescents from up to 3 teachers; data were not collected for participants who had completed high school (2%). Rating scales (with internal consistency and interteacher reliability estimates) included in this study were as follows: Externalizing (reliabilities = 0.97, 0.82) and Negative Mood (reliabilities = 0.80, 0.52).

Family Environment

The Parental Environment Questionnaire,^{31,32} an omnibus measure of family functioning, was completed by parents and offspring. Parental Environment Questionnaire scales include the following: Conflict with Parent (α = 0.84), Involvement with Parent (α = .79), Offspring's Regard for Parent (α = .81), and Parent's Regard for Offspring (α = .69). Rated on a 4-point scale, items were summed to produce a total score. Scales scores were submitted to a principal components analysis, separately for parents and offspring, and the first principal components were

extracted as measures of family discord. Component loadings ranged from 0.75 to 0.86 for parents and from 0.85 to 0.91 for offspring ($r = .47$).

Personality

Personality was assessed by using the Multidimensional Personality Questionnaire.³³ Multidimensional Personality Questionnaire scales included in this study are Well-Being (eg, happy, optimistic; $\alpha = .89$), Alienation (eg, views self as victim; $\alpha = .87$), and Control (eg, reckless or careless; $\alpha = .84$). All scales contain 18 items; items were rated on a 4-point scale and summed to produce a total score.

Academic Disengagement

Measures of academic disengagement included parent report of offspring's grade point average and academic motivation ($\alpha = .83$),³⁴ and their expectations regarding educational attainment. These measures were submitted to a principal components analysis, and the first principal component was extracted as a measure of academic disengagement. Component loadings ranged from 0.87 to 0.90.

Statistical Analyses

This study focused on risk factors for suicidal behavior including the following: psychiatric disorder symptoms, personality traits, family environment, and academic disengagement. Most variables had minimal missing data (0%–5%); however, 24% of participants were missing both teacher rating scales. An aggregate risk measure was created by regression weighting individual measures to predict reported suicide attempt in combination. For this aggregate measure, multiple imputation was used to account for data missing on individual measures. Analysis of variance (ANOVA) was used to investigate differences on individual and aggregate measures between

those reporting and those not reporting suicide attempts. The effect of adoption status on these measures was also explored by using ANOVA. Finally, the relationship between reported suicide attempt, adoption, and aggregate risk of suicide attempt was modeled by using logistic regression.

Data were analyzed by using version 9.2 of SAS software for Windows (SAS Institute, Cary, NC). Multiple imputation was conducted with the data augmentation method by using a Markov chain Monte Carlo algorithm. This approach to multiple imputation assumes a multivariate normal distribution but performs well with different types of data.^{35,36} For the purpose of imputation, lack of independence due to sibling resemblance was accommodated by restructuring data into multivariate vectors representing sibling pairs.³⁵ Diagnostic plots indicated that the Markov chain Monte Carlo procedure achieved a stationary probability distribution. Twenty imputed data sets were averaged to yield complete data for deriving a regression-weighted aggregate risk measure. In our primary statistical analyses, clustering of individuals within families was accommodated by using linear mixed models (multilevel models) with a random intercept at the family level to account for the correlation between siblings with respect to the dependent variable. Age at intake and gender were included as covariates in these analyses. We report standardized mean differences (d) for quantitative outcomes and odds ratios (ORs) for categorical outcomes. Standardized mean differences (d) were estimated by dividing the difference in covariate-adjusted means by the SD of the residual variance. Symptom counts and aggregate risk were log-transformed before analyses to reduce skew.

RESULTS

At least 1 suicide attempt was reported for 79 (6.7%) offspring by F1. In 23

participants (male: adopted = 5, non-adopted = 1; female: adopted = 10, nonadopted = 7), all attempts occurred before intake; these participants were excluded from remaining analyses. We included only participants who reported a suicide attempt between intake and follow-up assessments so that potential risk factors, measured at intake, would be assessed before at least 1 suicide attempt. We hypothesized that standing on risk factors assessed after all suicide attempts might represent a result of rather than a risk for suicidal behavior.

Table 1 shows the number (and percentage) of adolescents with reported suicide attempts between intake and F1, separately for gender and adoption status, by reporter. At least 1 suicide attempt was reported for 56 participants (4.7%; male: adopted = 5.6%, nonadopted = 1.7%; female: adopted = 8.6%, nonadopted = 1.8%). Of these, 10 were reported by parents only, 28 by offspring only, and 18 by both parents and offspring. A suicide attempt was reported for both offspring in 1 family. For adoptees, suicide attempt was not predicted by age at placement ($\chi^2 = 3.04$, $df = 1$, $P = .08$) or ethnic minority status ($\chi^2 = 0.50$, $df = 1$, $P = .82$). Furthermore, suicide attempt was not predicted by intercountry or domestic placement ($\chi^2 = 2.73$, $df = 1$, $P = .10$), where power was $\geq 80\%$ to detect differences with an OR ≥ 1.9 between these 2 samples ($\alpha = .05$, 2-tailed). Additional information was available for 46 offspring who self-reported suicide attempts. In this subsample, 26 (56.5%) reported > 1 attempt (median = 2).

Table 2 provides descriptive statistics for measures associated with suicide attempt between intake and F1 separately for attempters and nonattempters. Table 2 also includes standardized mean differences (d) between attempters and nonattempters with confidence intervals and ANOVA results. After

TABLE 1 Adolescents With a Reported Suicide Attempt by Reporter

	Males		Females		Full Sample (<i>N</i> = 1165)
	Adoptees (<i>n</i> = 295)	Nonadoptees (<i>n</i> = 236)	Adoptees (<i>n</i> = 362)	Nonadoptees (<i>n</i> = 272)	
Parent report only	3	1	6	0	10
Offspring report only	7	1	16	4	28
Parent and offspring report	6	2	9	1	18
All reporters combined	16 (5.4)	4 (1.7)	31 (8.6)	5 (1.8)	56 (4.7)

Data presented are *n* or *n* (%).

adjustment for age and gender, all measures revealed significant and often substantial standardized mean differences between those reporting and those not reporting suicide attempts. Standardized mean differences ranged from 0.52 (Low Well-Being) to 1.05 (symptoms of MDD and childhood disruptive disorders). We also aggregated all measures into a regression-weighted composite for prediction of reported suicide attempt. Although this procedure could capitalize on chance associations, we were reassured that all measures demonstrated significant relationships with suicide attempt at the individual level. Attempters and nonattempters differed by 1.9 SDs on aggregate risk.

Table 3 provides descriptive statistics for measures associated with suicide attempt between intake and F1 separately for adoptees and nonadoptees. Table 3 also includes standardized mean differences (*d*) between adoptees and nonadoptees with confidence intervals and ANOVA results. After adjustment for age and gender, many standardized mean differences between adoptees and nonadoptees were significant, albeit much smaller than between attempters and nonattempters. Childhood disruptive disorder symptoms (*d* = 0.40), teacher reports of externalizing behavior (*d* = 0.28) and negative mood (*d* = 0.34), family discord (*d* = 0.40 for parent and 0.26 for offspring report), and academic disengagement (*d* = 0.21)

were all associated with small to moderate differences between adoptees and nonadoptees. Variables showing non-significant differences included MDD and substance disorder symptoms and personality measures. Finally, adoptees and nonadoptees differed by an SD of 0.31 on aggregate risk.

Logistic regression results along with associated ORs, confidence intervals, and test statistics for 2 models are given in Table 4. In model 1, the OR in column (1) reflects increased odds of reporting a suicide attempt between intake and F1 in adoptees relative to nonadoptees controlling for age and gender. The odds of reporting a suicide attempt were fourfold higher in adoptees (OR = 4.23). In model 2, the OR in column (1) reflects increased odds of reporting a suicide attempt in adoptees relative to nonadoptees, net the effect of aggregate risk. Whereas the odds of reporting a suicide attempt in adoptees were reduced when conditioned on aggregate risk, they remained significantly elevated (OR = 3.70). The OR in column (4) reflects increased odds of reporting a suicide attempt for each SD increase in

TABLE 2 Suicidality Risk Factors in Attempters and Nonattempters

	Attempters (<i>n</i> = 56)	Nonattempters (<i>n</i> = 1109)	<i>d</i> (95% Confidence Interval)	<i>F</i> (<i>df</i>)	<i>P</i>
Clinical symptoms ^a					
Childhood disruptive disorders	9.82 (7.2)	4.30 (5.4)	1.05 (0.76–1.33)	50.27 (1, 1131)	<.001
MDD	1.05 (1.4)	0.25 (0.8)	1.05 (0.76–1.34)	52.02 (1, 1144)	<.001
Substance disorders	1.25 (3.0)	0.33 (1.4)	0.64 (0.36–0.91)	19.68 (1, 1136)	<.001
Teacher ratings					
Externalizing behavior	62.57 (18.2)	52.31 (14.0)	0.92 (0.57–1.27)	26.39 (1, 857)	<.001
Negative mood	11.79 (3.6)	9.95 (2.6)	0.71 (0.37–1.05)	16.83 (1, 838)	<.001
Family environment					
Family discord, parent	0.75 (1.2)	−0.04 (1.0)	1.01 (0.67–1.34)	34.26 (1, 874)	<.001
Family discord, offspring	0.74 (1.3)	−0.04 (1.0)	0.92 (0.61–1.23)	33.79 (1, 1076)	<.001
Personality					
Low well-being	19.91 (10.7)	16.26 (7.9)	0.52 (0.23–0.81)	12.57 (1, 1120)	<.001
Alienation	41.07 (11.5)	35.28 (9.2)	0.69 (0.41–0.97)	22.44 (1, 1124)	<.001
Low control	31.64 (9.2)	26.19 (8.4)	0.71 (0.43–0.99)	25.12 (1, 1139)	<.001
Academic disengagement	0.61 (1.2)	−0.39 (1.0)	0.78 (0.49–1.07)	27.70 (1, 1087)	<.001
Aggregate risk ^a	1.85 (1.8)	0.41 (0.7)	1.89 (1.60–2.18)	164.79 (1, 1136)	<.001

Data presented are descriptive statistics (mean [SD]), standardized mean differences (*d*) between attempters and nonattempters, confidence intervals, and ANOVA results. Childhood disruptive disorders included symptoms of ODD, ADHD, and CD. Substance use disorders included nicotine dependence and alcohol, amphetamine, cannabis, cocaine, hallucinogen, inhalant, opioid, phencyclidine steroid, and other illegal drug abuse and dependence. Covariates included age at the intake assessment and gender. Standardized mean differences (*d*) were estimated by dividing the difference in covariate-adjusted means (attempters minus nonattempters) by the SD of the residual variance.

^a Log-transformed before analysis to reduce skew.

TABLE 3 Suicidality Risk Factors in Adoptees and Nonadoptees

	Adoptees (<i>n</i> = 657)	Nonadoptees (<i>n</i> = 508)	<i>d</i> (95% Confidence Interval)	<i>F</i> (<i>df</i>)	<i>P</i>
Clinical symptoms ^a					
Childhood disruptive disorders	5.33 (6.0)	3.58 (4.9)	0.40 (0.27 to 0.53)	36.06 (1, 925)	<.001
MDD	0.33 (0.9)	0.24 (0.8)	0.12 (0.00 to 0.25)	3.42 (1, 903)	.065
Substance disorders	0.35 (1.4)	0.41 (1.7)	−0.03 (−0.16 to 0.09)	0.31 (1, 884)	.579
Teacher ratings					
Externalizing behavior	54.11 (15.2)	51.01 (13.1)	0.28 (0.12 to 0.43)	12.59 (1, 714)	<.001
Negative mood	10.42 (3.0)	9.53 (2.3)	0.34 (0.20 to 0.48)	22.31 (1, 855)	<.001
Family environment					
Family discord, parent	0.10 (1.0)	−0.15 (0.9)	0.40 (0.22 to 0.58)	19.29 (1, 1122)	<.001
Family discord, offspring	0.09 (1.0)	−0.13 (0.9)	0.26 (0.12 to 0.39)	12.78 (1, 902)	<.001
Personality					
Low well-being	16.55 (8.1)	16.28 (8.0)	0.05 (−0.08 to 0.18)	0.51 (1, 903)	.475
Alienation	35.69 (9.4)	35.39 (9.5)	0.05 (−0.08 to 0.18)	0.63 (1, 883)	.429
Low control	26.55 (8.8)	26.32 (8.2)	0.04 (−0.08 to 0.16)	0.45 (1, 865)	.501
Academic disengagement	0.07 (1.1)	−0.11 (0.9)	0.21 (0.08 to 0.27)	9.63 (1, 856)	<.01
Aggregate risk ^a	0.56 (0.9)	0.37 (0.6)	0.31 (0.18 to 0.43)	21.91 (1, 896)	<.001

Data presented are descriptive statistics (mean [SD]), standardized mean differences (*d*) between adoptees and nonadoptees, confidence intervals, and ANOVA results. Childhood disruptive disorders included symptoms of ODD, ADHD, and CD. Substance use disorders included nicotine dependence and alcohol, amphetamine, cannabis, cocaine, hallucinogen, inhalant, opioid, phencyclidine steroid, and other illegal drug abuse and dependence. Covariates included age at the intake assessment and gender. Standardized mean differences (*d*) were estimated by dividing the difference in covariate-adjusted means (adoptees minus non-adoptees) by the SD of the residual variance.

^a Log-transformed before analysis to reduce skew.

aggregate risk, controlling for adoption status. After adjusting for adoption status, the odds of reporting a suicide attempt were doubled for each SD increase in aggregate risk (OR = 2.42). Because previous analyses demonstrated that interactions among adoption status, aggregate risk, and gender were not significant, interaction terms were not included in model 2.

DISCUSSION

We investigated whether adoption status represents a risk of suicide attempt in a US sample of adopted and non-adopted offspring. We found the odds for reported suicide attempt between

intake and F1, adjusted for age and gender, to be ~4 times greater in adoptees relative to nonadoptees. This finding represents the first demonstration of increased risk of suicide attempt in US adoptees placed in non-relative families. These findings are consistent with those reported by Hjern et al,⁴ who observed significant age- and gender-adjusted odds for suicide attempt in Swedish inter-country adoptees relative to comparably aged young persons (OR = 2.7).

Furthermore, we confirmed that factors known to be associated with suicidal behavior, including psychiatric disorder symptoms, personality traits,

family environment, and academic disengagement, were elevated, individually and in the aggregate, in study participants who reported suicide attempts. Suicide attempters and non-attempters differed by almost 2 SDs on a regression-weighted aggregate risk measure. We also demonstrated a significant, albeit smaller, mean difference between adopted and nonadopted participants on aggregate risk and many individual measures. Finally, we examined whether aggregate risk mediates the relationship between adoption and suicide attempt. The odds of reporting a suicide attempt in adoptees were reduced when conditioned on aggregate risk, although remained significantly elevated.

The risk of suicide attempt associated with adoption may be due to various influences. von Borczyskowski et al¹⁶ confirmed that Swedish adoptees carry a higher burden of heritable risk for suicidality, that is, biological parents' substance abuse, suicidal behavior, and psychiatric illness explained one-third of increased risk of suicide attempt in domestic adoptees. Factors unique to relinquishment by a biological

TABLE 4 ORs From Logistic Regression of Reported Suicide Attempt by Adoption Status and Aggregate Risk

	Adoption Status			Aggregate Risk		
	OR (95% CI) (1)	χ^2 (<i>df</i>) (2)	<i>P</i> (3)	OR (95% CI) (4)	χ^2 (<i>df</i>) (5)	<i>P</i> (6)
Model 1	4.23 (2.06–8.68)	20.60 (1)	<0.001	—	—	—
Model 2	3.70 (1.70–8.04)	13.96 (1)	<0.001	2.42 (1.20–2.93)	27.24 (1)	<0.001

For model 1, ORs in column (1) reflect the increase in the odds of reporting a suicide attempt in the adoptee sample relative to the nonadoptee sample. For model 2, ORs in column (1) reflect the increase in the odds of reporting a suicide attempt in the adoptee sample relative to the nonadoptee sample, controlling for aggregate risk. Test statistics for the adoption status effect are given in columns (2) and (3). ORs in column (4) reflect the increase in the odds of reporting a suicide attempt for each SD increase in aggregate risk, controlling for adoption status. Test statistics for the aggregate risk effect are given in columns (5) and (6). Covariates in both models include age at the intake assessment and gender.

parent (eg, early trauma, institutional care, attachment issues) may also elevate risk for suicidal behavior later in life. Hjern et al³⁷ demonstrated increased risk for suicide death in individuals exposed to foster care or other child welfare interventions. Because all SIBS participants were adopted before 2 years of age, however, the preplacement period was relatively limited. Moreover, length of the preplacement interval did not predict reported suicide attempt.

Young adult adoptees may demonstrate impairment in social adjustment that is associated with weak attachment to adoptive families and, for internationally adopted children, loss of cultural identity and ethnic discrimination. Compared with nonadopted individuals, intercountry adoptees in Sweden and the Netherlands were less likely to have long-term intimate relationships, live with a partner,³⁸ or be married.^{9,38} Furthermore, in Sweden, odds for suicide attempt were reduced for domestic adoptees, although they were still elevated relative to nonadoptees.⁶ In our sample, however, there was no significant difference in odds for suicide attempt between

domestic and intercountry adoptees, and nonwhite ethnicity did not predict suicide attempt.

Our results provide additional information on the adjustment of adopted individuals. Consistent with results reported using the full intake sample, adoptees had a greater number of childhood disruptive disorder symptoms relative to nonadoptees and elevated scores on teacher reports of externalizing behavior and negative mood.⁸ In these analyses, adoptees were further distinguished from nonadoptees by moderately large differences on family discord and smaller differences on academic disengagement. Adoptees did not evidence significantly more substance use disorders or MDD symptoms and showed no differences on personality scales.

Our research is not without limitations. The sample of nonadopted adolescents does not represent the ethnic diversity present in US adolescents. Adoptees were ascertained from adoption agencies only. Our sample does not include placements arranged directly between birth and adoptive parents or permanent placements of foster children by local government agencies. Because we

have no information on biological relatives of adoptees, we were unable to assess the role of genetic factors in mediating increased risk of suicide attempt. Similarly, we had no information on preplacement experiences, including institutional rearing or early trauma. Finally, we had little systematic information on the nature of the reported suicide attempts.

CONCLUSIONS

Our results indicate the odds of a reported suicide attempt between intake and F1 are ~4 times greater in adoptees compared with nonadoptees. Aggregate risk partially mediates the relationship between adoption status and suicide attempt. After adjusting for aggregate risk, the odds of reporting a suicide attempt were reduced but still significant and substantial. The implications of these findings are twofold. Clinicians should be aware of increased potential for suicide attempt in adopted adolescents who manifest other risks for suicidal behavior. For researchers, continued inquiry into those factors mediating this increased risk may inform the larger investigation of suicidality in adolescents.

REFERENCES

- Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance—United States, 2009. *MMWR CDC Surveill Summ*. 2010;59(SS-5):1–142
- Brent DA, Baugher M, Bridge J, Chen T, Chiappetta L. Age- and sex-related risk factors for adolescent suicide. *J Am Acad Child Adolesc Psychiatry*. 1999;38(12):1497–1505
- Bridge JA, Goldstein TR, Brent DA. Adolescent suicide and suicidal behavior. *J Child Psychol Psychiatry*. 2006;47(3–4):372–394
- Hjern A, Lindblad F, Vinnerljung B. Suicide, psychiatric illness, and social maladjustment in intercountry adoptees in Sweden: a cohort study. *Lancet*. 2002;360(9331):443–448
- Slap G, Goodman E, Huang B. Adoption as a risk factor for attempted suicide during adolescence. *Pediatrics*. 2001;108(2). Available at: www.pediatrics.org/cgi/content/full/108/2/e30
- von Borczyskowski A, Hjern A, Lindblad F, Vinnerljung B. Suicidal behaviour in national and international adult adoptees: a Swedish cohort study. *Soc Psychiatry Psychiatr Epidemiol*. 2006;41(2):95–102
- Juffer F, van Ijzendoorn MH. Behavior problems and mental health referrals of international adoptees: a meta-analysis. *JAMA*. 2005;293(20):2501–2515
- Keyes MA, Sharma A, Elkins IJ, Iacono WG, McGue M. The mental health of US adolescents adopted in infancy. *Arch Pediatr Adolesc Med*. 2008;162(5):419–425
- Lindblad F, Hjern A, Vinnerljung B. Intercountry adopted children as young adults—a Swedish cohort study. *Am J Orthopsychiatry*. 2003;73(2):190–202
- Tieman W, van der Ende J, Verhulst FC. Psychiatric disorders in young adult intercountry adoptees: an epidemiological study. *Am J Psychiatry*. 2005;162(3):592–598
- Feigelman W. Are adoptees at increased risk for attempting suicide? *Suicide Life Threat Behav*. 2005;35(2):206–216
- Brent DA. Risk factors for adolescent suicide and suicidal behavior: mental and substance abuse disorders, family environmental factors, and life stress. *Suicide Life Threat Behav*. 1995;25(suppl):52–63

13. Andrews JA, Lewinsohn PM. Suicidal attempts among older adolescents: prevalence and co-occurrence with psychiatric disorders. *J Am Acad Child Adolesc Psychiatry*. 1992;31(4):655–662
14. Beautrais AL, Joyce PR, Mulder RT. Risk factors for serious suicide attempts among youths aged 13 through 24 years. *J Am Acad Child Adolesc Psychiatry*. 1996;35(9):1174–1182
15. Fergusson DM, Lynskey MT. Childhood circumstances, adolescent adjustment, and suicide attempts in a New Zealand birth cohort. *J Am Acad Child Adolesc Psychiatry*. 1995;34(5):612–622
16. Beautrais AL, Joyce PR, Mulder RT. Personality traits and cognitive styles as risk factors for serious suicide attempts among young people. *Suicide Life Threat Behav*. 1999;29(1):37–47
17. Fergusson DM, Woodward LJ, Horwood LJ. Risk factors and life processes associated with the onset of suicidal behaviour during adolescence and early adulthood. *Psychol Med*. 2000;30(1):23–39
18. Kashden J, Fremouw WJ, Callahan TS, Franzen MD. Impulsivity in suicidal and nonsuicidal adolescents. *J Abnorm Child Psychol*. 1993;21(3):339–353
19. Johnson JG, Cohen P, Gould MS, Kasen S, Brown J, Brook JS. Childhood adversities, interpersonal difficulties, and risk for suicide attempts during late adolescence and early adulthood. *Arch Gen Psychiatry*. 2002;59(8):741–749
20. Lewinsohn PM, Rohde P, Seeley JR. Psychosocial risk factors for future adolescent suicide attempts. *J Consult Clin Psychol*. 1994;62(2):297–305
21. Borowsky IW, Ireland M, Resnick MD. Adolescent suicide attempts: risks and protectors. *Pediatrics*. 2001;107(3):485–493
22. Resnick MD, Bearman PS, Blum RW, et al. Findings from the National Longitudinal Study on Adolescent Health: protecting adolescents from harm. *JAMA*. 1997;278(10):823–832
23. McGue M, Keyes MA, Sharma A, et al. The environments of adopted and non-adopted youth: evidence on range restriction from the Sibling Interaction and Behavior Study (SIBS). *Behav Genet*. 2007;37(3):449–462
24. Reich W. Diagnostic interview for children and adolescents (DICA). *J Am Acad Child Adolesc Psychiatry*. 2000;39(1):59–66
25. Welner Z, Reich W, Herjanic B, Jung KG, Amado H. Reliability, validity, and parent-child agreement studies of the Diagnostic Interview for Children and Adolescents (DICA). *J Am Acad Child Adolesc Psychiatry*. 1987;26(5):649–653
26. Spitzer RL, Williams JB, Gibbon M, First MB. The Structured Clinical Interview for DSM-III-R (SCID). I: history, rationale, and description. *Arch Gen Psychiatry*. 1992;49(8):624–629
27. Robins LN, Babor TF, Cottler LB. *Composite International Diagnostic Interview: Expanded Substance Abuse Module*. St Louis, MO: Authors; 1987
28. Robins LN, Wing J, Wittchen HU, et al. The Composite International Diagnostic Interview: an epidemiologic instrument suitable for use in conjunction with different diagnostic systems and in different cultures. *Arch Gen Psychiatry*. 1988;45(12):1069–1077
29. Conners CK. *Conner's Teacher Rating Scale*. Iowa City, IA: University of Iowa; 1969
30. Rutter M. A children's behaviour questionnaire for completion by teachers: preliminary findings. *J Child Psychol Psychiatry*. 1967;8(1):1–11
31. Elkins IJ, McGue M, Iacono WG. Genetic and environmental influences on parent-son relationships: evidence for increasing genetic influence during adolescence. *Dev Psychol*. 1997;33(2):351–363
32. McGue M, Elkins I, Walden B, Iacono WG. Perceptions of the parent-adolescent relationship: a longitudinal investigation. *Dev Psychol*. 2005;41(6):971–984
33. Tellegen A, Waller NG. Exploring personality through test construction: development of the Multidimensional Personality Questionnaire. In: Boyle GJ, Matthews G, Saklofske DH, eds. *Handbook of Personality Theory and Testing: Vol. II. Personality Measurement and Assessment*. Thousand Oaks, CA: Sage Publications; 2008:261–292
34. Johnson W, McGue M, Iacono WG. Genetic and environmental influences on academic achievement trajectories during adolescence. *Dev Psychol*. 2006;42(3):514–532
35. Allison PD. *Missing Data*. Thousand Oaks, CA: Sage Publications; 2001
36. Schafer JL, Graham JW. Missing data: our view of the state of the art. *Psychol Methods*. 2002;7(2):147–177
37. Hjern A, Vinnerljung B, Lindblad F. Avoidable mortality among child welfare recipients and intercountry adoptees: a national cohort study. *J Epidemiol Community Health*. 2004;58(5):412–417
38. Tieman W, van der Ende J, Verhulst FC. Social functioning of young adult intercountry adoptees compared to nonadoptees. *Soc Psychiatry Psychiatr Epidemiol*. 2006;41(1):68–74